CONTENTS

THE APPLICATION OF CAD/CAE TECHNOLOGY IN UPPER COVER MOLD BASED ON PRO/E..... INTERNET OF THINGS SECURITY RISK ANALYZED AND SOLUTION DESIGNED..... SHARING MECHANISM OF SUPPLY CHAIN RISK BASE ON SHAPLEY VALUE.....CHEN WEI, TIAN YUAN, YANG YIXIONG 9 CAMSHIFT OBJECT TRACKING ALGORITHM BASED ON DOUBLE DIFFERENCE METHOD...... JUNJIE LIU¹, HUA CAI, YONG YANG, QINGPENG LIU 14 THE SYSTEM OF WAGES MANAGEMENT INFORMATION SYSTEM BASED ON THE INTERNET OF THINGS...... FENG LEI, HE MIAO 19 EFFECT OF V ADDITION ON MICROSTRUCTURE AND MAGNETIC PROPERTIES OF FE-ZR-B ALLOY.....LI LIU, YURONG YANG, MIN QIU, YANMEI PI, GUOMIN YAN 22 DISCUSSION ON THE TREND OF THE UNIVERSITY GROUP COMPETITION DEVELOPMENT FROM THERMODYNAMICS NUMERICAL ANALYSIS ON SOLID-LIOUID PHASES OF ABRASIVE FLOW POLISHING COMMON—RAIL PIPE.....LIBIN ZHOU, JUNYE LI, XINMING ZHANG, YING XU, LIU JIANHE 28 A CONSTRUCTION PROJECT MANAGEMENT DECISION SUPPORT SYSTEM DRIVEN BY SYSTEM DESIGN AND REALIZATION BASED ON TMS320VC5402 SYSTEM..... MODELING AND SIMULATION OF EARNINGS MANAGEMENT OF LISTING CORPORATION BASED ANALYTIC HIERARCHY PROCESS—BASED CHINESE DISABLED SPORTS CURRENT SITUATION'S FACTOR ANALYSIS OF DISABLED STUDENTS' PHYSICAL MONITORING INDICATORS......LIANG DONG 46 BASED ON THE MULTIPLE LINEAR REGRESSION MODEL ANALYSIS THE INFLUENCE FACTORS THE DEVELOPMENT STATUS OF CLOUD COMPUTING...... DAI LU, ZHANG GANG 54 MEASUREMENT TECHNOLOGY FOR IMPEDANCE PARAMETERS OF AIRCRAFT PARTS BASED ON DSP...... MAO JIAJUN,FU YUYANG,JI CHENXU,TANG.YU,YUAN HAOMING 56 CHINESE MICROBLOG KEY-SENTENCE ANALYSIS BASED ON SVM WEN-FENG LIU 59 HOW TO OPTIMIZE THE LOCATION OF SEALING WALL IN CROSSHEADING FOR FULLY NUMERICAL SIMULATION OF CFD IN RESEARCH FOR THE OIL INDUSTRY..... **RESEARCH OF AC SERVO SYSTEM PARAMETERS SETTING...... JIANHONG ZHOU, ZEMING LI 68 IDENTIFICATION OF SPAM MICROBLOG SENTIMENT BASED HIERARCHICAL KEY-SENTENCES** MODEL...... WEN—FENG LIU 73 TRANSFERING PHENOMENON POLAR RESEARCH BASED ON USER REVIEWS OF EMOTION... WEN—FENG LIU 76 EFFICIENT IMPLEMENTATION TO FLOYD ARITHMETIC BASED ON TRAFFIC NETWORK...... LIJIN.GUO, XUESI.CAO, JIEFEI.DUAN AND BAILING.SONG 79 RESEARCH AND APPLICATION OF A NEW DSP_FPGA SERIES AND PARALLEL COMMUNICATION METHOD......JIANHONG, ZHOU, HONGCHUANG, CHEN AND MING, ZHAO 82 THE STRUCTURE AND GRAPHIC OF THE SOLUTION OF LINEAR EQUATIONS.....LV YOU, ZHANG HUA, YANG AI-MIN 85 AUXILIARY LAPLACE PARAMETER METHOD FOR SOLVING FRACTIONAL EQUATIONS..... STRATEGIC MANAGEMENT OF ADEN—SOFT COMPANY......AIMAN MATAR 91 CLOUD COMPUTING INDUSTRY FACES CHALLENGES...... DAI LU, LI JIANHUA 95

The Application of CAD/CAE Technology in Upper Cover Mold Based on Pro/E

Naiming Miao, Sheng Huang

School of Mechanical Engineering, Changzhou University, Changzhou, 213164, China

Abstract — According to the disadvantages of traditional mold design, the mold flow analysis technology was proposed for optimizing mold design. Taking upper cover injection product for example and Pro/E Plastic Advisor as a platform, this paper introduced the process of injection molding for plastic products and the method of forming simulation. The analysis results can provide useful guidance for optimizing the mold design, improve the quality of plastic products, reduce the forming defects, reduce the production cost and shorten the production cycle.

Index Terms — Pro/E, Plastic Advisor, mold flow analysis, optimization design

I. INTRODUCTION

With the extensive application of plastic products, the demands towards designing and manufacturing of plastic mold become higher and higher. The plastic mold is developing towards high efficiency, high quality and high precision. However, the traditional methods of mold design and manufacture are unable to adapt the market's requirements [1-3]. The design approach of traditional mold depends much on the abundant experience from technical staff. Meanwhile, before put into production, usually the mold needs to be tested and adjusted repeatedly. The low design level, long period, unstable forming technological parameter and so forth restrict the development of mold industry. CAD/CAE technology brings huge revolution to the development of mold manufacturing industry, and has become the new development direction for the mold technology [4-5].

Plastic Advisor is a kind of mold flow analysis module built in Pro/E. It is featured by powerful analyzing, calculating and dynamic simulating functions. By utilizing the Plastic Advisor, flowing status of the plastic melt, occupied state of the plastic parts, pressure changing condition of the injection, changing condition of the temperature and so forth could be observed directly. The technological parameters could be selected, set and revised at any time for improving the success rate of mold test once. The analysis result plays significant role in optimizing the mold structure and technological parameter of injection forming.

II . STRUCTURAL CHARACTERISTIC ANALYSIS OF THE PLASTIC PART

The shape of the plastic upper cover is shown in Figure 1. The overall dimension is $205 \times 85 \times 30$, and wall thickness is 2.5mm. The plastic part contains three side openings. The material is PP with fine mobility and high strength. It is easy to be injection molded. The molding shrinkage is 2%.



Figure1. Plastic upper cover



Figure 2. Analysis result of the optimal gate location

III. CONDUCT MOLD FLOW ANALYSIS BY ADOPTING PLASTIC ADVISOR

A. Analysis of gate location

The gate location influences the melt's flow inside the mold cavity and means a lot to the mold structural design. After the material of the work piece and the forming technology are fixed, Best Gate Location function in Plastic Advisor could be adopted for determining the gate location. The method is as below: select "Application" \rightarrow "Plastic Advisor" order in Pro/E, enter into the operation interface, and then enter into the "Analysis Wizard", select the analysis type "Gate Location". The selected material is PP, and the forming conditions to be set are: mold temperature 40 °C, melt temperature 240°C, maximum injection pressure 180Mpa, other technological parameters accept the system default. After the computer completes the corresponding analysis and process, analysis result of the optimal gate locate is obtained as Figure 2. Set gate at the blue area in Figure 2 is beneficial for mold filling. While set the gate at the central part of the work piece, the mold filling is short, the weld marks and quantity of gas hole are the minimum, and the mold filling effect is the best.

B. Analysis of the forming technological condition

By analyzing the forming technological condition, the optimal forming parameters such as the forming temperature and injection time could be obtained. Select the analysis option "Molding Window" in "Analysis Wizard", select the degree of gloss "Gloss" in the dialog box needed for the work piece surface and obtain the forming condition as shown in Figure 3. Seeing from the Figure, the vertical direction is the melt temperature, the horizontal direction is the injection time, each point represents a forming condition, and the center of the green area marked in the Figure is the area for optimal forming parameter. The corresponding forming temperature and injection time play referential role in the practical molding process.



Figure 3. Analysis of the forming technological condition

C. Analysis of the plastic melt filling

Plastic melt filling analysis could be conducted through selecting the "Plastic Filling" option in the "Analysis Wizard". The problems and quality defects that might be happened during the injection process could be analyzed.

(1)Analysis of the filling time. Check the filling process through the graph and simulated animation, the result is shown in Figure 4. The plastic part completes melt filling within 1.28s, firstly the central area of the plastic part is filled, finally is the edge place, the flowing balance is well.

(2)Analysis of the filling feasibility. It is used for evaluating whether the filling performance is good or not from a general perspective. Result of the filling feasibility analysis is shown in Figure 5. It could be seen that there is no filling defect on the plastic part and the filling state is well.



Figure 4. Analysis of the filling time



Figure 5. Analysis of the filling feasibility

D. Analysis of the cooling quality

The analysis of the cooling quality is used for predicting the defect position generated from different cooling speeds. By selecting the analysis option "Cooling Quality" in "Analysis Wizard", analysis of cooling quality towards the plastic part could be conducted. The result of cooling quality analysis is shown in Figure 6. Seeing from the Figure, the entire cooling quality to the plastic part is high, without partial overheating circumstance. Figure 7 is the variation diagram for the surface temperature of plastic part. Seeing from this Figure, the variation of surface temperature is even with little temperature difference, which indicates the technological condition selected is appropriate.



Figure 6. Analysis of the cooling quality



Figure 7. Variation analysis of the surface temperature

E. Defect analysis

(1)Analysis of the sink mark.

This is used for checking the location and size of the sink mark. By selecting the analysis option "Sink Marks", analysis of sink mark could be conducted. The result is shown in Figure 8. The location of the sink mark is the blue area on the Figure. It could be seen that the dimension of sink mark is within 0.005mm~0.01mm, which has little influence to the product quality.



Figure 8. Analysis of the sink mark

(2)Analysis of the bubble

Figure 9 is the analysis graphics of the bubble position. During designing the mold, exhaust groove in corresponding position could be set for air discharging. Or by utilizing the gap between the die joint and mold insert to discharge air, so as to scatter the air released from the melt successfully. This could prevent the

5

surface defects, scorch and other defects caused by the bubble.



Figure 9. Location of the bubble

(3)Analysis of the weld mark

The weld mark is a kind of thread mark on the surface of the plastic part. It is the melt mark formed while several strands of material flows join together separately in the mold cavity, they are not fused completely and could not be fused together with each other. It affects the appearance quality and mechanical property of the plastic part. Consequently, try to avoid generating the weld mark at the area with weak structural strength. Figure 10 is the position of the weld mark. Seeing from the Figure, the weld mark is near the opening slot. By combining the analysis result (Figure 11) of the temperature at the front material flow, it is indicated that the temperature of the material flow at the weld mark is not reduced obviously, and the temperature differences are not over 1 $^{\circ}$ C. The fusing of the weld mark is well, which ensures the mechanical strength and appearance quality of the plastic part.



Figure 10. Analysis of the weld mark position



Figure 11. Analysis of the temperature at the front material flow

IV. STRUCTURAL DESIGN OF THE MOLD

Combining with the result of the mold flow analysis, Pro/E is adopted to complete the structural design of the mold. The mold structure adopts one mold for one cavity. Due to there are holes on the plastic part side, the side extracting mechanism of sliding block is used. The mold parting surface is shown in Figure 12. The green color is the main parting surface, the purple color is the side extraction parting surface on one side, and the red color is the side extraction parting surface on the other side. Figure 13 simulates the molding opening process simply.



Figure 12. Mould parting surface



Figure 13. Molding Opening Simulation

V.CONCLUSION

By utilizing the Plastic Advisor module in Pro/E to conduct mold flow analysis, the optimal gate location could be determined and the reasonable forming technological condition could be obtained. It could not only simulates the plastic flow mold filling process dynamically and reveal the corresponding evaluating technical index, but also could predict the defects that might be generated to the plastic part. The analysis result could provide reasonable reference for the mold structural design and forming technological condition, shorten the manufacturing period of the mold design, improve the product quality of the plastic part and reduce the cost.

References

- Shen Kaizhi. Plastic Forming Mold (The 3rd Edition) [M]. Beijing: China Light Industry Press, 2013.
- [2] Zhao Jianhua, Xueqiong, Zhangyu. Application of CAD/CAM Technology in the Face Shell of Digital Camera [J].*Manufacturing Industry Automation*, 2009, 31 (4):93-118.
- [3] Liuyang, Lujun, Li Wenwen, Jiating. Plastic Mold Design of Terminal Block DK16 [J]. Mechanical Design and Manufacturing, 2010, (2): 240-242.
 [4] Chenhui, Li Mingyao, Wu Huachun. Development of Mold CAD/CAE/CAM Technology and Software
- [4] Chenhui, Li Mingyao, Wu Huachun. Development of Mold CAD/CAE/CAM Technology and Software Application [J]. *Mechanical Design and Manufacturing*, 2011 (6): 238-240.
- [5] Cai Xia, Chen Xiaohuan. The structure design of injection mold for plastic coil [J]. Equipment Manufacturing Technology, 2015(3):26 - 28.

Internet of Things security risk analyzed and solution designed

Yuan Feng

School of Computer and Communication Engineering, Zhengzhou University of Light Industry, Zhengzhou 450002, China

> Chunhui Hu, Jianwei Zhang, Zengyu Cai Zhengzhou University of Light Industry, Zhengzhou 450002, China

Abstract—The security of the IOT (Internet of Things) is the most important issue before the IOT is widely used. In this paper, we analyzes the IOT's three layer architectureperception layer, network layer, application layer firstly and then analysis the security threats and non-technical factors security problems about IOT through these three layers. On this basis, we present a complete security solution about moral education, technical support and legislative protection. This provides a helpful design and solution about the research of security risk of IOT.

Index Terms—Internet of Things, architecture, IOT security, security solution

I. INTRODUCTION

The IOT is a comprehensive information system which the core is perception. The development of IOT will promote the traditional production, mode of life and productivity, production efficiency and living quality [1]. Compared with the traditional network, the security of the IOT will be more outstanding. The IOT needs to solve the cost, complexity and other new challenges besides the traditional information security problems [2]. Many researchers are working on this field and made some achievements [3-6]. In this paper, we will start with the system structure of this network, labor the security threat on the perception layer, network layer, application layer of the IOT and made a security program on the basis.

II. THE ARCHITECTURE OF INTERNET OF THINGS AND KEY TECHNICAL ANALYSIS

The IOT is a network base on the network and traditional telecommunication network. The entire physical Object which can be independent addressing will be connection network. This network include sensor, RFID, security, network, communication, information processing, service technology, marking, positioning, Synchronization and other technosphere. As a variety of polymeric complex systems, networking involves IT at every level from top to bottom, according to information generation, transmission, processing and application process can be divided into the perception of the Internet layer, network layer, application layer, as shown in Figure 1.



Figure1. Architecture of IOT

III.THE SECURITY PROBLEMS OF INTERNET OF THINGS ANALYSIS

A. The security issues of Perception layer

Perception layer is the most basic level. This layer will collect information and identification of objects. Among IOT-base application services, must comprehensive treatment and utilization the complex information. Sensor sensing device within the network and the external network information transmission by the network gateway node and this node is the control channels of all internal nodes and outside nodes. Therefore, the security of sensor networks have decided Things perception layer of security, through the analysis, perceived security threats facing layer as show below:

RFID security threats against: In RFID systems, the information transmits between labels and reader by the electromagnetic wave. This process without any visual contact and is a serious safety hazard.

- Attack label. The RFID label of the object does not contains the perfect security module, is very vulnerable to attack, causing data to be copied, altered and deleted.
- Attack communications link. The communications of RFID includes the air interface between label and reader, and the network between reader and background system. The wireless air interface in the preceding link, Illegal users can cheat legally authorized for data

tampering, deletion, or communication channel blocking denial for DDOS attacks. In the background of the communication link, the system faces widespread traditional network security issues.

• Attacks on the RFID reader. Reader only provide user service interface and not provide the safety performance of the interface which can upgrade by user. Therefore, the reader also have safety loophole.

The safety issues of intelligence node: namely networking machine (sensor nodes) local security issues. Since the application of internet of things can replace people to complete a number of complex, dangerous and mechanical work, mostly of the machine and sensor nodes deployed in unattended scenes. The attacker can easily come into contact with such devices, thus causing damage to them, even though the local operation of the machine hardware replacement.

For WSN security threats: WSN (wireless sensor network, WSN) is composed of a large number of cheap micro sensor nodes through wireless communication consisting of a multi-hop self-organizing network in the monitor area and collect the information and transfer. The security attacks are physical nodes, the communication channel attacks, based on coordinated attacks.

On the perception layer other means of attack: Including data-driven attacks, malicious code attacks, denial of service.

B. The security issues of network layer

Internet of Things transport layer facing the security problem existing TCP / IP network. While due to the presence of internet of things interconnected networks of different architectures problems, the transport layer will facing with the a heterogeneous network transport layer cross-network authentication and other security issues, will be attack under Dos, middle attack, asynchronous attack, conspiracy attack and so on. Meanwhile, Because of the Internet of things is the connection of objects, the state information and the control instruction information amount will then have these objects are massive. The security measures of the core network will very easy to cause the network congestion, denial of service when facing massive and cluster data transmission demand. So the transport layer security threats facing more severe.

The vulnerability of internet and internet of things will be diffused. The internet of things was on the internet, the vulnerability of internet will diffuse in the internet of things and so as internet of things.

The heterogeneity of the core in the Internet of things network leading the vulnerability of management. Heterogeneous core network of the Internet of things to increase the difficulty of management will increase the management risk. In addition, in the network transport layer and application layer, will face the current TCP/IP networks in the presence of all security issues, at the same time, the safety issues of the internet of things will be more complex because of the huge and heterogeneous of the data and data format which collected by perception layer. Network interconnection of different security domain, different protocols can lead to serious security problems, such as cross domain mutual attack, protocol conversion, the reliability of sensitive information leakage etc.

C. The security problems in application layer

The application layer of the IOT is responsible for processing the received information, finally the feedback the operation control command to the object. Application layer face the various types of the actual needs of the application service, the information processing and sharing service. Different from the perception layer and network layer, application layer will face some new security problems; we must adopt some new security solutions to deal with these problems. The security of application layer also involves data authentication, computer data destruction, identification, computer forensics, security mechanism and so on.

The sensitive of command data: Instruction data is the key information about the application layer to control information feedback. Whether it is due to be intrusion data tampering or the massive data leads the calculated deviation of middle-ware, once the IOT make a mistake will cause serious consequences. Just imagine, if the electromagnetic oven has to cook the rice, then this should perform insulation or stop working, but due to the application layer error, continue to increase the power received instructions, obviously, this will be how significant security risk.

The confidentiality and integrity about data: At the application layer, will collect user privacy data inevitably some industries and applications, this sensitive information on hackers are often the most valuable, the security risks brought about by the very high. Data processing, transmission and storage time may also be modify, insert, delete, it will destroy the integrity of data.

The security vulnerability of application layer: The application layer includes terminal security loopholes, access control software vulnerabilities and security audit loopholes. The terminal holes of internet of things refers to the operation of mobile intelligent terminal or PC without reinforcement and test security, possible security holes caused by the. Access control vulnerability refers to the access control logic confusion or control failure, lead to serious security problems. Software vulnerability refers to the application of memory leaks, buffer overflow, SQL injection, XSS injection vulnerabilities and seriously affects the safe operation of the system. Security audit vulnerability refers to the lack of security audit function, not the audit important safety incidents, audit data protection such as inappropriate may cause potential safety event has occurred or not effectively track.

The security problem of internet of things without technological: The information security problem also relates with many without technology factors in the internet of things. Typically the education, management and safety risk assessment. In the aspect of education, the education for serious users aware of network security problems will help reduce the risk of information leakage. In the field of management, establish safety rules and regulations complete will make the safe hidden trouble is reduced to the minimum. The safety of network application system in safety assessment of the evaluation of scientific, effective and identify solutions, to ensure that the network system security.

IV. THE SECURITY SCHEME OF INTERNET OF THINGS

When we research on application of Internet of things, we also should create a good environment for the healthy development of the internet of things from the three angles of moral education, technical support and legislation.

A. Moral education

Driven by economic interests, the network attack motives have been from the early days of the practical joke, show the ability and to seek excitement, to gradually develop in the direction of organized crime, and even organized transnational economic crimes. Cyber criminals are gradually formed a black industry chain, network attack has become more and more specialized and commercial. Therefore, we must strengthen the moral education of privacy information security, network security and personal, reduce the network security threats.

B. The security solution technology

As the multi in one network, the security of intent of things relates to different levels of other network, in the independent network has practical applications in a variety of security technology, especially the security of mobile communication network and the Internet has experienced a long time, relatively mature, not detailed here. Aiming at the safety problem in sensor networks, should focus on the key management mechanism for the Internet of things, data processing and privacy, security routing protocol, certificate and access control, and intrusion inspection and intrusion tolerance wrong technology. We should study and employ various security technologies, and establishing the network security system integration. The difference of security technology about perception layer, network layer and application layer of the internet of things is shown in Figure 2.

Application layer	It can set the security level of the password techniques, lightweight cryptographic algorithms and authentication protocol, electrostatic shielding method, the active jamming, the reader change frequency, the label change frequency.	
Network layer	End-to-end authentication mechanism, key agreement and the management mechanism, and different communication patterns of authentication and confidentiality protection mechanism, VPS, firewall, IDS, PKI.	
Perception layer	Database access control, content selection mechanism, information tracking mechanism, and forensics, data disposal technology, the protection of intellectual property rights technology, anonymous signature and authentication, certification, rebellious tracking, digital watermarking and fingerprint technology.	

Figure 2. IOT security technology architecture ACKNOWLEDGEMENT

C. Legislative protection

The Internet of things is a new thing and the security system will be not perfect in the early stage. Each of us must participate, consciously abide by the security system of the Internet of things, do not harm the IOT security. At the same time, the country should establish security protection mechanism when promotion of development of internet of things, through legislation to ensure network security. The importance of different information network management requirements is no difference, no standard and specific issues such as lack of independent legislation of the internet of things. So we should strengthen the protection of network information though policies and regulations, related to national security, business secrets and personal privacy, especially the network information protection, infrastructure and other aspects of the regulations.

V.CONCLUSION

The security research of internet of things is an emerging areas and any security technology are accompanied by the specific needs of emerge as the times require. Security architecture for the Internet of things on the Internet of things exists at all levels of. At present, the research and application of the Internet of things is just beginning, research on its safety is still at the primary stage. With the wide application of the Internet of things, more and more security problem will expose, network security research have a long way to go, we will be focus on the network security evaluation model and research support plan network security in the future. The authors are grateful to the editor and anonymous reviewers for their valuable suggestions which improved this paper. This research was partially supported by the National Natural Science Foundation of China under Grant No. 61272038.

REFERENCES

- Babar S, Mahalle P, Stango A, et al. Proposed security model and threat taxonomy for the Internet of Things (IoT)[M]//Recent Trends in Network Security and Applications. Springer Berlin Heidelberg, 2010: 420-429.
- [2] Heer T, Garcia-Morchon O, Hummen R, et al. Security Challenges in the IP-based Internet of Things[J]. Wireless Personal Communications, 2011, 61(3): 527-542.
- [3] Li X, Xuan Z, Wen L. Research on the architecture of trusted security system based on the Internet of things[C]//Intelligent Computation Technology and Automation (ICICTA), 2011 International Conference on. IEEE, 2011, 2: 1172-1175.
- [4] Zhou L, Chao H C. Multimedia traffic security architecture for the internet of things[J]. Network, IEEE, 2011, 25(3): 35-40.
- [5] Ukil A, Sen J, Koilakonda S. Embedded security for Internet of things[C]//Emerging Trends and Applications in Computer Science (NCETACS), 2011 2nd National Conference on. IEEE, 2011: 1-6.
- [6] Wu Q W, Jiang L Z. A Flexible Security Architecture for the Internet of Things[J]. Applied Mechanics and Materials, 2013, 241: 3255-3259.

Sharing Mechanism of Supply Chain Risk Base on Shapley Value

CHEN Wei¹, TIAN Yuan¹, YANG Yixiong²*(corresponding author)

1. Glorious Sun School of Business and Management, Donghua University, Shanghai, China

2. Fashion and Art Design Institute, Donghua University, Shanghai, China

Abstract—Cooperation can reduce supply chain risk effectively. Fair and reasonable risk sharing mechanism can contribute to the division of labor in supply chain, and raise the level of cooperation. Our researches introduce the methods to solve the problem of supply chain risk sharing. We use the Shapley value formula of cooperative game to obtain the risk sharing model of supply chain. Based on the risk value revised, we extend the risk sharing mechanism to include three different points of view: average distribution, contribution rate of alliance members and the decisionmaking right of cooperation. In addition, the characteristics of each sharing mechanisms are compared and confirmed by an example. Our analysis indicates that Shapley value can effectively share the supply chain risk, and through revising the risk value the existing research ideas and conclusions can be extended.

Index Terms—supply chain, risk sharing, Shapley value, cooperative games

I. INTRODUCTION

Entire supply chain covers the suppliers, manufacturers, distributors, retailers and final customers, etc., in which the involving suppliers and distributors may be stratified or graded. Moreover, business contacts between supply chain members may cross the middlemen. Thus the supply chain is a complex and dynamic network. Because of mismatch of supply and demand, asymmetric information, uncertainty of market as well as a variety of unknown factors containing politics, economy, law and force majeure, the division of labor in the supply chain node enterprises creates various types of risks objectively. So the supply chain risks can be defined as the operational risk or disruption risk of supply chain, which are generated by unknown of economic cycle, consumer demand uncertainty and unpredictable disasters caused by natural or man-made[1].



Figure1. Classification of disposal methods of supply chain risk

According to disposal methods, supply chain risk management can be divided into: Supply chain risk transfer, supply chain risk avoidance and supply chain risk undertaken by itself (see Fig.1) [2].

Supply chain risk transfer indicates transferring supply chain risk outside of supply chain or imputing it to other members not in the supply chain by virtue of some means or approaches. Supply chain risk avoidance means cutting off risk sources by curbing the occurrence of risk events directly or indirectly. However, most of the risks are random and difficult to completely avoid. Supply chain risk undertaken by itself represents to that the risk remained in the internal supply chain by node enterprises, which can be reduced by internal control measures or taken on action to let the risk exist. When enterprises using risk management theory to deal with the risks, they should clearly realize that most risks can be prevented, reduced and avoided, but can not be completely removed. Supply chain risk undertaken by itself It is unable to reduce and avoid their own risk. So it is necessary to establish a series of supply chain risk-sharing methods having theoretical and guiding significance to manage and control risk overall from a global perspective. Effective and equitable risk-sharing mechanism can balance multi-stakeholder, promote in-depth cooperation and sustainable development of supply chain. Game theory is a feasible solution to solve the problem of decision analysis about mutual influence interests and multi-objective conflicts.

Currently, the research of supply chain risk sharing has focused on risk-sharing models of two-echelon supply chain (two node enterprises) in coordinating contracts. Only few studies on two-echelon or more nodes enterprise and complex supply chain. Xiao and Wang[3,4] used Stackelberg game to research coordination and risksharing of supply chain including one supplier and one retailer, obtain that the optimal suppliers buy-back price equal to wholesale price, and account the risk-sharing ratio of two enterprises is equal to the marginal cost ratio of them when the supply chain's order quantity is optimal. He and Zhang[5] studied the same problem of risksharing in a two-echelon supply chain constituted by one supplier and one retailer. Based on the study of He and Zhang[5], Zhao and Lu[6] further researched on the risksharing contracts of uncertain two-echelon supply chain in VMI (vendor managed inventory) model. Zhao and Zong[7] took a supply chain containing a manufacturer and a retailer as the research object, establish a decisionmaking model of supply chain option contract in uncertain condition, and analyze the effect of negotiating capacity on the supply chain performance. Based on a single product, single-period supply chain, Su and Li[8] dealt with the supply chain coordination and risk-sharing problems of internal quality fault and buy-back policy using Stackelberg non-cooperative game. Kim and Park[9] presented a method to cope with exchange rate risk by analyzing the risk sharing or transfer between supplier and retailer in a decentralized and risk aversion global supply chain.

Shapley value explores a stable solution of cooperative game. The advantage of Shapley value is allocating the benefit or cost according to all marginal contributions, which indicates earning or absorbed cost of participating member *i* equals to the mean value of marginal contributions of all alliances that member i joins in. At present, Shapley value is widely used to solve the allocation problem of cooperation alliance's interests. Murphy[10] distributed the value-added generated by energy policy using Shapley value. Xie and Dou[11] studied income-distribution and cost-sharing of low carbon economy with Shapley value. Hu et al.[12] used modified Shapley value to investigate the benefits sharing (Public-Private-Partnership, of PPP public-private partnerships) projects. Diao et al.[13] and He et al.[14] employed revised interests Shapley value to research the allocation pattern of alliance. Overall, the basic idea of revised Shapley value is: revising the weights of Shapley value by considering other factor about interest-sharing of alliance. So the allocation scheme with revised Shapley value can be integrated more interest allocation factors to improve the distribution mechanism.

Now, the problem of risk-sharing in complex supply chain with multiple members need to be solved at industrial economy field. In this paper, supply chain risk allocated to multi-members is studied by Shapley value combined with different concepts to revise the allocation risk in order to expand the applied scope of the Shapley Value. Although the cooperation of alliance members is a precondition of Shapley value, cooperation and shared are the results of rational choice by partner companies in supply chain spontaneously for the issue of supply chain risk-sharing. Overall, this research direction is in line with the status of supply chain management.

II. RISK-SHARING SHAPLEY VALUE MODEL

A. Characteristic Function of Risk-sharing Cooperative Game

Color figures will be appearing only in online publication. All figures will be black and white graphs in print publication.

Let (N, r) be the characteristic function of risksharing cooperative game[2]. We use $N = \{0, 1, 2, \dots, n\}$ to denote the set of participating members, in which n is positive representing the number of participating members. Let S be the subset of N, and $S \subseteq N$. Assuming that the r(S) is the sharing-risk of members who are participating cooperation in subset S, and $r(\emptyset) = 0$. Let $r(\{i\})$ be the member i's sharing-risk if operating independently. $y_i(i = 1, 2, \dots, n)$ denotes number i's sharing-risk from the minimal cooperation risk r(N). In order to facilitate the possibility of cooperation, characteristics function of cooperation risk must meet the following several conditions:

$$\begin{array}{l} (1) \quad r(S \cup T) \leq r(S) + r(T) \ , \ \forall S, T \subset N \ , \ S \cap T = \emptyset \\ (2) \quad y_i \leq r(\{i\}) \ , \ \forall i \in N \\ (3) \quad \sum_{i \in S} y_i \leq r(S) \ , \ \forall S \subset N \\ (4) \quad \sum_{i \in N} y_i = r(N) \ , \ \forall i \in N \ , \ y_i \geq 0 \\ (5) \quad r(\emptyset) \geq r(\{i\}) \ , \ \forall i \in N \end{array}$$

Where formula ① represents the total risk of cooperation between two disjoint subsets (S and T) of the alliance is no greater than the sum of their risk generated by operating independently, which is the basis of cooperation – that is, cooperation can reduce the total risk of the system. Formula ② proposes a rationality condition of individual that cooperation is better than fragmentation. Formula ③ is alliance's rationality condition that all participating members fully share the risk. Formula ⑤ is the rationality condition for individual entering the current system (supply chain).

B. Risk-sharing Formula of Shapley Value

Shapley value can solve the problem of alliance's benefits distribution, with the basic idea that cooperation can increase the utility. The characteristic function of risk-sharing cooperative game proposed in this paper is corresponding with that before. So the risk reduction of cooperation should be converted into interest increase to be suitable for traditional Shapley value method.

Similarly, Let (N,v) be the characteristic function of benefits distribution of risk-sharing cooperative game. Let $N = \{0, 1, 2, \dots, n\}$ be the set of participating members. v(S) is proposed the increased benefit of mutual cooperation of participating members in subset S. Let $v(\{i\})$ be the number *i* 's sharing-benefit if operating independently. So the risk conversion formula of risk reduction to benefit increase is as follows:

$$v(\phi) = v(\{1\}) = 0, \ i = 1, 2, \dots, n.$$

$$v(\{1, \dots, k\}) = r(\{1\}) + \dots + r(\{k\}) - r(\{1, \dots, k\}),$$

$$k = 2, 3, \dots, n$$
(1)

By transforming the formula, v(S) satisfies $v(S) > \sum_{i \in S} v(\{i\})$ apparently. Then, let $x_i(i = 1, 2, \dots, n)$ be number *i* 's obtained benefit from the maximum cooperation benefit v(N). We show the benefit distribution formula based on Shapley value as follows:

n!

In the above formula, |S| represents the number of members in subset S, where $S - \{i\}$ denotes the subset without member i [11-14]. So we can show that $x\{v\} = ((x_1(v), x_2(v), \dots, x_n(v)))$ is the benefit distribution Shapley value of n members

When the characteristic function of benefit distribution satisfies $\forall S, T \in N$ and $v(S) + v(T) \leq v(S \cup T) + v(S \cap T)$, it's called convex game. Shapley had proved the convex game's core is non-empty[15]. That is, when the game in the condition of convexity, allocation solutions of benefit distribution using Shapley value are stable and exist.

Reverting benefit increased back to risk reduction, can get the risk-sharing formula of supply chain with Shapley, which named sharing mechanism I:

$$y_i = r(\{i\}) - x_i(v), \ i = 1, 2, \dots, n$$
 (3)

Because risk reduction can be converted benefit increase by formula, it is possible to allocate risk by Shapley Value. One advantage of the Shapley value is allocating the risk to a member in accordance with its average marginal contribution to alliance.

C. Sharing Mechanism Based Residual Risk Revision

Shapley value is a benefit allocation method according to the contribution rate of members in alliance, which can raise the output level of alliance and cooperative positivity of participation members. However, some pointed out its limitations about no scholars considerations such as the effort level of membership[11], the level of the risk borne by members themselves, individual input and its output contribution[12], and the position of membership in the supply network[14]. Although some scholars took above factors to develop revised method of benefit-sharing with Shapley value, most of the existing methods are revising the allocation results of benefit-sharing direct, which may cause excessive correction and lose characteristic of Shapley value sharing mechanism. The risk-sharing Shapley value we propose in this paper is different with risk-sharing Shapley value. In our method the risk-sharing of cooperative members is divided into two parts (e.g., member i) : $-x_i(v)$ and $r(\{i\})$. Thus, member i's supply chain risk can be divided into two parts too using Shapley value: first is the allocation risk shared by Shapley value $-x_i(v)$, second is the risk undertaken by itself $r(\{i\})$. So the total of risk shared by Shapley value is $\sum -x_i(v)$, the total of risk undertaken by itself is $\sum -x_i(v)$. In this paper, $r(\{i\})$ and $\sum r(\{i\})$ are collectively called remaining risk after Shapley value distribution. If part of the total risk (allocating risk by Shapley value) was assigned by Shapley value method, the remaining risk could be revised by other theories or in combination with other risk-sharing influences. Based on the revised remaining risk, it not only can introduce sharing modes such as equal distribution, priority in efficiency and decision-making right of cooperation, but also can avoid adverse effects of losing the feature of supply chain benefit-sharing and risk-sharing with Shapley value caused by excessive revise, because of applying these sharing modes directly to Shapley value to solve the result.

Revised method of remaining risk can be grouped into two categories. The first category is distributing the total of risk undertaken by itself $\sum r(\{i\})$ depending weights:

$$r(\{i\})' = W_i \cdot \sum_{j=1}^n r(\{j\})$$

Where $r(\{i\})'$ represents the member *i* 's undertaken risk after weight revise. Let w_i be revised weight of member *i*.

The second category is revising each member's risk undertaken by itself $r(\{i\})$.

 $r(\{i\})''=r(\{i\})+\Delta r(\{i\})$

Where $r(\{i\})''$ denotes member *i* 's undertaken risk after revise, and $\sum \Delta r(\{i\})=0$. $\Delta r(\{i\})$ is the revised value of member *i* 's risk undertaken by itself.

Based on revised remaining risk, we proposed three new methods of supply chain risk-sharing with Shapley value, in which mechanism II and III belong to first category of revised methods, and mechanism IV belongs to second category of revised methods. (1) Sharing mechanism II. Without considering other influences of risk sharing, we assume part of the total risk has been shared by Shapley value, the remaining risk $\sum r(\{i\})$ can be shared to *n* members averagely. This sharing mechanism is very intuitive, that reflects both efficiency and fairness. Therefore the remaining risk-sharing formula is $\frac{1}{n}\sum_{j=1}^{n} r(\{j\})$. Member *i*'s undertaken

risk can be written as

$$y'_{i} = \frac{1}{n} \sum_{j=1}^{n} r(\{j\}) - x_{i}(v) , \quad i = 1, 2, ..., n$$
(4)

(2) Sharing mechanism III. Similarly, without considering other influences of risk sharing, we suppose part of the total risk has been shared by Shapley value, the remaining risk can be shared according to the contributions of risk-sharing has been allocated, which highlights the priority of efficiency. So the allocation formula of remaining risk can be written as

$$y_{i}'' = [x_{i}(v)^{-1} / \sum_{j=1}^{n} x_{j}(v)^{-1}] \cdot \sum_{j=1}^{n} r(\{j\}) - x_{i}(r),$$

$$i = 1, 2, ..., n$$
(5)

(3) Sharing mechanism IV. Shapley value defaults member's willingness to participate alliance is 1/n, which does not consider the impact of the decision-making right of alliance establishment on utility distribution. We use the decision-making right of alliance establishment for reference to revise the Shapley value[16], which can import the cooperative willingness to allocate risk and evade the harmful effects of excessive revise that induced by using this method to Shapley value allocation directly.

Risk-sharing decision-making considers risk reduction marginal contribution of cooperative members to be the important influences as well as economic contribution of cooperative members. Let e_i be the economic contribution rate of member i, and $\sum e_i = 1$. Assuming that decision-making weight of member equals to economic contribution rate, that is $d_i = e_i$, obviously $\sum d_i = 1$.

Decision-making of building alliance is a game process, which is relate to the order of participating members. We assume that when the decision weights accumulate to a certain threshold (or greater than) along with members joining, the alliance is established. Then the key joiner (this member's participation just make the accumulated decision weights exceed

Threshold) who promotes the establishment of alliance N becomes the key decision maker. The permutation amount of building alliance N is n!. Let α_i be the time of member i becoming the key decision maker. m_i denotes the assigned weight of remaining risk considering decision-making right.

$$m_i = \frac{1}{n} - \frac{\alpha_i}{n!} \tag{6}$$

Because $\sum_{i=1}^{n} m_i = 0$, the revised value of remaining risk

 $\Delta r(\{i\})$ can be expressed by

$$\Delta r(\{i\}) = \frac{m_i}{n} \cdot \sum_{j=1}^n r(\{j\}) = \left(\frac{1}{n^2} - \frac{\alpha_i}{n \cdot n!}\right) \sum_{j=1}^n r(\{j\})$$
(7)

The risk-sharing mechanisms after revising is

$$y_i''' = r(\{i\}) + \Delta r(\{i\}) - \varphi_i(v), \quad i = 1, 2, ..., n$$
(8)

Compared with the sharing mechanism I, these three sharing mechanism have their own characteristics based on revised remaining risk. Sharing mechanism I use Shapley value to calculate risk-sharing directly, which only considers the contribution rate federal members. Sharing mechanism II combines the contribution rate of alliance members and average thought to solve the problem of risk-sharing. Sharing mechanism III calculates the allocation according completely with the contribution rates of alliance members. Sharing mechanism IV not only considers risk reduction contribution rate of alliance member's cooperation, but also combines the influence of cooperative member's decision right, which expands the application of risksharing method. In a word, different risk-sharing mechanisms have different scope, which relates to the real fact.

III. CASE ANALYSIS

We suppose a textile and apparel supply chain including fabric and accessories supplier A, apparel manufacturer B and retailer C. If company A, B, C operated independently, the risk values would be 10,10,12 respectively. If company A and B cooperated, the risk value would be 17. If company A and C cooperated, the risk value would be 20. If company B and C cooperated, the risk value would be 18. If company A, B and C cooperated, the risk value would be 22. economic contribution rate of company A to the supply chain alliance is 20%. Similarly, company B is 50%, and company C is 30%. When the accumulated decision weights are more than 50%, alliance is established. Apparently, the above data conform to the conditions of cooperative risk characteristic function, so it can be used to risk-sharing formula. First, by the conversion formula of risk and benefit (formula (1)), we can obtain

 $v(\phi) = v(\{1\}) = v(\{2\}) = v(\{3\}) = 0$

 $v(\{1 \cup 2\}) = r(\{1\}) + r(\{2\}) - r(\{1 \cup 2\}) = 10 + 10 - 17 = 3$ $v(\{1 \cup 3\}) = r(\{1\}) + r(\{3\}) - r(\{1 \cup 3\}) = 10 + 12 - 20 = 2$ $v(\{2 \cup 3\}) = r(\{2\}) + r(\{3\}) - r(\{2 \cup 3\}) = 10 + 12 - 18 = 4$ $v(\{1 \cup 2 \cup 3\}) = r(\{1\}) + r(\{2\}) + r(\{3\}) - r(\{1 \cup 2 \cup 3\})$ = 10 + 10 + 12 - 22 = 10

Then calculating the allocation risk by Shapley value. In Table 1, company A's Shapley value is $\frac{1}{2} + \frac{1}{3} + 2 = 2\frac{5}{6}$. In the same way, company B's Shapley value is $3\frac{5}{6}$ as

well as company C's $3\frac{1}{3}$.

TABLE I.	SHAPLEY	VALUE	OF	COMPANY	А
----------	---------	-------	----	---------	---

S_i	{1}	$\{1\}\cup\{2\}$	$\{l\}\cup\{3\}$	Ν
v(S)	0	3	2	10
$v(S - \{i\})$	0	0	0	4
$v(S) - v(S - \{i\})$	0	3	2	6
S	1	2	2	3
W(S)	$\frac{1}{3}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{3}$

$W(S)[v(S) - v(S - \{i\})]$	0	$\frac{1}{2}$	$\frac{1}{3}$	2
-------------------------------	---	---------------	---------------	---

Because the decision-making weigh of member equals to economic contribution rate, so the decision-making weights of A, B and C of are 20%, 50% and 30% respectively. There are 6 permutations of participating orders of supply chain cooperative alliance composed by 3 companies, such as ABC, ACB, BAC, BCA, CAB, CBA. Meanwhile, let threshold of cumulative decision weights be 50%. So according to the known decision weights, we show the key decision-makers (just establish the alliance) corresponding to each permutation are B, B, A, C, B, B. The calculating results of remaining risk corresponding to sharing mechanism IV are in Table 2.

ABLE II.	CALCULATION OF	REMAINING RISK
	0.10000.11101.001	iteriteriteriteriteriteriteriteriteriter

Т

Companies	A/{1}	A/{2}	C/{3}
α_{i}	1	4	1
$\frac{\alpha_i}{n!}$	$\frac{1}{6}$	$\frac{2}{3}$	$\frac{1}{6}$
m_i	$\frac{1}{6}$	$-\frac{1}{3}$	$\frac{1}{6}$
$\Delta r(\{i\})$	$\frac{8}{9}$	$-\frac{16}{9}$	$\frac{8}{9}$

Then the risk-sharing values of A, B, C companies can be calculated by the formulas corresponding to these 4 risk-sharing mechanisms of supply chain. Finally, The results of each company are showed in Table 3.

TABLE III. THE RESULTS OF DIFFERENT RISK-SHARING MECHANISM

Companies	A	В	С	Total	Variance
$x_i(\nu)$	2.833	3.833	3.333	10	0.167
y_i / mechanism I	7.167	6.167	8.667	22	1.056
y'_i / mechanism II	7.833	6.833	7.333	22	0.167
y_i'' / mechanism III	9.526	5.302	7.172	22	2.987
y_i''' / mechanism IV	8.056	4.389	9.556	22	4.710

Table 3 shows that variance of the results of sharing mechanism III is significantly greater than that of the results of the sharing mechanism I or mechanism II, which reflects the feature of efficiency first. The variance of the results of sharing mechanism I is less than that of the results of the sharing mechanism II, which embodies the theory of equal distribution. But the sharing mechanism IV can not be compared with the previous 3 sharing mechanisms, because it introduces the risk influence of cooperative willingness. So sharing mechanism IV integrates risk-sharing with decision weights of alliance establishment. Therefore, the case results are consistent with their sharing mechanisms.

IV CONCLUSION

Enterprises can defense and reduce their operational risks through independent risk management. But as the members of supply chain, their business activities change will affect upstream or downstream businesses and even entire supply chain. So companies in the supply chain interact and restrict mutual, which is an organic whole. Risk spreading in the supply chain will deviate the supply chain from the intended target to hurt the interests of members. Therefore, cooperative and coordinating decision is an effective way of supply chain node enterprises (members) to deal with the risk, which can reduce risk and promote supply chain collaboration. But it needs to design a reasonable risk-sharing mechanism to balance the interests of all members who must take their own responsibility.

Shapley value of cooperative game has been used to distribute the benefit of cooperative alliance. This paper applies Shapley value to solve the problem of sharing supply chain risk. Based on this method, risk-sharing mechanism is put forward, which is a reference for the risk-sharing model study of supply chain alliance.

Not only do we use Shapley value to share part of the risk, but also revise the remaining risk, which make the risk-sharing model more objective, rational and practical.

Sharing mechanism I applies Shapley value to share supply chain risk directly, but not revise the remaining risk.

Sharing Mechanism II revises the remaining risk combining the idea of equal distribution.

Sharing mechanism III revises the remaining risk with the risk control contribution rate of supply chain members.

Sharing mechanism IV considers the factor Shapley value ignored before, which revises the remaining risk by the decision right of alliance establishment. It gives an example of Shapley value adding other risk-sharing influence.

All of the above mechanisms provide a guideline and calculation functions how to share the supply chain risk incorporating other sharing theories based on Shapley value. However, needing further research on specific issue to select more reasonable sharing method in practical problem.

ACKNOWLEDGMENT

This work is supported by Chinese Universities Scientific Fund (No. CUSF-DH-D-2014068), Shanghai Style Fashion Design And Value Creation Knowledge Service Center (No. 13S1070241), and Nonlinear Sciences Institute of Donghua University Fund (No. INS-1401).

References

- C. S. Tang, "Perspectives in supply chain risk management," *International Journal of Production Economics*, vol. 103, no. 2, pp. 451-488, 2006.
- [2] W. Chen, "Research on the evaluation and model of apparel supply chain risk for apparel manufacturing

enterprises," *Hangzhou: Zhejiang Sci-tech University*, 2011.

- [3] Y. M. Xiao, and X. Y. Wang, "Analysis on coordination and risk sharing of supply chain based on buy back contract," *Control and Decision*, vol. 23, no. 8, pp. 905-909, 2008.
- [4] X. Y. Wang, and Y. M. Xiao, "Research on supply chain coordination and risk sharing based on buy back policy," *Journal of Management Sciences in China*, vol. 12, no. 3, pp. 65-70, 2009.
- pp. 65-70, 2009.
 [5] Y. He, and J. Zhang. "Random yield risk sharing in a two-level supply chain," *International Journal of Production Economics*, vol. 112, no. 2, pp. 769-781, 2008.
 [6] D. Z. Zhao, and X. Lu, "Study on risk sharing contracts for
- [6] D. Z. Zhao, and X. Lu, "Study on risk sharing contracts for supply chain with random yield under VMI," *Soft Science*, vol. 26, no. 6, pp. 125-131, 2012.
- [7] T. Zhao, and M. L. Zong, "Risk allocation model of supply chain option contract under demand uncertainty," *Industrial Engineering Journal*, vol. 15, no. 5, pp. 105-111, 2012.
- [8] Q. Su, and Y. F. Li, "Supply chain coordination and risk sharing with considering internal quality fault and return policy," *Operations Research and Management Science*, vol. 21, no. 5, pp. 8-14, 2012.
- [9] K. K. Kim, and K. S. Park, "Transferring and sharing exchange-rate risk in a risk-averse supply chain of a multinational firm," *European Journal of Operational Research*, vol. 237, no. 2, pp. 634-648, 2014.
 [10] F. H. Murphy, and E. C. Rosenthal, "Allocating the Added
- [10] F. H. Murphy, and E. C. Rosenthal, "Allocating the Added Value of Energy Policies," *Energy Journal*, vol. 27, no. 2, pp. 143-156, 2006.
- [11] J. J. Xie, and X. S. Dou, "The income distribution problems in the low-carbon economy game: an application of the Shapely value method," *Soft Science*, vol. 26, no. 12, pp. 69-73, 2012.
- pp. 69-73, 2012.
 [12] L. Hu, W. G. Zhang, and X. S. Ye, "Profit allocation of PPP model based on the revised Shapley," *Journal of Industrial Engineering / Engineering Management*, vol. 25, no. 2, pp. 149-154, 2011.
- [13] L. L. Diao, and G. L. Zhu, and Z. Xu, "The profit allocation of alliances based on the multi-weighted Shapley value," *Industrial Engineering and Management*, vol. 16, no. 4, pp. 79-84, 2011.
- [14] X. J. He, Y. Y. Wu, and G. R. Jiang, "Profit allocation model of supply network based on revised Shapley," *Soft Science*, vol. 28, no. 2, pp. 70-73, 2014.
- [15] L. S. Shapley, "Cores of convex games," *International Journal of Game Theory*, vol. 1, no. 1, pp. 11-26, 1971.
 [16] G. Haeringer, "A new weight scheme for the Shapley
- [16] G. Haeringer, "A new weight scheme for the Shapley value," *Mathematical Social Sciences*, vol. 52, no. 1, pp. 88-98, 2006.

Camshift Object Tracking Algorithm Based On Double Difference Method

Junjie Liu¹, Hua Cai^{*2}, Yong Yang¹, Qingpeng Liu²

1.School of Computer Engineering, Changchun University of Science and Technology, Changchun China 2.College of electronic and information engineer, Changchun University of Science and Technology

Abstract—the traditional Continuously Adaptive Mean— SHIFT (Camshift) comes from the improvement of meanshift algorithm. To track the target, the Camshift algorithm establishes target color probability histograms in the target moving area, which can obtain the color probability distribution. It has a good real - time performance and greatly saves the computation resources. However, the Camshift algorithm needs to manually select the moving target, and has limitations on the fast moving and complex background situations. In this paper, we propose a method of combining background difference and frame difference to improve the camshaft algorithm. First of all, according to background subtraction and frame difference algorithm of combination, the background difference algorithm is obtained by the image and the adjacent two frame difference image, then the target is detected by the two value and the moving region of the object is determined, then the color feature of the target is extracted in the region, finally, the Camshift iterative algorithm is used to realize the target tracking. Experimental results show that our algorithm can quickly and accurately find the moving targets, and improves the accuracy and stability of the traditional Camshift algorithm. Our algorithm does not need to manually select the target, and has the advantage that not easy to diverge.

Index Terms—Camshift; target tracking; background subtraction; frame difference method

I. INTRODUCTION

Target detection and tracking is a key technology in video surveillance technology. It is mainly through the mutual relationship between the target and the parameters in each frame, then the target trajectory is determined by the matching relationship between the front and rear frames, so as to achieve the target tracking. Generally, the detection and tracking of moving target can be divided into the following two categories: One is the camera fixed in the case, which can only track the movement in its field of view. The other is that the camera can be up and down, left and right rotation, always ensure that the movement of the camera in the camera's field of view. In this paper, we study the moving target detection and tracking in different scenarios, according to the background subtraction algorithm and frame difference algorithm. First, we need to build a background model, and get the complete target profile by background difference method, then we need to make a difference between two adjacent frames to get the changed area and background pixels, and update the background pixels to the background model, then the regional image of the moving target is obtained by the background subtraction and the inter frame difference

algorithm. So whether the camera is stationary or moving with the moving target, we can detect the moving target by the background difference algorithm and the frame difference algorithm, the color probability distribution of the target is established in the moving target area. Finally, the moving target is tracked by Camshift algorithm.

II. DOUBLE DIFFERENCE METHOD

A. Background subtraction algorithm

Its basic idea is to build a background model, and then to make the difference between the current frame and the background model. Then we need to select a threshold, if the pixel difference is greater than this threshold, judging the pixel belongs to the foreground object, if less than belongs to the background image. The establishment and updating of the background model is the key step in the tracking effect.

Its basic idea is to build a background model, and then to make the difference between the current frame and the background model. Then we need to select a threshold, if the pixel difference is greater than this threshold, the pixel will belong to the foreground object, if not that it will belong to the background image. The establishment and updating of the background model are the key step in the tracking effect.

• Background model establishment and update

There are two ways to get the background image, one is the time average method, but this kind of method is easy to cause prospect target and the background image fusion. Another is average method, which is based on the continuous image sequence in statistical average to obtain the background image, because under the condition of stationary camera. In a sequence of images, the background is more than the prospect of the future, such a sequence of images is taken for a period of time. For each pixel, average values for all frames are obtained, and the average values are closed to the background values. Expressed in formula:

$$B_n(x, y) = \frac{1}{N} \sum_{i=1}^N image_i(x, y)$$

 $B_n(x, y)$ is the prayer of background images, N said all the frames in an image sequence, $image_i(x, y)$ represents the (x, y) pixels in a sequence of I frames, all background images can be obtained by changing the values of x and y. So we can set up the formula for background update:

$$B_{a+1}(x, y) = a \times B_a(x, y) + (1-a)D_a(x, y)$$

A represents the update rate, the general value of between 0.5 to 1, $B_n(x, y)$ is the value of the current background image, $D_n(x, y)$ is the gray—scale value of the current frame, $B_{n+1}(x, y)$ is the updated background gray value.

• Foreground extraction

Because moving targets and background images are different in color, brightness, and so on. Selecting each frame image, we use the current frame image and the background image to make a difference, when the absolute value is higher than the threshold Tn, we think it is the moving target, we set to 1, if it is lower than the threshold, we think it is the background, we set to 0, according to the formula for updating background in the background, so the processed image is two value image:

$$G_n(x, y) = \begin{cases} 0, |D_n(x, y) - B_n(x, y)| < T_n \\ 1, |D_n(x, y) - B_n(x, y)| \ge T_n \end{cases}$$

The advantage of background subtraction algorithm: It can detect the moving target very quickly and completely. Its shortcomings are easy to be influenced by light changes, and the background model is the key, is not suitable for camera movement.

Frame difference algorithm

Basic idea: frame difference algorithm is to extract a sequence of images, in which the image sequence is selected to make the difference between two adjacent frames or multiple frames, so that we can get a whole outline of the moving target directly. When a moving target is appeared in the monitoring scene, there is a big difference between the two adjacent frames and multiple frames, the absolute value of the difference of the image is obtained by using two or more frames, and then we judge whether it is larger than the threshold value, to detect whether the moving image sequence in the target and the target of general outline. The mathematical formula between two frames for difference:

$$D_{k}(x, y) = |I_{k}(x, y) - I_{k-1}(x, y)|$$

Among them, $D_k(x, y)$ is the gray value of the difference between two adjacent frames (x, y), K represents the difference between the K frame and the K—1 frame, $I_k(x, y)$ and $I_{k-1}(x, y)$ are respectively the gray value of K and K—1 in the (x, y) pixels, for $D_k(x, y)$ binary operation:

$$G_k(x, y) = \begin{cases} 1, D_k > T_n \\ 0, D_k \le T_n \end{cases}$$

Among them, T_n is the threshold, the location of the change between the two images of pixel value is 1, between the two images without changing the position of the pixel value is 0, so as to detect the target, this formula also applies to three consecutive frames or more frame images to extract the moving target.

The advantage of frame difference algorithm: The implementation of the algorithm is relatively simple and

has a low degree of program design complexity, which has a high degree of dynamic environment adaptability, relatively less sensitive to changes in different scenarios, better stability. But its methods have some disadvantages: It can't extract the complete image, for example, can only detect moving target outline, at the same time. If the time interval between the frames is not appropriate, one of the conditions is that the moving object is moving too fast, resulting in no overlap between the two frames, so that the two separate objects are detected, another is when the target is moving slowly, the time interval between the selected frames is too short, resulting in almost complete overlap between two adjacent frames, the object is not detected.

III. THE TRADITIONAL ALGORITHM OF CAMSHIFT

Camshift (Continuously Adaptive Mean—SHIFT) algorithm is an improvement Meanshift algorithm, called Meanshift continuous adaptive algorithm. Camshift is deduced from the Meanshift, Since Meanshift is just a single image, it is not very important to track the moving target, So the Camshift is based on the Meanshift algorithm, and the continuous image sequences are analyzed. Its basic idea: Camshift algorithm is to use the color probability distribution of the image to express, and then determine the location and size of the object in the current frame image, in the next frame of the video image, the initial search window is the location and size of the target which is obtained by the last frame, and the area of the target is determined by multiple iterations. The traditional Camshift algorithm process: roughly divided into three parts:

Reverse projection

The video sequence of each frame image is converted from RGB color space to the HSV color space. Explanation for HSV color space: HSV (Hue, Saturation, and Value) is a kind of color space based on the most visual characteristics of color. It is also called hex vertebral model (Hex-cone Model). It has three color parameters. Tone H: measure the angle. Its range is 0° -360°, its calculation method is based on the red as the starting point in a counter clockwise direction, red is 0° , green is 120° , blue is 240° . Saturation S: its value range is $0.0 \sim 1.0$.Brightness V: its value range is 0.0(black) to 1.0 (white). After the conversion, we make histogram statistics for the H component, so we can get the probability of different H component values. We can find out the probability of the size of the h by the histogram, finally, we can get the probability of a color look—up table. We will replace the value of each pixel in the image into its corresponding color probability, eventually we will get the color probability distribution, it is a gray image, and this process is called reverse projection.



Fig. 1 HSV color model

B. Meanshift

It is non—parametric kernel density estimation, at the beginning; it is called the mean vector of the offset. When it is used for tracking, Meanshift algorithm is equivalent to an iterative step, the offset value will be repeated, and eventually converge to a certain condition. It is generally divided into the following steps:

First, we need to select the search window S in the color probability distribution diagram above. Second, we need to calculate the zero order from: M_{00} and calculate of first order from: M_{10} , M_{01} calculate the center of the search window: $X_C = M_{10}/M_{00}$, $X_C = M_{10}/M_{00}$, adjust the size of the search window: the width of $X_C = M_{10}/M_{00}$. Third, In the end, we need to move the center of the search window to the position of the center of mass of the next step and select an appropriate fixed threshold T, if the distance is greater than T, we should repeat the above steps .When the distance between the center of mass is less than T, it's over.

C. Camshift algorithm

It is actually a continuous image sequence for Meanshift operations, all the frames in the video sequence are Meanshift iteration and the size and location of the search window is obtained in the current frame. In the next frame, the results obtained from the last frame are used as the initial value of the Meanshift algorithm. So after several iterations, we can achieve the goal of accurate and effective tracking. The traditional Camshift algorithm has some shortcomings: It needs to manually select the area where moving targets, and only a simple consideration of the color histogram. When the background or other target color pixels interfere, a tracking error or loss can occur. When the case of the camera in motion tracking performance is not good, it is not suitable for multiple target tracking. So we must carry on the corresponding improvement to the algorithm.

IV. CAMSHIFT OBJECT TRACKING ALGORITHM BASED ON DOUBLE DIFFERENCE METHOD

We have learned the advantages and disadvantages of the background difference algorithm and the frame difference algorithm. So we can merge these two algorithms, and make them complementary to each other, so as to improve the effect of motion detection. Firstly, we should select a background frame; a single Gauss background model is established for each pixel. Then, the adjacent two frames are selected for differential operation in the sequence of images, thus the target area and the non target region are divided. We need to update the non target area to the background, so that we can clearly distinguish between the target area and the background region in the current frame. When we obtain the information of the target contour and the relevant pixels in the contour, then we establish the color probability distribution in the target area. Finally, the target is tracked by the combination of Camshift algorithm.

The steps of the algorithm:

• We need only select the background image frame image from a video sequence, and then the

background image is modeled, set as the initial background image $B_n(x, y)$.

We need to select the current frame image: $I_k(x, y)$ and calculate the difference between the current frame and background frame image:

 $D(x, y) = \left| I_k(x, y) - B_n(x, y) \right|$

So we can get the complete moving target from the image.

 Then we need to select the next frame image with it: I_{k-1}(x, y) and calculate the current frame difference from the previous frame:

$$D_{k}(x, y) = |I_{k}(x, y) - I_{k-1}(x, y)|$$

We will get the change of the target, for the non target part, we need to update it to the background image model: $B_n(x, y)$.

- We get the contour of a moving target by the intersection of D(x, y), $D_k(x, y)$.
- For real—time changing the background image, we can use the average method:

$$B_n(x, y) = \frac{1}{N} \sum_{i=1}^N image_i(x, y)$$

Calculating the change of background, and then we can repeat (2) to (4) steps to detect the changes of target.

- Because the area of the moving target is determined, so when we use Camshift algorithm to track moving objects, we don't need to manually select the moving target. We only need to detect the target area as the initial search window, and then the color probability distribution map is established by reverse projection.
- In the reverse projection graph, we use the Meanshift algorithm to search the iteration. By selecting the similarity coefficient in the adjacent two frame image to find the largest matching region. Then moving the center of the search window to the center of the search results and adjusting the size of the search window adaptive, this is Camshift search algorithm.
- We get the center of the current frame and the size of the search window, and then take it as the starting point for the next frame Camshift search window. After repeated iterations, we finally track the moving target.

V. THE EXPERIMENTAL RESULTS AND DISCUSSION

The experimental environment is Opencv2.4.8 with VS2012, VS2012 is Microsoft's currently most popular application development environment, we mainly use C ++ programming language. Opencv (Open Source Computer Vision Library) is a cross—platform distributed under Open Source Computer Vision Library that can be run on Linux, Windows and Mac OS operating system, it consists of a series of C functions and C++ classes, and its main interface language is C++

language. Its biggest advantage is that it can take full advantage of the performance of multi-core processors.

The object of our experiment is the movement of the human body. First, we detect the moving target by background subtraction and frame difference algorithm. Then we need to extract the outline of the moving object and mark it with an oval frame.





Fig.4 the oval box marking target

After detecting the region and the outline of the human body, we use the Camshift algorithm to track. Firstly, we need to establish the color probability distribution histogram in the human body target area:



The effect of the traditional Camshift algorithm



Fig.6 the tenth frame image



Fig.10 the 150th frame image

The effect of Camshift object tracking algorithm based on double difference



Fig.12 the thirtieth frame image



Fig.15 the 150th frame image

For the same segment of video sequences, we carry out the target tracking experiment with two algorithms. The moving target is completely within the range of the camera's field of view at the time of the tenth frame. When we use the traditional Camshift target tracking algorithm to track, we need to manually select an initial search window at the tenth frame. In the 70th frame, the tracking effect is good, at the time of the 100th frame, the error occurs, search window can not search to the full body movement target. Until 150th frame, we found that we can't keep tracking of the human body, and the search window is completely divergent. When we use the Camshift target tracking algorithm based on the double difference, first of all, we use the background difference algorithm and frame difference algorithm ,In the tenth frame, we complete detect the moving object and its area, at this time we do not need to manually select the moving target. We only need to detect the target area as the initial search window that is the region of the ellipse, and then we need to establish the color probability distribution histogram by the back projection in this region. As shown in figure 5, combining with Camshift search algorithm, During the whole process of tracking, We can find that the improved algorithm is still able to track the moving target accurately and quickly after 100th frames, and the tracking effect is stable, when tracking to about 150th frames, When the object gradually disappears in the field of view of the camera, We find that we can still track the moving target, and the tracking window does not produce the phenomenon of divergence. Tracking is more durable and stable.

VI. SUMMARY

Moving target tracking is an important aspect in the field of computer vision, the moving target detection and tracking algorithm must have good real - time performance, high tracking accuracy and robustness. In this paper, we introduce the background subtraction algorithm, the frame difference algorithm, and the basic content of the Camshift algorithm. I propose a Camshift algorithm based on double difference method. The moving target can be detected quickly and accurately by the combination of background difference algorithm and frame difference algorithm. It changes the characteristics of the Camshift algorithm which need to manually select the target area. It has a strong adaptability to the changing background. The improved Camshift algorithm has achieved good tracking results, the target tracking time is long and stable, and it has strong adaptability and robustness.

ACKNOWLEDGEMENTS

This research has been supported by Science and Technology Development Plan of Jilin province (20130101179JC).

REFERENCES

- [1] Xiong Y. Moving object extraction based on background difference and frame difference method. Computer Era, 2014.3:38-41.
- [2] Zhang J, Mao X B, Chen T J. Survey of moving object tracking algorithm. Application Research of Computers, 2009.26(12):4407-4410.
- [3] Lu X, Lei H, Hao Z B. Automatic Camshift tracking algorithm based on multi-feature. Journal of Computer Applications, 2010.30(3):650-652.
- [4] Lu Z P, Kong D F, Li X L. Moving object extraction based on background difference and frame difference method. Computer measurement and control, 2013.21(12):3315-3318.
- [5] Wang T, Liu W N, Han G L. Target Tracking Algorithm Based on Improved Meanshift. Chinese Journal of Linquid Crystals and Displays, 2012.27(3):396-400.
- [6] Guo J M, He X, Wei Z H. Track Mean Shift Color Image Based on Support Vector Machine. Chinese Journal of Linquid Crystals and Displays, 2014.29 (1):120-128.
- [7] Wang Z G, Wang J D, Li P.A Camshift Optimized Particle Filter Tracking Algorithm. Optoelectronic Technology, 2011.30(1):58-63.
- [8] Yun X, Xiao G. Camshift Ship Tracking Algorithm Based on Multi - feature Adaptive Fusion. Opto - Electronic Engineering, 2011.38(5):52-58.
- [9] Zhang X J, Xu H. Moving Vehicle Detection Algorithm Based on Video Processing. Chinese Journal of Liquid Crystals and Displays, 2012.27(1):108-113.

The System of Wages Management Information System Based on the Internet of Things

FENG Lei, HE Miao

Department of Information Engineering, Shaanxi Polytechnic Institute,

Abstract—The human society has been in 21century, which is a combined knowledge economy, information technology and digital period. Crop is a hall where is training the talent for the future society, so Crop can't remain the condition as now. The modern Crop management, the voluntary official business and the scientific decision are a inevitable trend in the modern official manage mental development. The wages information management has a great deal of changes of elements as an important part in the Crop management. The complicated management, long interval and big regular basal wages make a huge data, as a result, the human management becomes very difficult, so the software of the wages management is developed in the twelfth Crop of Qing he area in Tie Ling.

Key words—knowledge economy, information technology, the Crop management, the information wages, software

I. INTRODUCTION

The traditional methods of the wages management are all used in the way of artificial statistics and calculational management, but the methods of the management not only waste time and physicals, but also easily make errors and omissions on calculation. The universal access to the technology of computers breaks the traditional management methods of financial management, improves the efficiency of management at the same time (weiwei..2012), and overcomes the problems in the traditional methods of management, and enables the controller to orderly and overally manage every worker, what's more, it also makes them calculate and develop the wage of the staff strictly according to the terms of wages and distributed system(Wei Wei..2010).

The system of the wages management of enterprise can complete daily salary management, such as query, modification, additionally, deletion, storage and so on, and promptly and accurately complete all kinds of the statistics of the salary date and the summary of the work, additionally, quickly print out salary reports and greatly improve the efficiency of the enterprise management(Wei Wei..2011).

sjb.SetSJkk(sjkk); sjb.sql_update(m_id);

CDialog::OnOK();

II. THE DESIGN OF USERS'MANAGEMENT MODULE

Achieve the Goal

Achieve the functions of the new, deleting users, and the users'management dialog designed as shown in figure 1 (Wei Wei..2012).

用户名: 密码:	 -
添加	 退出

Figure 1 System

The Steps of the Design

(1) Add a new Dialog resource to the project, whose ID is IDD_XINJYH. Click the right mouse' button in the IDD_XINJYH resource in the dialog ,perform the menu command of the pop—up context menu "Properties", open the Dialog the Properties Dialog box, select the General TAB, change the" Caption "content of the text box for the "user management "in the Properties Dialog.

(2) Add four Statics, a Combos, three Edits and a Button control to the Dialog resource , change the attributes of the resources, and set up the corresponding variable for the resource , as shown in table 1.

ID.			Member Variables		
ID	Properties	Туре	Member		
IDC_EDIT1	Default	CString	m name		
IDC_EDIT2	Password is true	CString	m_pwd		
IDC_EDIT3	Password is true	CString	m_pwd1		
IDC_COMBO1	Default	CComboBox	m_jb		
IDOK	Add Caption				
IDC_BUTTON1	Delete Caption				
IDCANCEL	Quit Caption				

Table I

Scientific Research Program Funded by Shaanxi

III. THE CODE ANALYSIS	MessageBox("Users to exist. Please
(1)Add the OnInitDialog function, initialization	Input Again");
Combo controls. The collective code is as follows: BOOL CXinjyhdlg::OnInitDialog()	return; }
{ CDialog::OnInitDialog();	<pre>xxb.SetCzyName(m_name); xxb.SetPwd(m_pwd);</pre>
<pre>// TODO: Add extra initialization here SetIcon(m_hIcon, TRUE);</pre>	m_jb.GetLBText(m_jb.GetCurSel(),strjb); if(strjb=="System Controller") strib="1":
m_jb.AddString("SYSTEM'S	else
COMTROLLER");	strib="0":
m_jb.AddString("NORMAL CONTROLLER);	xxb.SetCzyjb(strjb);
focus to a control	<pre>xxb.sql_insert();</pre>
// FXCEPTION: OCX Property Pages	CDialog::OnOK();
should return FALSE	}
Add a message responsible function to the button	
'button'. The code is as follows:	Add a margage regrangibal function to the button
void CXinjyhdlg::OnOK()	"delete" The code is as follows:
{	void CXinivhdlg: OnButton1()
// TODO: Add extra validation here	
UpdateData(true);	// TODO: Add your control notification handler
$if(m_name = "")$	code here
MessageBox("Please Input the User's	UpdateData(true); if(MessageBox("Whether to Delete the Current
return:	Record
}	","Please Input Again ",MB_YESNO)==IDYES)
CString jb;	
m_jb.GetWindowText(jb);	vyh sal delete(m. name):
if(jb=="")	<pre>xx0.sql_delete(in_indine); }</pre>
{	}
MessageBox("The Level Can't be	When the user clicks the menu item "user
Empty");	management" on the main interface menu, it will
return;	perform Menuyhgl function. Specific code is as follows.
if(m, nwd == "")	void CGZGLXTDlg::OnMenuyhgl()
MessageBox("Please Enter the	// IODO: Add your command handler code
Password");	if(ffvvb GetCzvib() == "1")
return;	
}	CXinjyhdlg dlg;
$\inf_{\mathcal{L}}(m_pwdl == "")$	dlg.DoModal();
{ MassagePoy("Plaage Confirm the	}
Password "):	else
refurn	{
}	MessageBox("Permission Denied ");
if(m pwd!=m pwd1)	return;
	}
MessageBox("Two Password are	}
Diffrent");	
return;	ACKNOWLEDGEMENTS
}	We would like to thank the anonymous reviewer for
UUZYAAU AAU; if(xxh Havename(m. name)==1)	their valuable comments. This work is supported by
{	West Virginia Higher Education Policy Commission and
t	er Grant FRT2W762W. This job is supported by

Provincial Education Department (Program No.2013JK1139) and Supported by China Postdoctoral Science Foundation (No.2013M542370) and supported by the Specialized Research Fund for the Doctoral Program of Higher Education of China (Grant No. 20136118120010). And this project is also supported by NSFC Grant (Program No. 11301414 and No.61272283 and No.61272283 and No.61472318).

REFERENCES

- IETF. Specification of the Controlled Load Network Element Services [S]. RFC2211, 1997.
- [2] IETF. Architecture for Differentiated Services[S]. RFC2475, 1998.
- [3] Shi Yingbo, Wu Chengke, Zhou Youxi, Feng Ying. Robust wireless transmission scheme for scalable video streaming[J]. Journal on Communications, 2008, 29(7):15–19.
- [4] ZHANG Wei, SUN Jun, LIU Jing, ZHANG Hai—bin. Performance analysis of IEEE 802.11e EDCA in wireless LANs[J]. Journal of Zhejiang University, 2007, 8(1): 18–23.
- [5] Wang Zhengjun, Wang Youzhao. Strategy of Closed loop Rate Control and Traffic Shaping Based on RTCP[J]. Journal of Computer Science and Technology, 2011, 38(7):100—102.
- [6] Liu Jian, Qv Weidong. Transportation and Synchronization Of MPEG—4 Video Stream Based On RTP [J]. Computer Applications and Software, 2007,24(2):151—153.
- [7] Jirka Klaue, Berthold Rathke, Adam Wolisz. EvalVid—A Framework for Video Transmission and Quality Evaluation[c], the 13th International Conference on Modelling Techniques and Tools for Computer Performance Evaluation, Urbana, USA, 2003, 255—272.
- [8] Chia—Yu Yu, Chih—Heng Ke, Ce—Kuen Shieh, Naveen Chilamkurti. MyEvalvid—NT—A Simulation Tool set for Video Transmission and Quality Evaluation, IEEE TENCON, Hong Kong, Nov. 2006, 14—17.

- [9]Wei Wei, Qi Yong, "Information Potential Fields Navigation in Wireless Ad—Hoc Sensor Networks"SENSORS, Sensors 2011, Pages: 11, 4794— 4807.
- [10]Wei Wei, PEIYI SHEN, Ying Zhang, Liang Zhang, "Information fields navigation with piece—wise polynomial approximation for high—performance OFDM in WSNs", Mathematical Problems in Engineering, Article: 901509, DOI: 10.1155/2013/901509, Year: 2013, SCI:WOS:000316891600001.
- [11]Wei Wei, Xiao—Lin Yang, Bin Zhou, Peiyi Shen, "Holes Detection in Anisotropic Sensornets: Topological Methods", International Journal of Distributed Sensor NetworksVolume 2012 (2012), Article ID 135054, 9 pagesdoi:10.1155/2012/135054.
- [12]Wei Wei, Xiao—Lin Yang, Bin Zhou, Jun Feng, "Combined energy minimization for image reconstruction from few views", Mathematical Problems in Engineering, Volume 2012 (2012), Article ID 154630, 15 pagesdoi:10.1155/2012/154630.
- [13]Lu Yiming, Liu Dong, Liu Jinsong. Intelligent grid network information integration requirements and model analysis [J]. Automation of electric power systems, 2012, 34(8): 1—4.
- [14]Ni Jingmin, He Guangyu, Shen Chen et al. Overview of USA smart grid assessment [J]. Automation of electric power systems, 2012, 34(8): 9—13.
- [15] Hu Jing. Jump strategy of strong smart grid [J]. National grid, 2011, 2(1): 25—28.
- [16] Huang Xuyong, Liu Pei, Miao Shihong et al. Dynamic application of wireless sensor networks in power control [J]. Power system automation, 2013, 31(7): 99–103.
- [17] Zhang Qiang, Sun Yugeng, Yang Ting et al. Application of wireless sensor network in intelligent power grid [J]. Chinese electric power, 2011, 43(6): 31–36.
- [18] Fan Xiaoping, Xiong Zheyuan, Chen Zhijie, Liu Shaoqiang, Qu Zhihua. Research on video coding in wireless multimedia sensor networks [J]. Journal of communication, 2011, 32(9): 137—146.

Effect of V addition on microstructure and magnetic properties of Fe–Zr–B alloy

Li Liu, Yurong Yang, Min Qiu, Yanmei Pi, Guomin Yan College of Science, Department of Physics, Heihe University, Heihe, China

Abstract—Fe₇₆Zr_{12– χ}V_{χ}B₁₂ (χ =0, 2, 6) alloy ribbons were prepared by a single-roller melt-spinning method in an argon atmosphere. The ribbons were annealed under a protective atmosphere for 60 minutes at 480 -750 °C The effect of the addition of V on the crystallization event, microstructure and magnetic properties of Fe-Zr-B alloy has been investigated. It has been found that the addition of increases the onset crystallization temperature, saturation magnetization (Ms) and decreases coercivity (*Hc*). The structures of the $Fe_{76}Zr_6V_6B_{12}$ alloy are still amorphous phase after annealing at 540 °C. Hc of Fe₇₆Zr₁₂B₁₂ and Fe₇₆Zr₁₀V₂B₁₂ alloys decrease tardily at first and then increase rapidly with increasing annealing temperature. However, Hc of Fe76Zr6V6B12 alloy increases continuously. The dependence of coercivity and saturation magnetization on microstructure is discussed.

Index Terms—Amorphous, crystallization, microstructure, magnetic property

I. INTRODUCTION

It has been discovered that nanocrystalline soft magnetic alloy consisting of body—centered—cubic (bcc) nanoscale crystallites embedded in a residual amorphous minority matrix can be obtained by crystallizing melt—spun amorphous ribbons [1]. Nanocrystallization of the NANOPERM—type Fe—Zr—B alloy has attracted great attentions because of its potential applications in the areas of nanocrystalline soft magnetic materials and magnetic sensors [2]. They exhibit higher saturation magnetization and lower magnetic permeability. Moreover, the soft magnetic properties of nanocrystalline Fe—M (M=Zr, Hf, Nb)—B alloy can be improved by the addition of elements [3].

There are several studies which reported the effect of the addition of elements on the structure and the soft magnetic properties of nanocrystalline Fe-M-B alloy [4,5]. Makino et al. found that the Pd or Cu addition decreases the a-Fe grain size [6,7]. Bitoh et al. studied that the effect of the addition of Ti, V, Cr, and Mn on the magnetic properties of a nanocrystalline soft magnetic Fe–Zr–B alloy [8]. They found that V is a useful element to control magnetostriction by keeping the saturation magnetic flux density (Bs) high, and the simultaneous addition of V and Mn increases Bs. In addition, Wang et al. investigated that the effect of Si on the glassforming ability, thermal stability and magnetic properties of Fe-Co-Zr-Mo-W-B alloy [9]. However, few studies was found involving the effect of V on the crystallization event, microstructure of Fe-Zr-B alloy so far. In this paper, our efforts have been devoted to examining deeply the influence of V on the crystallization event, microstructure and magnetic properties of $Fe_{76}Zr_{12-}$ $_{\chi}V_{\chi}B_{12}$ ($\chi=0, 2, 6$) alloy ribbons.

II. EXPERIMENT

Fe₇₆Zr_{12- χ}V_{χ}B₁₂ (χ =0, 2, 6) alloy ribbons were prepared by a single—roller melt—spinning method in an argon atmosphere. The rapidly solidified ribbons are of the width of 6mm and thickness of 40µm. To obtain different stages of the structural evolution, the ribbons were annealed under a protective atmosphere for 60 minutes at 480 °C, 540 °C, 600 °C, 650 °C, 700 °C and 750 °C; these temperatures were chosen according to the results of the differential thermal analysis given below.

The crystallization temperature(Tx) was investigated by differential thermal analysis (DTA, PETG/DTA— 6300) at a heating rate of 10 K/min. The structure of samples was investigated by X—ray diffraction (XRD, D/max—RA, Cu—K α , λ = 1.5418 Å). Grain size (D) was calculated by Scherrer formula D= 0.89 λ/β cos $\theta(\beta)$ indicates the width of half—height diffraction peak, θ is Bragg angle, λ is X—ray wavelength, D is grain size). The magnetic property was measured by vibrating sample magnetometer (VSM, Lake Shore M7407).

III. RESULTS AND DISCUSSION

The crystallization process for the as-quenched samples was followed by differential thermal analysis in a temperature range from 30 °C to 900 °C. Fig.1 shows the most important temperature region for the amorphous $Fe_{76}Zr_{12}$ — $\chi V\chi B_{12}$ (χ =0, 2, 6) alloys. There are several exothermic peaks in each DTA trace. The first exothermic peak corresponds to the initial crystallization event during heating. Other exothermic peaks were due subsequent crystallization events at higher temperatures. The onset of crystallization of Fe₇₆Zr₁₂B₁₂ amorphous alloy is expected at 480 °C, at which temperature the partial structural transformation from the amorphous Fe to the bcc-Fe is supposed to take place. The onset crystallization temperature Tx of Fe₇₆Zr₁₂— $_{\chi}V_{\chi}B_{12}$ (χ =0, 2, 6) alloy increases with increasing V content. Therefore, it can be considered that the increase of Tx for $Fe_{76}Zr_{10}V_2B_{12}$ and $Fe_{76}Zr_6V_6B_{12}$ alloys is contributed by the addition of V.



Figure 1. The differential thermal analysis measurement for the $Fe_{76}Zr_{12-\chi}V_{\chi}B_{12}$ ($\chi=0, 2, 6$) amorphous alloys.

Figs.2–4 show the x—ray diffraction patterns of the as—quenched and annealed $Fe_{76}Zr_{12-\chi}V_{\chi}B_{12}$ (χ =0, 2, 6) alloy ribbons. A broad peak corresponding to the amorphous state can be seen around at 2θ =44 degree for all as—quenched alloys. The bcc α —Fe phase is identified after heating the samples from the XRD patterns of $Fe_{76}Zr_{12}B_{12}$ and $Fe_{76}Zr_{10}V_2B_{12}$ alloys. The influence of V on the crystallization kinetic and structural evolution is more evident in the samples with 6 atomic percent. [see Fig.4].For the $Fe_{76}Zr_{6}V_{6}B_{12}$ alloy, after annealing at 540 °C, the structure of alloy is still amorphous character. With further increase of the annealing temperature, all the alloys continue to crystallize into α —Fe phase, and no other phases, such as Fe₃B and Fe₂B, are detected below 800 °C.



Figure 2. X—ray diffraction patterns of Fe₇₆Zr₁₂B₁₂ alloy in the as quenched state and annealed at various temperatures.



Figure 3. X—ray diffraction patterns of $Fe_{76}Zr_{10}V_2B_{12}$ alloy in the as—quenched state and annealed at various temperatures.



Figure 4. X—ray diffraction patterns of Fe₇₆Zr₁₀V₆B₁₂ alloy in the as—quenched state and annealed at various temperatures.

In order to find out the microstructural changes of Fe₇₆Zr_{12- χ}V_{χ}B₁₂ (χ =0, 2, 6) alloy with isothermal heat treatment conditions, the mean grain size of the α —Fe phase (*D*) at different annealing temperatures (*Ta*) was estimated, the variation of *D* with *Ta* is shown in Table I. From Table I, it can be seen clearly that *D* increases with the increasing annealing temperature.

The mean grain sizes of ${\rm Fe}_{76}ZR_{12-x}V_{x}B_{12}$ (x=0, 2, 6) alloy ribbons annealed at different temperature

Annealing temperature/ °C	480	540	600	650	700	750
<i>D/nm</i> /Fe ₇₆ Zr ₁₂ B ₁₂	9.20	15.68	18.59	21.86	24.25	30.12
<i>D/nm</i> / Fe ₇₆ Zr ₁₀ V ₂ B ₁₂	17.61	20.86	25.08	30.83	35.68	41.67
$\frac{D_{\prime nm}}{/}$ Fe ₇₆ Zr ₆ V ₆ B ₁₂	_		17.20	29.6	34.41	42.85

The evolution of coercivity (*Hc*) and saturation magnetization (*Ms*) of as—quenched Fe₇₆Zr_{12— χ}V_{χ}B₁₂ (χ =0, 2, 6) alloys are indicated in Table2. With the V content increasing, Hc of Fe—Zr—V—B decreases, while Ms increases. It can be obtained that the addition of V improves the soft magnetic properties, the addition of V can control magnetostriction of Fe—Zr—B alloy while keeping the saturation magnetic flux density high.

As is known, the microstructures of nanocrystalline alloys as well as the chemical compositions of the constituent phases tend to affect the magnetic and electrical properties of materials. Fe-Zr-B amorphous alloy has been reported to exhibit excellent soft magnetic properties after being annealed under optimal conditions. Fig. 5 shows Hc of Fe₇₆Zr_{12- χ}V_{χ}B₁₂ (χ =0, 2, 6) alloy as the function of annealing temperature (Ta). According to the results as shown in Fig. 5, Hc of Fe₇₆Zr₁₂B₁₂ and Fe₇₆Zr₁₀V₂B₁₂ alloys decrease tardily at first and then increase rapidly with increasing annealing temperature. The decrease of Hc in the initial annealing stage is ascribed to the structure relaxation of amorphous phase, which involves the annihilation of free volumes and the enhancement of the short-range ordering of the amorphous structure. However, when the annealing temperature is higher, nanocrystalline phases will precipitate in the amorphous matrix, which may lead to the generation of a great deal of interfaces. The continuous increase of interfaces, in turn, may hinder the movement of magnetic domain walls, causing the rapid increase of coercivity. Moreover, Hc of $Fe_{76}Zr_{12}B_{12}$ and $Fe_{76}Zr_{10}V_2B_{12}$ alloys decrease to the minimum value at 480 and 540 °C, respectively. Additionally, as shown in Fig. 5, Hc of Fe₇₆Zr₆V₆B₁₂ alloy increase slowly with increasing the annealing temperature in the initial annealing stage (below 540°C) .After 540°C, Hc of Fe₇₆Zr₆V₆B₁₂ alloy increases sharply is ascribed to the increasing grain size(D). Significance in optimizing of microstructures is recognition of the fact that for very small grain size (D < 100 nm), Hc increases rapidly with increasing grain size [10].



Figure 5. *Hc* of $Fe_{76}Zr_{12-\chi}V_{\chi}B_{12}$ (χ =0, 2, 6) alloy ribbons as a function of annealing temperature (*Ta*).

The evolution of saturation magnetization (Ms) of Fe₇₆Zr_{12- χ}V_{χ}B₁₂ (χ =0, 2, 6) alloy as the function of annealing temperature (Ta) is shown in Fig. 6. Ms of Fe₇₆Zr₁₂B₁₂ and Fe₇₆Zr₁₀V₂B₁₂ alloys increase continually with increasing the annealing temperature, which should be attributed to the competition between the ferromagnetic and antiferromagnetic exchange interaction between Fe and Zr atoms. Ms of Fe76Zr6V6B12 alloy decreases at first and then keeps almost unchanged below 540 °C. When the temperature exceeds 540 °C, Ms of Fe₇₆Zr₆V₆B₁₂ alloy increases rapidly with the increase of temperature and reaches a value as high as 110.09 emu/g at 750 °C. As shown in Fig.4, after annealing at 540 °C, the structures of the Fe₇₆Zr₆V₆B₁₂ alloy are still amorphous character. The decrease of Ms at 480 °C can be related to the influence of V enrichment in the amorphous matrix.



Figure 6. *Ms* of Fe₇₆Zr_{12- χ}V_{χ}B₁₂ (χ =0, 2, 6) alloy ribbons as a function of annealing temperature (*Ta*).

IV. CONCLUSIONS

(1) $Fe_{76}Zr_{12-\chi}V_{\chi}B_{12}$ ($\chi=0, 2, 6$) alloy ribbons were prepared by a single—roller melt—spinning method in an argon atmosphere. The onset crystallization temperature Tx of $Fe_{76}Zr_{12-\chi}V_{\chi}B_{12}$ alloy increase with increasing V content.

(2) With further increase of the annealing temperature, all the alloys continue to crystallize into α —Fe phase, and no other phases. For the Fe₇₆Zr₆V₆B₁₂ alloy, after annealing at 540 °C, the structure of alloy is still amorphous character. The grain size of bcc α —Fe increases with temperature.

(3) With the V content increasing, Hc of Fe₇₆Zr₁₂— $_{\chi}V_{\chi}B_{12}$ (χ =0, 2, 6) alloy decreases, while *Ms* increases.

(4) Hc of Fe₇₆Zr₁₂B₁₂ and Fe₇₆Zr₁₀V₂B₁₂ alloys decrease tardily at first and then increase rapidly with increasing annealing temperature. However, Hc of Fe₇₆Zr₆V₆B₁₂ alloy increases slowly with increasing the annealing temperature in the initial annealing stage (below 540 °C). After 540 °C, it increases sharply.

(5) Ms of Fe₇₆Zr₁₂B₁₂ and Fe₇₆Zr₁₀V₂B₁₂ alloys increases continually with increasing the annealing temperature. However, Ms of Fe₇₆Zr₆V₆B₁₂ alloy decreases at first and then keeps almost unchanged below 540 °C. When the temperature exceeds 540 °C, Msof Fe₇₆Zr₆V₆B₁₂ alloy increases rapidly with the increase of temperature and reaches a value as high as 110.09 emu/g at 750 °C.

ACKNOWLEDGMENT

Financial supported by Scientific Research Fund of Heilongjiang Provincial Education Department (NO: 12541572).

REFERENCES

- [1] Y. Hu, L. Liu, K. Chan, M. Pan, and W. Wang,, "The effect of crystallization on microstructure and magnetic properties of Fe₆₁Co₇Zr_{9.5}Mo₅W₂B_{15.5} bulk metallic glass," Materials Letters,vol.60,pp1080—1084, April 2006.
- [2] H. Huang, G. Shao, and P. Tsakiropoulos, "Crystallization of the amorphous Fe₈₀Zr₁₂B₈ alloy under controlled heating," Journal of Alloys and Compounds, vol.185, pp185–190, July 2008.
- [3] E. Matsubara, S. Sato, M. Imafuku,T. Nakamura, H. Koshiba, and A. Inoue, "Structural study of Amorphous Fe₇₀M₁₀B₂₀ (M=Zr, Nb and Cr) alloys by X—ray diffraction," Materials Science and Engineering A, vol.312,pp136—144, July2001.
- [4] Y. Gao, and D. Shindo, "Magnetic microstructure of Fe₈₄Nb₇B₉ alloys observed by electron holography," Journal of Applied Physics, vol.93, pp7462-7464, May 2003.
- [5] C. Zhang, Z. Zhang, Z. Qi, Y. Qi, J. Zhang, and X. Bian, "Ball milling induced abnormal crystallization behavior of an amorphous Fe₇₈Si₉B₁₃ alloy," Journal of Non— Crystalline Solids, vol.354, pp3812—2816, April 2008.
- [6] A. Makino, A. Inoue, and T. Masumoto, "Soft magnetic properties of nanocrystalline Fe — M — B(M=Zr,Hf,Nb) alloys with high magnetization," Nanostruct Mater, vol.6, pp985—988, November 1995.
- [7] A. Makino, T. Bitoh, A. Inoue, and T. Masumoto, "nanocrystalline Fe-M-B-Cu(M=Zr, Nb) alloys with improved softed magnetic properties," Journal of Applied Physics ,vol.81,pp2736, April 1997.
- [8] T. Bitoh, M. Nakazawa, and A. Makino, "Effect of Ti, V, Cr, and Mn additions on the magnetic properties of a nanocrystalline soft magnetic Fe–Zr–B alloy with high magnetic flux density," Journal of Applied Physics ,vol.85,pp5127–5128, April 1999.
- [9] W. Wang, A. Gebert, S. Roth, U. Kuehn, and L. Schultz, "Effect of Si on the glass—forming ability, thermal stability and magnetic properties of Fe–Co–Zr–Mo–W–B alloys," Journal of Applied Physics ,vol. 459, pp 203— 208, May 2008.
- [10] J. Tang, X. Mao, S. Li, W. Gao, and Y. Du, "Effects of two—step annealing on the microstructures and soft magnetic properties of nanocrystalline Fe₈₆Zr₇B₆Cu₁ ribbons," Journal of Alloys and Compounds,vol.375, pp.233—238, November 2004.

Discussion on the Trend of the University Group Competition Development from the Reform of School Sports Meeting

Yongshan Peng

School of Physical Education, Jiangxi University of Finance and Economics, Nanchang, China

Abstract—With the deepening of educational reform in colleges and universities in China, school sports work has gradually established a guiding ideology of "healthy sports, happy sports and sports life—long education". However, implementation is directly related to the cultivation and formation of college students' sports consciousness and behavior, habits and ability, but also providing the reform with a new idea and new education for the group competition and reflecting the philosophy of education of "students—oriented" to cultivate students with creative ability and the consciousness of team spirit of cooperation, so, to meet the reform of physical education system and the historical role of new mission, the group competition must be established on long—term mechanism and innovative ideas.

Index Terms—sports meeting, group competition, sports trend

I. INTRODUCTION

As an important part of the work of school sports, the school sports meeting and other school group competitions are the important means of improving the level of sports to promote the mass sports development and attract the majority of students actively to participate in the exercise. The school sports meeting before 2006 in Jiangxi University of Finance and Economics mostly is the track and field sports meeting once a year, however, through investigation, this movement mode result is far away from the actual expectation, which leads to a growing gap between students with poor physique and technique and students with good physique and technique, thus, it can not reach the goal of sports competition, and it is easy to find certain drawbacks in the active and interesting aspects of student participation. In order to adapt to the reform of school physical education, people deepen the reform with scientific design, reasonable and effective method, so that the vast majority of students can participate, and students participation and fitness can be achieved, which can further reflect the sports guiding ideology "doing exercise one hour a day, working healthily for fifty years, and a happy life for a lifetime".

II. THE INVESTIGATION AND ANALYSIS OF THE REFORM FOR THE SCHOOL SPORTS MEETING IN RECENT YEARS

With the development of society, the renewal of education concept, cultural progress, the track and field sports mode for the school sports meeting is essentially the same. According to the survey, the students' motivation to participate in the traditional sports events is not active, and the sports field only becomes the performance of those who are good at it or the sports expertise. In some colleges, some students are forced to participate in the sports for the collective honor, which leads to the fact that the students who participated in the game in the last year participate in this year again. Thus, people can feel that the sports value is always brought by such fixed elite sports students. Most students can only act as cheerleaders or the role of propaganda; some even think that sports meeting have nothing to do with them.

The participants of school sports meeting are the students, which are not only the main contest, but also the beneficiaries of the competition. In the sporting process, students can realize the huge value of the sports. Sports meeting can not only cultivate the struggling spirit of students, but also the spirit of collectivism of students. Seen from previous sports events in the past few years, people can find that the collective projects are quite few. The collective events in school sports meeting is conducive to develop good team spirit for the students, which plays active role in adapting to fierce competition in the modern society. Therefore, In 2007 sports meeting, people made major changes in the track and field projects with an increase of a series of interesting collective projects. According to the students' preferences, by maintaining the original projects, people add 4 funny sports items. Then, the number of students participating in the games for each year presents an increasing trend.

However, with the further reform and exploration, people can find that the students as the main body of the sports meeting are not only the organizers of the sports meeting, but also the participants and beneficiaries of the sports meeting. Games not only have the role of development for students' physical quality also includes the development of students' psychological quality, however, because of the restrictions on the number of participants, sports exercise value is obviously restricted. Therefore, after 2008, people renamed the original track and field games to the fall sports meeting by increasing a large number of collective projects and fun projects. (Figure 1, Figure 2).



Figure1. Number of events in 2006—2010 sports meetings of Jiangxi University of Finance and Economics



Figure2. Number of participants in 2006—2010fall sports meeting of Jiangxi University of Finance and Economics

III. TO ACHIEVE THE LONG—TERM MECHANISM AND INNOVATIVE IDEAS FOR THE REFORM OF SPORTS MEETING

A. Creating the stage for students, highlighting the health and vitality

Group activities should be actively carried out, and those can be used to promote quality education and campus culture construction. Students are regarded as the main body, the sports as the main line, education as a theme in school sports activities, which is an important measure to take for students in school from exam oriented education to quality education. It is also an important measure for the national fitness program to promote the vigorous development of school physical education.

How to deepen the reform of sports? How can all the students experience the pleasure of participating in sports activities? People should enhance the enthusiasm of students to participate in sports, prompt every student has consciousness, habit and ability to participate in physical exercise, and share the sports rights, and thus truly improve the physical quality of all the students. In recent years, according to the guiding ideology of physical education reform in the Ministry of Education, people in the school have actively carried out sports and cultural activities with the characteristics of "sports, health, sunshine and energy"-- the competition of "health and vitality". The competition with four projects (aerobics, modern artistic gymnastics, sports dance, martial arts is divided into seven groups, attracting 2791 students from 17 colleges and other free teams in school, and the game has video recording in the whole process with the largest number of participants, involving the widest range of projects of a game. Through the competition, the students' team spirit and team spirit are enhanced, and the students fully experience the healthy sports, happy sports, sunshine sports, and lifelong sports. It provided a stage to show the elegant demeanor for the students. At the end of the game came to the Prize School Leadership, Students Presentation, Affairs Department, the Communist Youth League and other relevant units and all teachers responsible for people and sports ministry participated in, the school leader made a passionate speech, and the performance of the champion team awarded climax, which is full of happiness and joy in the scene. All the teachers and students' interactive sessions in modern rhythmic gymnastics and aerobic exercises, sports dance, martial arts four projects is a climax in the whole activities. Based on "I exercise, I am healthy, I exercise, with my vigor", teachers and students enjoyed dancing together with youth and passion, immersing in health, vitality and joy, which gave a perfect full stop for the competition, but also took a new trail for the college group competition. After the game, we sent the game video to each student participating in, letting them feel the display arena of health and vitality, but also a good memory for the future life.

B. To open up the new world for group competition with tutor groups

To thoroughly implement "CPC Central Committee and the State Council on further strengthening and improving college students' ideological and political education" (2004), based on the above suggestions and "provisional measures for school supervisor group system" in Jiangxi University of Finance and Economics, the relative people should effectively promote the general education of college students' ideological and political education in accordance with established tutor group for general education college, which becomes the new platform to carry out the diversification of humanistic education and ideological and political education for students. In the tutor group, sports teachers act as the responsibility of the health education, play the role of physical education teachers in cultivating students, and establish new teacher—student interaction relationship as well as promoting communicate and exchange between the teachers and students, thus forming a full education with all the teachers and all the aspects to cultivate the student with the good moral quality, culture knowledge, learning ability and scientific research ability, eventually to create a good and harmonious campus environment. Physical education teachers in serving as tutors convey the concept of health sports, happy sports, sunshine sports, lifelong sports by the close contacts and exchanges, and have opened up a new world for our group competition through carrying out all kinds of sports activities interested by university students.

C. Insights on life philosophy from the simulation

Sports competition is in a strong competitive atmosphere. Under the pressure of competition, students' learned technology and knowledge can be in a very good use, which is truly useful, but also the performance of social adaptation ability in the future. The main task of the school is to impart knowledge to students, improve their overall quality, so that students can be from the biological people to a social people, preparing for their future into the community. Sports competition is a social simulation. Its external form, inner requirement and value idea are the same as the demand of the society. So it is of great significance for students to have social education. In this simulation of the game, students can experience the pressure of competition, the power of solidarity and cooperation and the effect of tenacious spirit on the spiritual support of a person. Through the efforts of their own team, they gain the joy of victory. In sports competition, the psychological feelings of achieving success are the same as the feelings of success in the society, and the cost of the failure in sports competition is much smaller than the cost in real life. Sports competitions are in the form of games and the educated students can experience and learn more things with happiness, as well as learning more from pain. The effect of education is unmatched by other means. So in order to make the students can avoid detours in the future into the community and paying a painful price, sports simulation is the essential part of education for students. We should pay attention to the function of sports competition in

school physical education. Various forms of sports competitions should be actively carried out for students, so that more students participate in them. The education function of sports can be further extended in the sports competition, so as to improve the students' comprehensive quality and to convey more useful for the society.

IV SUMMARIZE THE TREND OF THE UNIVERSITY GROUP COMPETITION DEVELOPMENT FROM THE REFORM PRACTICE

A. New ideas and concepts

Group competition is one of the basic ways to achieving the goal of physical education in colleges and universities. Previous groups competitions in universities with obsolete content, single form, strong competition, less interesting and entertaining, result in the low participation of students, which can be described as "the minority doing the competition, the majority watch the competition", and this is deviated from the concept of "people-oriented, health first" advocated by "national fitness", "sunshine sports". The establishment of the guiding ideology of "healthy sports, happy sports and life—long physical sports" provides a new idea of reform for the sports competition in universities and colleges, reflecting the concept of students oriented, cultivating students' creative ability, spirit of cooperation and team spirit, Thus, the universities must build a new model of the group competition in order to meet the physical education system reform and take a historic new mission.

B. Everyone participates, everyone feels happy

The purpose of school group competition should be always facing all the students, to promote the extensive mass sports activities with deep and lasting development, continue to strengthen the students' consciousness, habits and skills of lifelong physical culture. Colleges and universities should make more students participate in the competition as far as possible according to the existing conditions. And the higher requirements the existing competition rules of university limit the enthusiasm of most students' participation. The competition of college groups is the most basic competition, and should be the students' "happy sports". Based on the "healthy and happy sports", people can expand the students' participation. Group competition in universities and colleges requires us to combine students' physical and mental characteristics and level of knowledge, then creatively to develop those scientific, effective, simple and interesting public competition projects with an appropriate increase in collective projects, then to stimulate students' lasting interest in physical activity, so as to improve the students' enthusiasm to participate in school sports competition, lastly, the minority game can change into majority game. So it is necessary to make the reasonable competition reform of content and form with the specific formulation science, increasing the reform

C. Everyone is the master of their sports

long—life.

For school sports, the sports competition is better for promoting the development of school sports activities, so that more students can actively participate in sports activities. Before the reform, the sports competition projects are mainly set in track and field events, with more personal events but less collective projects. The contents of the events are mainly for competition, which are dull and monotonous. The phenomenon can be described as "no chance to participate in childhood, be unconscious when growing up, no competent to participate in adults". The projects lack of collective, fun, performance ornamental elements, can be no conducive to the development of students' personality and expertise. Thus, through various game forms, students can participate in sports competitions, setting part of the projects and competition rules, and organize their sports competition for themselves. those changes of project settings and the forms attract all students to participate in various sports, which can show the main role function of students and play the subjective initiative. People should choose some events which students are interested in, with a lower degree of difficulty in the competition, thus, it can let more students back to the field to do sports, as well as enjoy the common fun of exercise.

D. To shape the school sports culture brand

Each school is a melting pot of culture, which has deep cultural deposit. So in our school, the school culture should be melted into the school sports competition, forming the unique sports culture "to be honest, smart, upright and persevering". The unique school culture gives group competitions a new energy, the unique spirit of Jiangxi University of Finance and Economics. So the "school sports meeting" is no longer a simple game, it is project of a sports culture, so as to help students get the fun in sports activities and improve the theoretical knowledge, fully showing the school's unique culture and performance. The school sports meeting can brings happiness to the teachers and students in the sports competition, which is also a feast for the whole teachers and students to enjoy sports.

REFERENCES

- [1] M. Engels, "Anthology," People's Publishing House, 1995.
- Song Jixin, "Seeking for Sports "Class" Civilization On Public Sports Spirit," *Journal of Physical Education*, 2005.
- [3] Zhang Jianli, Li Haojie, and Yuan Dan, "Promotion and Restriction by Chinese Culture to 2008 Olympic Games in Beijing," *Journal of Physical Education*, 2003.
- [4] Lu Yuanzhen, "Study on Chinese Sports Culture," Beijing Sports University Press, 2005.
- [5] Hao Qin, "Status and Role of Government on Sports Development," *Journal of Physical Education*, 2004.

Thermodynamics Numerical Analysis on Solid— Liquid Phases of Abrasive Flow Polishing Common—Rail Pipe

Libin Zhou, Junye Li, Xinming Zhang, Ying Xu, Liu Jianhe

College of Mechanical and Electric Engineering, Changchun University of Science and Technology, Changchun 130022, Jilin, China

Abstract—Common—rail pipe is the key components of engine fuel system, its surface quality often decided the atomization and injection performance of the engine, thereby affecting the overall efficiency of the engine, the AFM (abrasive flow machining) technology can effectively improve the surface microstructure and the surface quality. For the exploration of quality characteristics of abrasive flow polishing the common rail pipe, the thermodynamics characteristics of the machining process are analyzed. By discussing the different machining speed and temperature under the condition of dynamic pressure, velocity, turbulence intensity and static temperature parameters on the influence of the abrasive flow polishing surface, for solid liquid two phase of abrasive flow polishing process provides the theory basis for further research.

Index Terms—AFM Polishing ; Numerical Analysis ; Common—rail Pipe; Two—Phase Flow

I. INTRODUCTION

The non—linear tube used in this research is the common—rail part which is an important part of engine fuel supply system. It has high hardness, low surface roughness, with fillet in the oil outlet cross section, pipe internal surface is smooth and without burrs. According to the data provided by the enterprise, the selected common—rail pipe parts geometric model entrance one 16 diameter, branch diameter is 4 mm, The three—dimensional model of the common—rail pipe parts of is shown in figure 1.



Figure 1 The three-dimensional model of the common-rail pipe



Figure.2. Principle of abrasive flow machining

It is difficult to achieve deburring and chamfering of the common rail pipe cross hole by using the traditional processing methods , AFM technology provides an efficient way to solve this problem[1].Principle of AFM is shown in figure 2.

II. RESULT AND DISCUSSTION

The numerical simulation of the common rail 3D channel model was made in two modes (different initial temperatures and the same inlet velocity vs. different inlet velocities and the same initial temperature), and after the calculation, their residual error curves are shown in Figure 3.



Figure 3 The calculation residual error curve of common-rail channel

Figure 3 shows that convergence occurs after about 88 iterations, indicating that the common—rail channel model is designed and the calculation parameters are set reasonably, through which the convergence can be reached[2—3]. In view of the characteristics of this physical model, the flow characteristics of the abrasive flow in common—rail channel were obtained mainly from the comparative analysis of the factors affecting the turbulence pattern of abrasive flow. In order to make the best analysis of the characteristics of the AFM flow field, the simulation results on surface XOZ and surface YOZ were displayed. With an inlet velocity of 60 m/s and the initial temperatures set at 290 K, 300 K, 310 K, 320 K, 330 K and 340 K respectively, the synchronous machining of five branches was simulated, thus producing the distributed cloud maps of dynamic pressure and velocity as shown in Figure 4 and 5.



(a) Temperature: 290 K

ANSYS





Figure 4 shows that, in the trunk of the common—rail channel, the dynamic pressure from the inlet to a certain region was relatively large, but it declined with the advance of the flow[4]. This can be attributed to the energy loss of the abrasive flow due to viscosity and particle collisions or other factors during the flowing course. The dynamic pressure in the branches of the common—rail channel was greater than that in the trunk: the closer the regions were to the branch center, the greater the dynamic pressure was, and it grew to the maximum at the cross hole. This is caused by the sudden decrease in the cross section of common—rail branches and the direction change of abrasive flow in the channel[5]. Figure 4 shows that dynamic pressure distribution differed in the five branches: the closer the branch was to the inlet, the better its internal dynamic pressure distribution was. However, the dynamic pressure in common—rail channel did not change much as the temperature increased; as the temperature increased, the gap between dynamic pressures narrowed slightly.



Figure 5 Cloud maps of velocity when five branches were processed synchronously at different temperatures

Figure 5 shows that, due to the adhesive effect of the abrasive media, the abrasive flow formed a boundary layer at the regions close to the wall when it entered the main channel of the common rail. The boundary layer gradually expanded along the flow direction, that is, the velocity of the flow close to the wall was lower than that

at the center. This resulted from the fact that energy loss caused by viscosity, collisions between particles and wall, etc. can lead to velocity attenuation. This Figure also indicates that velocity decline occurred at the confluence of the main channel and the branches[6]. In the five branches, velocity and dynamic pressure were presented to have similar distributions. That is to say, the velocity of the flow close to the wall was significantly lower than that at the center; and the closer the velocity distribution was to the inlet, the more conducive it was to machining. However, as the working temperature increased, the viscosity of abrasive media would decline, which increased the mobility of abrasive flow and reduced the decrement of velocity.

With an initial temperature of 300 K and the inlet velocity set at 30 m/s, 40 m/s, 50 m/s and 60 m/s respectively, the case that five branches were

processed synchronously was simulated and the cloud maps of dynamic pressure distribution are shown in Figure 6.



(d) Velocity: 60 m/s

Figure 6 Cloud maps of dynamic pressure when five branches were processed synchronously at different velocities

Figure 6 shows that, at the same temperature, the increasing velocity will result in the increase in pressure[7]. In the trunk of common rail, the dynamic pressure distribution was getting even as the velocity increased, that is, the pressure attenuation was getting weak. This would contribute to a better formation of

turbulent flow and uniform machining results in the trunk, thus producing desired surface quality.

The ratio of the turbulence pulse velocity to the average turbulence velocity is termed as turbulence intensity, an indicator to assess turbulence strength[8]. The cloud maps of the turbulence intensity when five branches were processed synchronously at different velocities are shown in Figure 7. It shows that the turbulence intensity at the regions close to the wall of the main channel was greater than that at the center, and the former was getting even as the flow moved, indicating that abrasive particles close to the wall of channel showed better pulsation diffusion effect than their counterparts at the center. That is to say, abrasive particles close to the wall had more intense random motion than those at the center. This difference came from the collisions between abrasive flow and the channel wall, which made the flow close to the wall have bigger pulsation velocity and successively bigger turbulence intensity[9]. In the five branches of the common rail, the turbulence intensity was similarly greater at the regions close to the wall and lower at the center regions, but the general turbulence intensity in the branches was much greater than that in the trunk, which is favorable to the finishing process of the branches. The turbulence intensity distribution differed in the five branches: the farther the branch was from the inlet, the worse the turbulence intensity distribution, which is clearly not conducive to the uniformity of the machining process.



© ACADEMIC PUBLISHING HOUSE



Figure 7 Cloud maps of turbulence intensity when the five branches were processed synchronously at different velocities

(f) Temperature: 340 K

Figure 8 Static temperature cloud maps when five branches were processed synchronously at different temperatures

III. CONCLUSIONS

1.In accordance with the machining characteristics of abrasive flow and the parts structure of common—rail channel, the 3D simulation model was built. The numerical simulation of AFM was performed with the application of the Fluent software and the pressure distribution and velocity distribution maps were obtained. The cases of the abrasive flow machining of different techniques were compared. The simulation results show that the practice of machining one branch separately with abrasive flow facilitates the consistency in machining.

2. Under the condition of low temperature, the increase of speed of abrasive flow polishing common rail pipe is larger, the abrasive flow polishing efficiency is higher. When the temperature rises to a certain value, some problems such as heat—sinking capability of abrasive flow polishing device itself and medium viscosity reduction can lead to low machining efficiency and surface quality.

ACKNOWLEDGEMENT

The authors would like to thank the national natural science foundation of china No. NSFC 51206011, Jilin province science and technology development program of Jilin province No. 20130522186JH and Doctoral Fund of Ministry of Education of China No. 20122216130001 for financially supporting this research under Contract.

References

- Li Jun—ye, Wang Xing—hua, Xu Ying,et al. A numerical analysis of velocity thermodynamics characteristics of liquid—solid two—phase fluid[J]. Manufacturing Automation, 2015, 37(6):82—85
- [2] Li Jun—ye, Xu Ying, Yang Li—feng, et al.Research on abrasive flow machining experiments of Non—linear Tubes. China Mechanical Engineering[J], 2014, 25 (13) : 1729—1734.
- [3] Li, Jun—ye, Liu, Wei—na, Yang, Li—feng, et al. Study of Abrasive Flow Machining Parameter Optimization Based on Taguchi Method[J]. Journal of Computational and Theoretical Nanoscience, 2013, 10(12):2949—2954.
- [4] K Malla,Reddy, A K Sharma. Some aspects of centrifugal force assisted abrasive flow machining of 2014 Alalloy[J]. Engineering Manufacture, 2008,222:773-783.
- [5] R. K. Jain, V. K. Jain, P. M. Dixit. Modeling of material removal and surface rough—ness in abrasive flow machining process[J]. International Journal of Machine Tools & Manufacture, 1999(39): 1903—1923.
- [6] R. K. Jain, V. K. Jain. Finite element simulation of abrasive flow machining[J]. Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture, 2003(217): 1723–1736.
 [7] R. S. Walia, H. S. Shan, P. Kumar. Determining discussion of the optimal discussion of the state of the state of the state.
- [7] R. S. Walia, H. S. Shan, P. Kumar. Determining dynamically active abrasive particles in the media used in centrifugal force assisted abrasive flow machining process[J]. Int J Adv Manuf Technol, 2008(38): 1157– 1164.
- [8] R. S. Walia, H. S. Shan, P. Kumar. Morphology and integrity of surfaces finished by centrifugal force assisted abrasive flow machining[J]. Int J Adv Manuf Technol, 2008(39): 1171–1179.
- [9] H.Zarepour, S. H. Yeo. Single abrasive particle impingements as a benchmark to determine material removal modes in micro ultrasonic machining[J]. Wear, 2012, 288: 1—8.

A Construction Project Management Decision Support System Driven by System Dynamics Model

Yujing Wang, Peidong Guo Management School, Shanghai University of Engineering Science, Shanghai, China

Abstract—In order to manipulate SD simulation model and data resources to make management decision effectively, this article designed Construction Project Management Decision Support System (CPMDSS) driven by SD Model. Firstly, system requirements of the system were analyzed, and then the core functionalities of the system were given. At last, the software architecture was designed, which includes the design of presentation layer, business logic layer and data storage layer. It is concluded that CMPDSS could support construction project manager to optimize project schedule and choose project managerial policies effectively.

Index Terms—System Dynamics, construction project management, Decision Support System (DSS)

I. INTRODUCTION

Given the growing complexity and uncertainty in many decision situations, helping managers use quantitative models to support their decision—making and planning is an important research topic [1]. System Dynamics (SD) has received much attention in construction project management [2—5] for the reason that it is well suited to dealing with the dynamic complexity in construction projects, which are inherently complex and dynamic, involving multiple feedback processes and non—linear relationships [6]. SD provides decision support for project manager by developing project SD model and conducting simulation experiments on it in computer.

However, the existing researches in this area focus on how to capture feedbacks inherent in projects by SD and how to make managerial policies to improve project performances. Study for application method and application environment of SD simulation model is rarely involved. As a matter of fact, there are three obstacles for manager to use SD model to gain support. Firstly, simulation of construction project SD model needs large amounts of parameters and historical data, SD simulation software (such as Vensim and iThink, etc.) is difficult to manage and organize them effectively. Secondly, many data inputted to SD model comes from legacy information system so it is a hard work to export data and import data artificially. Thirdly, users of project SD model aren't always specialists in SD modelling so they have problems to manipulate SD simulation model parameters.

To address this, this article will design a Construction Project Management Decision Support System (CPMDSS) driven by SD Model. It has three characteristics: (1) construction project model is the dominant component that provides the primary functionality of CPMDSS such as making construction management strategies and making project plans, (2) users of CPMDSS could manipulate model parameters easily through interface, and (3) CPMDSS is intended for repeated use in some kinds of decision situations.

II. SYSTEM REQURIEMENT ANALYSIS

CMPDSS is needed to effectively use project SD model to give support for project managers and is based on IT application status quo in the construction project management field. What's more, characteristics of construction project should be considered System requirements are as follows:

A. Taking SD model as dominant component

SD model could capture manager's thinking process consisting of identifying, analyzing, selecting and decision-making when manager handles problem. SD model is also a kind of simulation model which is used by manager to understand how systems change over time. In order to describe real construction project system more accurately, SD model developed in this paper takes into consideration factors affecting project progress such as the dependency relations among construction project works, project quality, construction changes, various time delays, productivity, schedule pressure, resource allocations and management strategies which are excluded in traditional project model, for example, CPM (Critical Path Method) and WBS (Work Breakdown Structure). Project SD model is developed qualitatively through identifying feedback loops inherent in construction project firstly, then extract variables and establish mathematical equations. Last but not least, multiple simulation experiments or runs conducted on SD model by users through setting different model parameters. The results of each experiment are recorded and the impacts of management policies to solve problem are assessed, in which way, managers make their decision supported by SD model.

The main functions of CMPDSS are provided by SD model so the SD model is the dominant component in the CMPDSS architecture and the design of CMPDSS needs to emphasize access to and manipulate of project SD model

B. Being a web—based system

Construction management includes steps such as raising problem, planning, decision—making, implementing and checking and each task is always implemented by different persons who are all the users of CMPDSS. Some person imports data into CMPDSS, some person makes plan through it, some person uses it to make control policy and others just use it to check the project state. Being a web—based system may be the best choice for CMPDSS for the reason that project participators could gain and handle project information anytime and anywhere through a "chin client" web browser. What's more, database remaining on a legacy system can be accessed for a Web technology and displayed in a Web browser.

C. Integration of existing project management tools

Traditional project management methods, especially critical path method (CPM), have been widely used for many decades in project management. Given the dominance of them, CMPDSS should integrate CPM tool. Functionality of assisting users in analyzing dependency relationships among project works, finding critical line and critical works is also needed when making decision. In addition, in order to accurately display simulation results of work duration and its start time and finish time in an accustomed way, Gantt chart tool should also be integrated.

D. Support mobile client

Field engineers need to input information of actual progress of project into CMPDSS in time and communicate with project manager and designer outside construction site at any time. However, it is inconvenient for them to work by computer. So supporting mobile phones and other mobile electronic devices will enhance the utilization of SDMPDSS.

E. Compatibility with other project information systems

"Information Island" problem has hampered the process of IT application in construction industry and how to apply information technology and data standards to solve it is an important issue Avoiding another " Information Island", architecture and development technology of CMPDSS should take its compatibility with existing project information system into consideration so that data can be exchanged between different systems.

In addition, CMPDSS should also consider security, scalability, convenient human—computer interaction, multi—user conflict resolution and other design requirements.

III. FUNCTIONALITY ANALYSIS OF CMPDSS

CMPDSS aims to provide support for users to choose the best management policy and make rational project plan through repeated human—computer interaction.

To achieve this goal, the main functions of this system are input data analysis, project progress forecasting and program comparative analysis, real—time simulation, model calibration, schedule optimization and probability analysis of project completion.

A Input Data Analysis

All input data of CMPDSS are exogenous variables of SD model. They include three types. One is relevant to project scheduling such as Earliest Start Time, Earliest Finish Time, Latest Start Time and Latest Finish Time of each work in a project. Another is related to project characteristic concluding Work Dependency, Work Complexity, Work Quality, Change Probability and so on. The third type is about management policy and Concurrent Construction Policy, Resources Allocation Policy, Goal Adjustment Policy and Time Delay Policy could be gained by using CMPDSS. Users can make policy analysis by designing different simulations represented by different values of policy parameters.

B. Project progress forecasting and alternatives analysis

The functionality of project progress forecasting and alternatives analysis could help users manipulate model parameters to conduct "what if" analysis. CMPDSS provide prediction results of each management policy and feedback loops triggered by it in order to users could compare different policies and then choose the best one.

This function provides both dynamic analysis and static analysis. With the help of dynamic analysis tools such as project behavior curve and resource change curve project manager could make decision through analyzing changing trends over time. Static analysis tools such as Gantt chart and CPM network diagram show start time and finish time of each work and overall progress of project when selected management policy is implemented in a clear way. The influence of each management policy on project behavior is always counter—intuitive and none linear, so mental model has difficult to handle complex problems in complex system. For making decision more accurate and scientific, the functionality of causal loops analysis help managers understand the impacts of each alternative policy.

C. Real—time Simulation

The functionality of real-time simulation could simulate project progress at any time step, and user can manipulate model parameters to control the running of SD model. It provides decision support in the following two aspects: (1) Help user to determine how long a management policy should be taken for. As we known, short-term impact and long-term impact of same policy on project are different. For example, overtime policy could accelerate project progress and avoid negative effect of time delay of increasing workforce in short period, while overtime work in long term will make worker feel overtired, which in turn reduces worker's productivity and project quality. (2) Support user to find control policy in one period. For example, when works are finished only by 80 percent and the target goal is 90 percent, the functionality of real-time simulation CMPDSS could support user to find the best control policy to achieve the goal.

D. Scheduling Optimization and Probability Analysis of Project Completion

The function of scheduling optimization could assist user in making optimal project plan when main influencing factors influencing such as dependency relations among construction project works, project quality, construction changes, various time delays, productivity, schedule pressure, resource allocations and management strategies are taken into account. The plan is t simulation result of SD model whose inputted data are parameters relating to factors above. This function can also analyze probability of project completion under a predetermined duration by the method of Monte Carlo.

E. SD Model Calibration

The functionality of model calibration could optimize parameters of SD model in accordance with the actual project progress in order to increase SD model's coupling degree with the real construction project system. In this way, SD model could predict project progress more accurately in next period.

IV. SYSTEM ARCHITECTURE

The target of CMPDSS is to make full use of SD model and data resources shared on internet through human—computer interaction. CMPDSS is designed as a three—layer structure including presentation layer, business logic layer and data storage layer. Correspondences between layers and system components are shown in Fig. 1.



Figure 1 System architecture of CMPDSS

A. Presentation Layer

Presented as use interface, this layer is the component of system interaction, through which user can control CMPDSS by technologies such as menus, forms, command language and etc. User interface accepts control information and data inputted by users, and presents running results to users. This layer is a combination of model component and data component, and through it user can control system running effectively.

B. Business Logic Layer

This layer includes model management system, SD model, and database management system. SD model, as core resource to provide decision support, is packaged as a Vensim DSS software package [7] in CMPDSS. SD model loads parameter values from database and give output values back to it. There are two functionalities of model management system. One is defining the source and destination of input and output and interacting with database, the other is interacting with SD model so that the user can control it directly.

C. Data Storage Layer

This layer provides data resource to management decision. Database uses relational data model to store data resources, including model parameters (such as duration of the project work, project quality, construction change, time delays, productivity, schedule pressure, etc.), management strategy parameters, project simulation values, the actual progress, constantly updated model uncertain parameters and so on. In addition, CMPDSS also could use existing data resources stored in legacy information systems through database management system.

V. CONCLUSION

This article designs a Construction Project Management Decision Support System (CPMDSS) driven by SD Model. Users could use the shared resources on the network such as SD model and decision-making data to optimize project schedule and choose project managerial policies with the help of system functionalities such as input data analysis, project progress forecasting and alternatives analysis, scheduling optimization and probability analysis of project completion, real-time simulation and model calibration through repeated person—computer interactive. CMPDSS is designed as a three-layer structure including presentation layer, business logic layer and data storage layer. It is concluded that CMPDSS can support construction project manager to make decision effectively. How to use developing techniques to realize the functionalities of CMPDSS needs to be further researched

ACKNOWLEDGMENT

This work is supported by Ministry of Education Humanities and Social Sciences Youth Fund (No.13YJC790034), Shanghai Yong College Teacher Cultivation Project (No. ZZGJD12034).

REFERENCES

- D.J. Power and A. Shardab. "Model—driven decision support systems: Concepts and research directions," *Decision Support Systems*, 2007, 43, pp. 1044–1061.
- [2] H. Sangwon, L. Peter, P. M. Feniosky. "A system dynamics model for assessing the impacts of design errors in construction projects", *Mathematical and Computer Modelling*, 2013, 57(10),pp. 2044–2053.
 [3] J. M. Lyneis and D. Ford. "System dynamics applied to
- [3] J. M. Lyneis and D. Ford. "System dynamics applied to project management: a survey, assessment, and directions for future research", *System Dynamic Review*, 2007, 23 (2/3), pp.157—189.
- [4] C. Li, L.S. Zhou, N. Li, M. Zeng. "Modelling and Simulation of Power Grid Engineering Project based on System Dynamics on the Background of Smart Grid", *Systems Engineering Procedia*, 2012(3), pp. 92–99.
- [5] Y. Man. "Application of System Dynamics in Emergency Management System of Major Projects". *Management Science and Research*, 2013,2(3): 23—30.
- [6] J.D. Sterman. "System dynamics modeling for project management", Working paper, MIT, Cambridge, 1992.
- [7] Ventana Software Inc. Vensim[®] Brochure[EB/0L]. Looking up on website : http://vensim.com/vensim software/.[2015.07.10]

Design And Realization Based On TMS320VC5402 System

FENG Lei1, Yanhua Zhong2, Wei Wei3

Department of Information Engineering, Shaanxi Polytechnic Institute,
 2.Jiangmen Polytechnic, Jiangmen, Guangdong 529020, China
 3.School of Computer Science and Engineering, Xi'an University of Technology, Xi'an 710048, China

Abstract—In this paper, we discussed the solid hour system of the DSP based on TMS320VC5402 to carry out the international standard speed compresses arithmetic of the G.729A 8Kb/s. We first discuss in detail the circuit design procedure, circuit diagram scheme, and PCB scheme. Finally, we provide the detailed discuss of problems encountered in testing. In that system, the DSP carries out the plait decoding of the speech, the Flash used for depositing the procedure and data, the RAM used for exchanging the speech compression data with exterior.

Index Terms—TMS320VC5402 chip , Digital signal processor, Speech coding

I. INTRODUCTION.

With the increasing function of DSP, the technology continues to upgrade, the system has been improved, and the technology of DSP has been widely used in the field of audio processing, which makes the audio processing technology have a great development, and the effect of processing has been improved. Audio technology has made great progress in the last 20 years. From 20 years ago, first of all, the introduction of compact discs (CD), to further the development of super audio CD (SACD), DVD audio disc and MP3 multimedia player, digital audio technology is more and more popular. And these high quality digital media are not separated from the DSP. The introduction of DSP technology into the audio system design into a new era. The processing performance of the digital field, the transformation technology and the complex algorithm are all in the form of graphics, making it more convenient and economical. DSP technology enables the design engineer to develop or transfer their system to the digital field quickly, so it can make full use of the high quality of digital media.

Speech compression codec is a digital speech compression algorithm which has high bit rate. It is transmitted by a specific compression algorithm. It is changed into a low bit rate, and then carries on the decoding, recovery and reconstruction in the receiving end. The purpose is to save the transmission bandwidth of 1.2. Over the last decade, in the field of speech coding and decoding technology, there have been many algorithms are proposed and eventually become international standards, which is the most representative of the G CCITT — 721, G — 726, G — 728, G — 729, etc..

G - 729 is a ITU (International Telecommunication Union) (International Telecommunication Union) to develop and publish a speech codec international standard, which is called 8Kb/s at CS-ACELP: Coding

Linear—Prediction of Speech using 8Kb/s _Structure Conjugate Code—Excited Algebraic. It will PCM 64Kb/s signal compression to 8Kb/s, is currently the new voice compression international standards. The simplified scheme G — 729A further reduces the computational complexity. In the process, the A signal is converted into a linear signal and the PCM signal is converted to a linear signal. The obtained parameters are transmitted via the transmission line and converted into a signal with a A or a PCM.

II. SYSTEM HARDWARE DESIGN

system is composed of Flash, SRAM, The TMS320VC5402, clock circuit, analog digital conversion circuit, level buffer and power circuit. The clock circuit generates the clock required for the DSP chip. The analog to digital conversion circuit is composed of MC14LC5480 and peripheral circuit. The level of the interface chip is 74LC 16245. In order to simplify the circuit, the system does not need to decode the circuit. FLASH not only in the data space, but also in the program space. SRAM mapping in data space. FLASH and RAM occupied by the data space address is overlapping, but the FLASH uses the DSP external data bus low 8 bits, while the SRAM uses the DSP external data bus 8 bits, thus not conflict with each other. The system uses an external parallel 8 bit Boot method. FLASH data space address is ~FFFFH 0000H, the program space address is FFFFH 0000H~. 010000H~01FFFFH, 020000H ~ 02FFFFH, ~03FFFFH 030000H. SRAM's data space address is 8000H~FFFFH.

III. POWER SUPPLY DESIGN

This system uses the TMS320VC5402DSP chip, the DSP core voltage is 1.8V, the interface voltage is 1.8V to 3.6V, the system uses 3.3V. Among them, the CVdd provides current for all internal logic of the device, and DVdd provides the voltage for the external interface pin. Therefore, the system power supply 5V, 3.3V and 1.8V three kinds of. In which the Flash, RAM, clock circuit, analog digital conversion circuits are powered by 5V, and the flat interface is powered by 3.3V. The system 5V is provided by an external supply, 3.3V and 1.8V are provided by the system internal voltage regulator. Figure 3.1 shows the dual power supply output application for TI. TPS73HD3xx series is a dual power supply output chip provided by TI company, with 5402 of the working voltage of 3 3V/ 1.8 V, so the selection of TPS73HD318 chip. The output voltage is 3 8V 1 3V/, the maximum output current is 750 mA. The chip also provides two low level reset pulse width of 200ms, which can be used to reset the DSP chip, we choose 1RESET as the reset end.



Figure.1 output of dual power supply3.1 DSP design

TMS320VC5402DSP chip internal clock generator, which consists of internal oscillator and phase locked loop (PLL) circuit two parts. But the clock generator requires a reference clock input that can be provided by two methods.

The first method: the use of the DSP chip inside the crystal circuit, the DSP chip X1 and CLKIN X2/ connection between a crystal can start the internal oscillator, as shown in figure 3.2.1.1. The circuit works in the fundamental mode, the crystal is the basic mode, and the parallel resonance.



Figure 2 internal oscillating circuits

Second ways: the external clock source directly into the X2/CLKIN pin, the X1 pin is left floating. As long as the 4 pin on the $3\sim5v$ voltage, the 2 pin to ground, you can get the required clock in the 3 foot. As shown in figure2.

Second kinds of methods can be used to encapsulate a good crystal oscillator, which is convenient to use. At the same time, the VC5402 DSP PLL chip internal TMS320 has the function of frequency multiplication and signal purification, the frequency of the external frequency source can be lower than the rate of the CPU CLKOUT, which can reduce the high frequency noise caused by high speed switching clock.

3.2 Reset circuit design and Serial interface

The DSP TMS320C54X chip is generally provided with 4 serial ports, namely, standard serial interface, serial port (BSP), time division multiplexing (TMD), serial interface (McBSP) with multiple channels. These serial ports are accessed by the registers residing in the memory mapped region, and the core CPU is achieved by the interrupt. And the system uses the chip TMS320VC5402DSP only provides the serial interface of the two multi channel buffer (McBSP), McBSP has a full duplex bidirectional communication function, can be directly connected with the encoder MC14LC5480, as shown in figure 3.2.5; double the transmission buffer and three times the acceptance of slow, allowing continuous data flow; independent acceptance, sending the frame and clock signal.

McBSP can be divided into a data path and a control channel in the structure. Data channel to complete data transmission and reception, mainly through the data sending DXR1 / 2 and data register DRR1 / 2. The tasks of control channel include the generation of internal clock, the generation of frame synchronization signal, the control of these signals and the selection of multi channels. Control channel is also responsible for generating terminal signal sent to CPU.

Its work principle is: when sending, first write data to the data send register DXR[1, 2], and then send the FSX control of the transmit clock CLKX and frame synchronous transmit signal, XSR[1, 2]

Sends data to the DX control of the CLKR and the frame of the receiving data into the receiving RSR[1, 2], and copy the data into the receive buffer register FSR, 2], RBR[1, 2], DRR[1, DMA, DR,, CPU. This process allows both internal and external data communications to carry out simultaneously.

McBSP serial port includes: data receiving DR, data sending DX, sending clock CLKX, receiving clock CLKR, receiving frame synchronization FSR, sending frame synchronous FSX and external input clock CLKS. The McBSP MC14LC5480 clock and PCM clock source are used in the design. The frame synchronization signal is generated with the same 8KHz clock source, which is generated by the CPU timer, thus ensuring the same frequency as the PCM receiver and transmitter.

McBSP internal data transmission and receiving controller responsible for sending and receiving data of displacement and cache, the clock and frame synchronous generation and control module to achieve McBSP serial data transmission baud rate setting and synchronization signal generation and judgment, DSP provides multi channel transmission mode. CPU and DMA interrupt module used to trigger the interrupt response of the controller. DSP access to the 16bit control register through the internal peripheral bus McBSP. CPU or DMA controller receives data from the data receiving register DXR, writes the data from the data transfer register DRR, writes the DXR data to the DX pin by transferring the shift register XSR. Similarly, the receiving data from the DR pin is shifted to an RSR and copy to the DRR, and then it can be read by the CPU or DMA controller. Such internal and external data communication can be carried out simultaneously. McBSP can work in multi channel mode, the maximum support 128 channels. If a channel is not selected, the McBSP will not generate an interrupt or synchronization event in the time slice of the channel, ensuring that only the selected channels are processed and ignored by other channels.



Figure 3. serial interface (McBSP) design for multi channel buffer

3.3 FLASH (AT29C020) interface design

When designing the interface between FLASH and TMS320VC5402, the following aspects are mainly considered:

DSP method using the external 8 bit BOOT;

II through the DSP simulation system, the program and data can be written to FLASH;

When the system operates independently, the program can be read out from the FLASH into the SRAM;

The interface as simple as possible.

According to the design of the FLASH interface, as shown in Figure ${\bf 4}$



Figure 4.Interface design of AT29C020 and DSP

SRAM maps in the DSP of the external data area, so the external address of the RAM is mapped to the 8000H~FFFFH range in the DSP data area. SRAM corresponding to the DSP side of the interface as shown in figure 3.3.

V.CONCLUSIONS

The main task of this design is to master the design process of DSP and realize the hardware circuit of 729A G. algorithm. According to the actual situation of the chip model, determine the selected hardware composition, the final design of the printed circuit board, sent to the manufacturers to do board. After the hardware debug, the 729A G. algorithm is installed on the system board, and the operation of the system is monitored by real-time monitoring. Of course, the system board also shortcomings, such as the has some use of TMS320VC5402 resources is not enough, including the HPI port and INTO in addition to the interruption, etc. are not used. This needs to be extended to the system performance. Since the current TMS320VC54x series DSP development has been quite perfect, it can learn from the program is also a large number of. On the basis of the system configuration, the extended function system can be realized by adding some special module or improving the existing circuit, which can be realized by using the extended function system, which is based on the multi function IP 5402, which needs to add a general purpose processor (such as MPC860T's Motorola, etc.), in order to deal with the network protocol, signaling interaction. call processing and user interface information.

Through this graduation design, the electronic design process, especially for the design of the DSP process has a clear understanding and familiar, this is the main purpose of my graduation design. In the design process, I deeply feel that the electronic design is not only the design of the circuit, the other part is also very important, the data collection, drawing system circuit diagram after the PCB production, system programming and debugging, any negligence may cause immeasurable impact on the system. In the design, the beginning of the flash memory with AT29LV020 chip, it is the working voltage is 3.3V, when I go to buy components found no this chip, can only use AT29C020 instead, and AT29C020's working voltage is 5V, must be level conversion, resulting in increased wiring, PCB wiring brings a lot of trouble, but also to modify the circuit diagram, bring more workload, resulting in this situation is mainly the collection of information is not done. In general, the design to achieve the desired objectives, so that I understand the electronic design of more mature, more hands—on ability, I will start work will be a great help.

Reference

- [1]. TMS320C54x CPU and Peripherals (SPRU131C), Copyright 2000 Texas Instruments Incorporated
- [2] .TMS320VC5402Datasheet(SPRS079E), Copyright2000Tex asInstruments Incorporated
- [3]. TMS320VC5402 DSK Online Help, Copyright2000 Texas Instruments Incorporated
- [4]. 74LV16245A Datasheet, Copyright2000 PHILIPS Incorporated TPS74HS318 Datasheet, Copyright@1999TexasInstruments Incorporated
- [6].CY7C185 Datasheet, Copyright@1996 Cypress Semconductor Incorporated
- [7].AT29C020 Datasheet, Copyright@2005Atmel Coporation Incorporated
- [8].MC14LC5840 Datasheet ,Motorola Semconductor Technical Data
- [9] Wei Wei, Qi Yong, "Information Potential Fields Navigation in Wireless Ad—Hoc Sensor Networks"SENSORS, Sensors 2011, Pages: 11, 4794— 4807.
- [10] Wei Wei, PEIYI SHEN, Ying Zhang, Liang Zhang, "Information fields navigation with piece—wise polynomial approximation for high—performance OFDM in WSNs", Mathematical Problems in Engineering, Article: 901509, DOI: 10.1155/2013/901509, Year: 2013, SCI:WOS:000316891600001.
- [11] Wei Wei, Xiao—Lin Yang, Bin Zhou, Peiyi Shen, "Holes Detection in Anisotropic Sensornets: Topological Methods", International Journal of Distributed Sensor NetworksVolume 2012 (2012), Article ID 135054, 9 pagesdoi:10.1155/2012/135054.
- [12] Wei Wei, Xiao—Lin Yang, Bin Zhou, Jun Feng, "Combined energy minimization for image reconstruction from few views", Mathematical Problems in Engineering, Volume 2012 (2012), Article ID 154630, 15 pagesdoi:10.1155/2012/154630.
- [13] Lu Yiming, Liu Dong, Liu Jinsong. Intelligent grid network information integration requirements and model analysis [J]. Automation of electric power systems, 2012, 34(8): 1—4.
- [14] Ni Jingmin, He Guangyu, Shen Chen et al. Overview of USA smart grid assessment [J]. Automation of electric power systems, 2012, 34(8): 9—13.
Modeling and Simulation of earnings management of listing Corporation based on Chinese data

Yiru Yang^{1,*}, Hong Liu²

¹School of Accounting, Economics and Finance, University of Wollongong, Wollongong, 2500, Australia ²Computer and Information Engineering College, Hohai University, Nanjing ,210098, China

Abstract—During the practical earnings management, due to the information asymmetry, institutional investors often fail to obtain the correct information. In this way, the earnings obtained are expressed as the interval information. The interval probability is introduced to earnings management in this paper. The earnings function and the payoff matrix of the dynamic game between the two earnings management sides under the uncertain information are built. PSO is adopted to solve the Nash equilibrium solution of the dynamic game under the uncertain information. The optimal strategy that both sides might choose is adopted so as to maximize the managers in the listed company and the institutional managers.

Index Terms—Chinese Data, Listing Corporation, Earnings Management, Simulation

I.INTRODUCTION

Emerging as a frontier research topic in the accounting field since the 1980s, earnings management has still been a critical field of modern accounting theoretic research, and an important index to measure operation performance of enterprises [1]. Investors, managers, creditors and government departments have paid great attention to it. Enterprises' earnings represent the earnings of investors, and are basis of various securities in the capital market, which could influence the compensation level of managers [2]. Government's taxation is also connected with enterprises' earnings [3]. Due to the important role of accounting earnings, enterprises try every means to manipulate their earnings, thus leading to the popularity of earnings management among listed enterprises. In January 2013, Research Institute of the Commerce Ministry issued Financial Safety Analysis Report of Non - Financial Chinese Listed Enterprises in 2012, which showed that 823 out of 1698 listed enterprise samples or 48.79% of the total whitewashed their financial statements to different degrees up to the third quarter of 2012 [4]. Research suggested that, due to the pressure of stock price, supervision and delisting, the greater financial risks enterprises are faced with, the stronger their motive and willing to whitewash the financial statements and the higher the probability of whitewashing the financial statements [5]. All in all, the financial safety status of non—financial listed enterprises declined sharply. (1)

Earnings management is different from financial frauds. However, excessive earnings management might result in financial frauds [6]. However, the boundary between the two is hard to define both theoretically and

practically. Most financial scandals exploding worldwide in the early 21st century were a result of excessive earnings management. Levitt (2001), former president of SEC (the U.S. Securities and Exchange Commission), pointed out in his speech entitled Digital Game that accounting rules are abused [7]; managers adopt various "creative accounting methods" to glorify the financial statements; enterprises' earnings reflect wishes of the administrative level instead of the practical operation performance of enterprises; earnings management is wandering in the grey zone between legality and illegality, thus seriously jeopardizing the quality of financial statements, dealing a heavy blow to the confidence of investors and seriously influencing the efficiency of resource allocation. Considering the serious economic results of earnings management, earnings management of listed companies has been an issue of great concern to the academic circles, practitioners and supervision departments.

To study earnings management under an uncertain environment is an emerging research topic. First, earnings functions of the dynamic game and the payoff matrix between two earnings management sides against the backdrop of uncertain information are built respectively. The extended dynamic game is transferred into the dynamic strategy-based game. The probability formula of interval numbers is employed to compare the payment value of managers and in listed enterprises and institutional investors in the form of interval numbers so as to obtain the complementary probability matrix. Second, PSO (Particle Swarm Optimization) is adopted to work out the Nash equilibrium solution of the dynamic game under the situation of uncertain information. At last, the optimal decision - making strategy for earnings management under the asymmetric information environment is worked out.

II. DYNAMIC GAME MODEL OF EARNINGS MANAGEMENT BASED ON THE UNCERTAIN INFORMATION

2.1 Dynamic game strategy set of earnings management

During the earnings management process, institutional investors and managers of listed enterprises are regarded as two players. The dynamic game counteraction during the interval of k is adopted. (See Fig. 1)





during the interval of k

The extended dynamic game model under the situation of uncertain information can be expressed as

 $G = \{N, S, U\}$, where $N = \{1, 2\}$ and N stands for two participants in the game with 1 representing the institutional investor and 2 as the manager of listed enterprises. First, the institutional investor might make the choice of whether to supervise or not and then the manager of listed enterprises is in a position to decide whether to conduct earnings management. 23]

 $S = \{s_{1i}^k, s_{2j}^k\}$ stands for the action strategy set of two sides in the game; S_{1i}^{κ} stands for the *i* action strategy of the institutional investor during the interval of k; S_{2j}^{κ} stands for the J action strategy of the manager of listed enterprises ; $U = \left\{ \overline{u}_1(s^{k,j}), \overline{u}_2(s^{k,j}) \right\}$ stands for the

earnings interval corresponding to every action group which might be chosen by the institutional investor and the manager of listed enterprises.

In Fig. 1, the action circumstances during the kinterval of the game can be expressed by an information set. Therefore, the action strategies of the institutional investor and the manager of listed enterprises are in fact the action rules of two sides in every general collection.

 H_i can express the information set, I_j , of the institutional investor, namely $H_i = \{I_j\}$. $A_i(I_j)$ can

express the action set in the information set, I_{j} , of the institutional investor. Therefore, the pure strategy set of the institutional investor can be expressed by the

$S_i \prod_{I_j \in H_i} A_i \left(I_j \right)$

Cartesian product, , on the action set of every general information set. Similarly, the manager of listed companies can also be expressed in this way.

III. SIMULATION EXPERIMENT

In this paper, a listed company is taken as an example. The due compensation of managers of the company in 2012 was $e \in [2,5]$ million; the remaining earnings of institutional investos were v = 20 million; the excess earnings of managers were $s \in [6, 80]$ million; the probability of earnings management actions to be revealed was p = 0.4; the fines for managers after their management behaviors were revealed were $F \in [10, 60]$ million; the supervision cost was c = 0.1million; the shareholding percentage of institutional investors was β =20%. Then, the earnings management counteraction strategy set between institutional investors and managers in listed companies during the three stages were shown in Table 1.

Table 1 Earnings counteraction strategy set of two sides during three

	stages	
Stage	Strategies of managers in listed companies	Strategies of institutional
1	Managers of the listed company conduct earnings management Managers of the listed company conduct no earnings management.	With the supervision of institutional investors Without the supervision of institutional investors
2	The game strategies of both sides in Stage 2 is similar to those in Stage 1	
3	The game strategies of both sides in Stage 3 is similar to those in Stage 1	

From Table 1, it can be seen that the zero - sum payoff matrix showing the counteraction between institutional investors and managers of the listed company is a 2*2 dimensional one. The attack-defense confrontation during three stages forms a 8*8 dimensional matrix. According to the operation rules of the interval numbers, the payoff matrix of the earnings management confrontation 8*8 dimensional strategy game between two sides during three stages can be worked out:

	$(S_{21} S_{21} S_{21})$	$(S_{21} S_{22} S_{21})$	$(S_{21} S_{21} S_{22})$	$(S_{21} S_{22} S_{22})$	$(S_{22} S_{21} S_{21})$ (S	$S_{22} S_{21} S_{22})$ (S	$S_{22} S_{22} S_{21})$	$(S_{22} S_{22} S_{22})$
	$(S_{11} S_{11} S_{11})$ [-459.3,113.7]	[-383.2,95.5]	[-383.3,95.7]	[-307.2,77.6]	[-383.4,95.6]	[-307.4,77.4]	[-307.3,77.7]	[-171.3,-0.3]
	$(S_{11} S_{11} S_{12})$ [-463.2,89.8]	[-387.2,71.8]	[-387.3,71.9]	[-311.3,53.7]	[-387.2,71.8]	[-311.4,53.6]	[-311.2,53.8]	[-235.2,35.8]
	$(S_{11} S_{12} S_{11}) = [-463.2,89.9]$	[-387.5,71.6]	[-387.6,71.6]	[-311.6,53.9]	[-387.4,71.7]	[-311.1,53.5]	[-311.8,53.2]	[-235.3,35.6]
	$(S_{11} S_{12} S_{12}) = [-347, 231.9]$	[-271,213.2]	[-272,213.8]	[-196,195.8]	[-271,213.9]	[-195,195.9]	[-197,195.6]	[-119,177.9]
-1 -	$(S_{12} S_{11} S_{11})$ [-463.5,89.5]	[-387.7,71.6]	[-387.5,71.5]	[-311,53.5]	[-387.5,71.4]	[-311.5,53.3]	[-311.7,53.1]	[-235,35.7]
	$(S_{12} S_{11} S_{12}) = [-346, 231.7]$	[-275,213.5]	[-277,213.4]	[-195,195.9]	[-271.6,13.5]	[-194,195.4]	[-198,195.7]	[-117,177.6]
	$(S_{12} S_{12} S_{11}) = [-346, 231.8]$	[-271.6,13.7]	[-271.5,213.8]	[-199,195.4]	[-271.8,213.2]	[-192,195.6]	[-197,195.9]	[-120,177.2]
	$(S_{12} S_{12} S_{12})$ [-471,42]	[-397,25]	[-396, 22]	[-314,6.2]	[-395,24]	[-315, 6.8]	[-319,6]	[-243,-12]

The element in every row of the game payoff matrix is used to express the strategies of managers in the listed

(S|S|S)companies. Among them, can express the © ACADEMIC PUBLISHING HOUSE strategies adopted by managers of the listed company for earnings management in Stage 1. In Stage 2 and Stage 3, the same earnings management strategies are adopted. The element of every row stands for the strategy of

institutional investors. Among them, (3 | 5 | 5) stands for the supervision strategy that institutional managers adopt during Stage 1. During Stage 2, no supervision strategies are adopted; while, supervision strategies are adopted during Stage 3.

The fitness value of the earnings management game between the two sides under the situation of uncertain information can be obtained through PSO:



Fig. 2 Fitness variation curve for institutional investors



Fig. 3 Fitness variation curve for managers in the listed company

Based on the simulation experiment, the Nash equilibrium solution of institutional investors during the three stages can be obtained, $x^* = (0, 0, 0, 0, 0.68, 0, 0.29, 0.029, 0)$; the payoff

value is v = -346.626. In other words, the probability for institutional investors to adopt the fifth, seventh and eighth strategy is 0.68, 0.29 and 0.029, respectively. In terms of the fifth strategy, institutional investors adopt non — supervision strategies in Stage 1, but adopt supervision strategies in Stage 2 and Stage 3. In terms of the seventh strategy, institutional investors adopt non supervision strategies in Stage 1 and Stage 2, but adopt supervision strategies in Stage 3. In terms of the eighth strategy, institutional investors adopt non — supervision strategies in Stage 3. In terms of the eighth strategy, institutional investors adopt non — supervision strategies during three stages.

The Nash equilibrium solution of managers in the listed company during three stages is $y^* = (1,0,0,0,0,0,0,0,0)$; the payoff value is v = 347. In other words the probability for the listed

company to choose the first strategy is 1, which means that the listed company adopts the earnings management strategy during three stages. It shows the absoluteness of earnings management behaviors of managers in the listed company. Under the circumstance, institutional investors should enhance the restriction of their behaviors so as to prevent their benefits from being infringed.

The Nash equilibrium solution of the two sides during three stages is defined as that institutional investor and managers of the listed company choose strategies at the probability of x^* and y^* . The equilibrium between the two is an optimal choice for the two. If any party destroys the balanced state, earnings of the side might be reduced.

V.CHAPTER SUMMARY

This paper studies the issue of dynamic game of earnings management under the uncertain environment. During the practical earnings management, due to the information asymmetry, institutional investors often fail to obtain the correct information. In this way, the earnings obtained are expressed as the interval information. The interval probability is introduced to earnings management in this paper. The earnings function and the payoff matrix of the dynamic game between the two earnings management sides under the uncertain information are built. PSO is adopted to solve the Nash equilibrium solution of the dynamic game under the uncertain information. The optimal strategy that both sides might choose is adopted so as to maximize the managers in the listed company and the institutional managers.

REFERENCES

- [1]Stubben S R. Discretionary Revenues as a Measure of Earnings Management[J]. Accounting Review, 2009, 85(2):695-717.
- [2]Chia—Ling Chao, Richard L. Kelsey, Shwu—Min Horng, et al. EVIDENCE OF EARNINGS MANAGEMENT FROM THE MEASUREMENT OF THE DEFERRED TAX ALLOWANCE ACCOUNT[J]. Engineering Economist A Journal Devoted to the Problems of Capital Investment, 2010, volume 49(1):63—93.
- [3]Wu H, Wang X, Chen X, et al. On Earnings Management Strategy Based on Fuzzy Game[J]. Reformation & Strategy, 2014.
- [4]Tsai B. Earnings Management before Rights Issues and the Subsequent Cash Transfer in Chinese Firms[C]// COMPUTATIONAL METHODS IN SCIENCE AND ENGINEERING: Advances in Computational Science: Lectures presented at the International Conference on Computational Methods in Sciences and Engineering 2008 (ICCMSE 2008)AIP Publishing, 2009:489–492.
- [5]Shivakumar L. Estimating Abnormal Accruals for Detection of Earnings Management[J]. Social Science Electronic Publishing, 1996.
- [6]Mashoka T Z. Earnings management and loss reversal[J]. Brunel University, 2010.
- [7]Yim A, Yim A. Earnings Distribution Discontinuity from a Continuous Model of Earnings Management[J]. Ssrn Electronic Journal, 2012.

Analytic Hierarchy Process—based Chinese Disabled Sports Current Situation's Quantitative Comprehensive Evaluation

Xun Liu

Physical Education Changchun University, Changchun 130022, Jilin, China

Abstract—With the success of Beijing Olympic Games, Chinese disabled sports undertakings development has been greatly promoted, however during development process, it still has imbalanced conditions, so as to make clear about problems of them the paper will go ahead with quantitative evaluation on Chinese disabled sports current situation, through applying quantitative evaluation model and analytic hierarchy process model, finally gets that sports competition aspect of the paper selected six indicators has the highest score and has no big gap from optimal full score, which verifies the item is going well in China and could be recognized by relative experts, while disabled physical education and sports management aspects take the second place that shows these two aspects performance are all right and belong to moderate level, while disabled sports science research and physical exercises aspects belong to general level, the worst is the aspect of employment, the result gets closer to practice and verifies the model's rationality and effectiveness, so the research will play a certain promotion role in the field development in future.

Index Terms—Sports current situation; analytic hierarchy process; disabled sports; quantitative comprehensive evaluation

I. INTRODUCTION

The former international Olympic Committee president Samaranch have ever said, 'sports that awakens conscience belongs to the disabled sports', society should develop disabled sports undertakings so as to advance, China is a country that possess the largest amount of disabled in the world, as far as the disabled is concerned, sports is an important mean to adjust the mood, interest and restore health, which also is an important symbol that reflects social value and ceaseless striving spirits, so research on disabled sports is of important significance in Chinese disabled healthy development.

Regarding disabled sports aspect researches, formers have made many contributions, such as Davis once put forward in the paper that disabled sports belonged to a kind of adaptive physical exercises, it could change disabled task and environment under the circumstance met personal demands; Zhu Li—Qiong and others comprehensive analyzed disabled sports functions, and thought that disabled sports undertakings not only owned aesthetic value and bodybuilding value, but also political value and social value, the most important values and functions contained entertainment function, education function, health restoration function and value compensation function.

The paper just bases on formers' researches, makes further analysis targeted at disabled sports current situation, respectively makes statements from input, handling and output these three links, through applying quantitative comprehensive evaluation and analytic hierarchy process approach, finally gets China's disabled sports main indicators existing differences, and puts forward corresponding suggestions.

II. THEORETICAL MODEL ESTABLISHMENTS

Comprehensive evaluation refers to evaluation through transforming multiple indicators finally into an indicator that can objective reflect comprehensive conditions. Corresponding theoretical support is as following:

(1) Establish factor set
$$U$$
,
 $U = (U = U = \cdots = U)$ (1)

$$\begin{array}{cccc} (C_1 & C_2 & \cdots & C_k) \\ (C_1 & C_2 & \cdots & C_k) \\ (C_2 & \text{Establish} & \text{weight} & \text{set,} \\ \end{array}$$

$$A = (a_1, a_2, \cdots, a_n)$$
, it meets
conditions:

$$\sum_{i=1}^{n} a_i = 1 \quad (0 \le a_i \le 1)$$
(2)

(3) Quantitative comprehensive evaluation result $B = A \circ U$

$$= (a_1, a_2, a_3, \cdots, a_n) \circ \begin{bmatrix} r_1 \\ r_2 \\ M \\ r_n \end{bmatrix}$$
(3)
$$= (b_1, b_2, b_3, \cdots, b_n)$$

Here fuzzy operator is using 0 to represent, and b_j represents under v_j states corresponding B subset membership, after doing normalization handling on it, it has $\sum = b_1, b_2, b_3, \dots, b_n$, then it has:

$$B' = (b_1 / \sum b_2 / L \ b_n / \sum) = (b_1', b_2', L \ b_n')$$
(4)

(4)Make analysis according to B', and evaluate through combining with practical situations.

AHP model also calls analytic hierarchy process approach, it has stronger logicality and hierarchical structure, the algorithm mainly is calculating indicators weights. It is applicable to comprehensive assessment system, is a powerful mathematical method that converts problems into quantitative research. Chinese and foreign disabled sports current situation quantitative comprehensive evaluation analysis gets involved in multiple reference indicators, the decision problems is suitable to analytic hierarchy process.

2.1 Construct analytic hierarchy process structural model

When applying analytic hierarchy process approach to select weights, firstly it should establish hierarchical structural model as following Figure 1.



2.2 Construct judgment matrix

For above three kinds of indicators, it makes meticulous comparison of the two's relative importance to construct judgment matrix. Such as :Take K_i, K_j to make important comparison, the structure is using K_{ij} to express, and then all factors after comparing can get judgment matrix U. Its expression is as following:

$$U = \begin{pmatrix} K_{11} & K_{12} & \cdots & K_{1j} \\ K_{21} & K_{22} & \cdots & K_{2j} \\ \vdots & \vdots & \ddots & \vdots \\ K_{i1} & K_{i2} & \cdots & K_{ij} \end{pmatrix}$$
(5)

 K_{ij} represents indicator i and indicator j importance value to target K, paired judgment matrix is $T = (T_{ij})_{n \times n}$, result is as Table 1.

$$T_{ij} > 0$$
 $T_{ij} = \frac{1}{T_{ji}}; (i \neq j; i, j = 1, 2, 3, \dots, n)$

(6)

Table 1: Indicators paired judgment matrix
$$K_k$$
 T_1 T_2 T_3 \cdots T_n

T_1	<i>T</i> ₁₁	<i>T</i> ₁₂	<i>T</i> ₁₃		T_{1n}
T_2	T_{21}	T ₂₂	<i>T</i> ₂₃		T_{2n}
T_3	T_{31}	C ₃₂	<i>T</i> ₃₃		T_{3n}
:	•	:	•	•••	
T_n	T_{n1}	T_{n2}	T_{n3}		T_{nn}

We use 1—9 number to describe; number representative meaning is as following Table 2: Table 2: 1—9 scale meaning

Scale	Meaning
1	Indicates two factors have equal
	importance to objective
	Indicates the former is slightly more
3	important than the later by comparing two
	factors
5	Indicates the former is more important than
5	the later by comparing two factors
	Indicates the former is relatively more
7	important than the later by comparing two
	factors
	Indicates the former is extremely more
9	important than the later by comparing two
	factors
Even	Represents importance is between two odd
number	numbers
D · 1	Represents factors positive and negative
Reciprocal	comparison order

2.3 Consistency test

To

$$\begin{array}{c} U = \left(b_{ij} \right)_{n^*n} , \text{ if matrix element} \\ b \ b \ -b \end{array}$$

meets $b_{ij}b_{jk} = b_{ik}$, then matrix is consistency matrix.

Among them, $b_{ij} > 0$, $b_{ij} = 1/b_{ji}$. In order to use it to calculate factor weight, it requires that matrix inconsistency only under acceptable conditions. When problems are relative complicated, we cannot take all factors into account, which causes paired comparison construct judgment matrix instant, judgment matrix cannot arrive at ideal state consistency.

Judgment matrix consistency indicator CI, and judgment matrix consistency ratio CR, their computational method is as following formula:

$$CI = \frac{\lambda_{\max} - n}{n - 1} \tag{7}$$

Among them, n represent order number of judgment matrix that is also the number of compared factors.

$$CR = \frac{CI}{RI} \tag{8}$$

Among them, RI represents Random Consistency Index value, as following Table 3:

	Table 3: RI value table										
n	1	2	3	4	5	6	7	8	9	10	11
RI	0	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49	1.52

When $CR \ge 0.1$, it is thought that judgment matrix occurs inconsistency that needs to make adjustment on judgment matrix again. When CR < 0.1, judgment matrix inconsistency is within acceptable range.

Single hierarchical judgment matrix conforms to consistency requirements by consistency test; it can think that calculation weight is reasonable. Next step is doing combination consistency testing. Assume in one layer, m pieces of factors weight calculation result is α_m ,

pieces of factors weight calculation result is m, corresponding consistency indicator value is respectively CI_m , combination consistency test consistency ratio is:

$$CR = \frac{\sum_{j=1}^{m} \alpha_j CI_j}{\sum_{j=1}^{m} \alpha_j RI_j}$$
(9)

By calculation, combination consistency ratio computational value is:

CR < 0.1

So the hierarchical total arrangement consistency test meets consistency requirements. It checks that Chinese and foreign disabled each indicator weight calculation result is reasonable or not, if not then should make further amendment.

2.4 Calculate each level weight

Calculate each level weight, and arrange according to weight, finally we can get each indicator relationships as following Table 4:

Table 4: Total	arrangement weight	calculation
14010 1. 10141	unfungement weight	culculation

Hierarchy B Hierarchy	A_{1}	A_2	 $A_{ m m}$	Hierarchy B total arrangement
A	a ₁	a ₂	 a _m	weight
<i>B</i> ₁	b ₁₁	b ₁₂	 b_{1m}	$\sum_{j=1}^m b_{1j} a_j$
<i>B</i> ₁	b ₂₁	b ₂₂	 b _{2m}	$\sum_{j=1}^m b_{2j} a_j$
:			 	:
B _n	b _{n1}	b _{n2}	 b _{nm}	$\sum_{j=1}^m b_{nj} a_j$

III. CHINESE DISABLED SPORTS CURRENT SITUATION QUANTITATIVE COMPREHENSIVE EVALUATION

According to above theory, and combine with practice, the paper establishes disables sports competition evaluation indicator system as following Table 5:

Table 5: Disabled sports competition evaluation indicator system	
--	--

Disabled sports competit evaluation system		First level indicator	Second level indicator	
	competition		Sports management	
		Sports competition base	Physical education	
			Sports science research	
		Sports competition process	Sports competition	
		S	Employment	
		Sports competition result	Physical exercises	

By above Table 5, we can get comprehensive 3.1 Weight a valuation factor as: 5.1 Firstly estimates of the set of the set

$$X = \{x_1, x_2, \dots, x_6\}$$

={ Sports science research, physical education, sports management

sports competition physical exercises employment}. 3.1 Weight defining through analytic hierarchy process

Firstly establish each level evaluation judgment matrix, by establishing comparison matrix, it can get each factor effects on disabled sports, and then combine with formers' experiences, construct judgment matrix as following Table 6:

Table 6: Disabled sports competition evaluation judgment matrix

Competition evaluation	Competition base	Competition process	Competition result
Competition base	1	3	1/5
Competition process	1/3	1	1/4
Competition result	5	4	1

Through analytic hierarchy process, it can get each indicator judgment matrix maximum feature vector

- is : $\begin{vmatrix} 0.6048 \\ 0.3093 \\ 0.7349 \end{vmatrix}$, CR=0.09324<0.1, carry out normalization
- processing after testing, and get each indicator weight $\begin{bmatrix} 0.3689 \end{bmatrix}$
- as : $\begin{vmatrix} 0.003 \\ 0.1879 \\ 0.4457 \end{vmatrix}$, so we learn that the most important

indicator among first level indicator evaluation belongs to competition result, while on the contrary, competition base next to it .

According to above process, similarly we can get second level indicators comparison and second level indicator judgment matrix is as following Table 7:

Competition base	Physical education	Sports science research	Sports management
Physical education	1	3	4
Sports science research	1/3	1	2
Sports management	1/4	1/2	1

Table 7: Disabled sports compatition base judgment matrix

By above Table 7, we can get competition base [0.7749]

0.5149

judgment matrix maximum feature vector is: $\begin{bmatrix} 0.3666 \end{bmatrix}$, CR=0.8997<0.1, carry out normalization processing after

0.4678

0.2213

testing, and get corresponding weight as : $\lfloor 0.2213 \rfloor$, therefore disabled sports competition's competition base belongs the most important, next is physical education.

According to previous two matrixes, we can get [0.5]

competition result weight is: $\lfloor 0.5 \rfloor$, we can get from the result that employment and physical exercises belong to the same level, which proves the two are equal important. *3.2 Disabled sports each level weight defining*

Through previous hierarchy B weight computational formula, we can get corresponding second level indicator total weight coefficient, so can get total indicator system weight allocation coefficient as Table 8:

Table 8: Disable	ed sports con	petition e	evaluation comprehent	sive weight table	
	E' 4	1 1		G 1 1 1	

		First level indicator	Weight	Second level indictor	Weight
		Competition base	0.2000	Science research	0.1714
Disabled	manatition		0.3000	Education	0.1141
Disabled co	mpetition			Management	0.0812
evaluation	evaluation	Competition process	0.1873	Competition	0.187
		Competition	0.4458	Physical exercises	0.2224
	result	result		Employment	0.2228

Express above through formula, it gets:

 $W = \begin{bmatrix} 0.1716 \\ 0.1104 \\ 0.0813 \\ 0.1876 \\ 0.2228 \\ 0.2228 \end{bmatrix}$

3.3 Define evaluation indicator scores and data processing

In order to more reasonable get the scores, the paper selects foreign relative indicators that regards optimal scores as benchmark, selects relative field experts to score, from which is full mark system, defines 90 scores as excellent, 80 scores as good, 70 scores as moderate, 60 scores as general, 50 scores as poor, referencing formers experts evaluation result as following Table 9:

Table 9: Relative personnel evaluation score						
Relative personnel group	Managemen t	Employmen t	Physical exercises	Science research	Education	Competition
No.1	Moderate	60	60	65	70	80
No.2	Moderate	70	75	70	65	77
No.3	Good	65	60	55	88	80
No.4	Excellent	50	70	70	80	90
No.5	Good	50	65	60	86	85
No.6	Good	75	75	80	90	90

No.7	Good	70	65	70	75	70
No.8	Excellent	80	65	75	60	70
No.9	Excellent	60	80	50	80	85
No.10	Good	55	70	50	85	80
Average score	81	63	68	64	77	80

Handle with Table 9, we can get comprehensive evaluation score result as following Table 10: Table 10: Disabled sports competition evaluation score

Relative	NT 1				
personnel	No.1	No.2	No.3	No.4	Average score
group	77.0	75.0	71.4	(0.1	71.725
Education	77.9	75.9	71.4	62.1	71.725
Science	64.0	54.1	67.9	56.5	60.895
	0.1	0.0. (
Management	81	80.6	80.4	77.9	78.675
Employment	63.5	50.6	55.3	67.2	59.6
Physical exercises	68.5	70.5	68.7	69.3	69.575
Competition	80.7	87.2	70.5	90.2	82.145

3.4 Quantitative comprehensive evaluation result

Mutual independence and compensability exist between first level and second level indicators, so it can make evaluation through selecting weighted approach. By above process, we can get Chinese disabled sports competition comprehensive evaluation score condition is:

B=X ● W= (60.875 71.775 78.625 82.125 69.275

$$59.1) \bullet \begin{vmatrix} 0.1716 \\ 0.1104 \\ 0.0813 \\ 0.1876 \\ 0.2228 \\ 0.2228 \end{vmatrix} = 69.3$$

VI CONCLUSION

Through Chinese disabled sports correlation analysis, the paper's final evaluation result, we can learn that sports competition aspect of the paper selected six indicators has the highest score and has no big gap from optimal full score, which verifies the item is going well in China and could be recognized by relative experts, while disabled physical education and sports management aspects take the second place that shows these two aspects performance are all right and belong to moderate level, while disabled sports science research and physical exercises aspects belong to general level, the worst is the aspect of employment, the result gets closer to practice and meanwhile also verifies China should focus on solving the aspect existing problems in future development.

References

- XIAO Huan—yu, WENG Zhi—qiang, CHEN Yu zhong.Basic Characteristics of Social and Sports Population Structures of Contemporary China[J].Journal of Shanghai Physical Education Institute, 2005, 29(2):10—14.
- [2] XIAO Huan—yu, FANG Li.Concept, Classification and Statistical Criteria of Sports Population[J].Sports Science Research, 2005, 26(1):7—10.
- [3] MIAO Zhi—wen, QIN Chun—lin.Sociological analysis of contemporary Chinese sports population structures[J].Journal of Physical Education, 2006, 13(1):119—121.
- [4] YAN De—yi.Development of sports for all under circumstance of building well—off society[J].Journal of Wuhan Institute of Physical Education, 2006, 40(1):15—19.
- [5] GUO Hong.Summary on Chinese Sports Population Research Since 1980s[J].China Sport Science and Technology, 2007, 43(3):36–40
- [6] LI Hong, XUE Hai—hong, FENG Wu—long.Sociological Analysis of Comparison of Chinese Population with the Sports Population of Chinese[J].Journal of Xi'an Institute of Physical Education, 2007, 24(4):25—28.
- [7] CHEN Po, QIN Zhong—Mei, YIN Ying, XIA Chong— De.Correlation Analysis of Current Situation of Regional Athletics Sports Development and Society Population Structure in China[J].Journal of Beijing Sport University, 2007, 30(12):1610—1613.
- [8] XUE Jin—xia, WANG Jing—tong.Analysis on Development Level of Competitive Sports of Eastern China in the "Eleventh Five—Year" Period[J].Bulletin of Sport Science & Technology, 2011, 19(4):57—59.
- [9]LI Lin, YANG Jie, YANG Tian, XU Lie—hui.A Research on the Sustainable Development of Evaluation Index System of Regional Sports Industry[J].Journal of Beijing Sport University, 2010(9).

Factor Analysis of Disabled Students' Physical Monitoring Indicators

Liang Dong

Physical Education Changchun University, Changchun 130022, Jilin, China

Abstract — Present social health problems have become the prime concern of people ,from which attentions also have been attached to students' physical health , the old physical health as well as all working class health problems , and disabled students' physical health problems. The paper takes disabled students as research objects, utilizes factor analysis approach , and screens out primary influence factors from body mass index, grip of body weight, lung capacity of body weight , 1000m or 800m, 25*2m test performance, standing long jump, throwing solid ball, sit up and pull—up these nine indicators. The result shows that body mass index, grip of body weight and lung capacity of body weight these three indicators are important influence factors.

Index Terms — disabled students; physical health; factor analysis approach; influence factors

I.INTRODUCTION

The disabled is one of main vulnerable groups, as far as they are concerned, social welfare is an important source of income, and physical health is an important guarantee for life. As social hotspot, disabled students' physical health indicators have attracted relative scholars and the public's attentions.

In 2013,Song Hong—Sheng in the article "Tianjin vision disabled middle school students' physical health test study", emphasized that the state had issued a series of students' physical monitoring criterions since 1949, however, monitoring criterions for disabled students had not yet been detailed mentioned . The writer applied multiple research methods, took vision disabled students as research objects, firstly carried out screening work about evaluation indicators, result showed that vision disabled students couldn't fulfill 1000m running, 800 running, step test, standing long jump as well as 50m running these four sports events. By experiments with relevant proxies, it could conclude that for people of blind level in vision disability, 60seconds 60 times squatting could replace step test so as to test heart and lung functions, and 30m running could replace 50m running so as to test reaction speed, while vertical jump and reach could replace standing long jump so as to test lower limbs' explosive power.

lower limbs' explosive power. In 2013,Li Hua—Dong in the article "Tianjin intelligence disabled students' physical health test study", emphasized that though current society had a series of students' physical health monitoring indicators, no proper monitoring system for intelligence disabled students. The paper took intelligence disabled students as research objects, on the premise that referenced lots of literature documents, combining with foreign mature experiences, and carried out relevant experiences to implement theoretical verification on proposed system. Result showed that as far as intelligence disabled students were concerned, amount of exercise was far less than needed amount to recover and growth. In 1000m running(man) & 800m running(woman) , rope skipping, basketball, volleyball, football and pullup these six sports events, from the perspective of overall intelligence disabled students, finishing rate was not high , from which seriously intelligence disabled students' finishing extent was rather lower, while slight intelligence disabled students' finishing extent was rather higher that similar to finishing status of normal students. At the same time, it indicated intelligence disabled students had shortage in learning these sports events, school and society didn't provide basic sports learning and physical exercise guarantee for intelligence disabled students. In the field of testing disabled students' physical quality, 1000m running (man), 800m running (woman) and quickly squatting had similar results , and pull—up and push—up had similar results. When using these proxies to test, disables students' physical status could be successfully reflected.

In 2009, Li Jian—Qiang in the article "Chinese students' physical health standard evolution and characteristics study" emphasized that though Chinese students' physical health standard constantly evolved, some problems still existed. The author studied "Standard" changing processes to find out rules and characteristics thereof, and presented counter measures for Chinese students' current physical health status. The result showed that all kinds of testing standards were simplified during changing processes, operability became stronger and stronger. Using scoring standard to replace qualified standard could let progressive increase or degressive increase principles to be followed in the standard of comparison result scoring that was generated among different groups of people, and distinction degree of all kinds of scored also changed from rough to precise.

In 2013, Wang Ming—Yuan in the article "Hearing disabled students' physical health test proxies study", through contrast test, found out that pull—up, sit—up, rope skipping and others total 13 sports events could be used as hearing disabled students' physical health monitoring indicators, the conclusion provided certain theoretical basis for hearing disabled people's physical health testing.

Presently, as far as hearing disabled students are concerned, available health status monitoring items are quite a lot, the paper will take hearing disabled students as research objects, and study health status monitoring simplification approaches.

II. MODEL ESTABLISHMENTS

The model takes factor analysis approach as theoretical basis, combines with disabled students' all kinds of testing indicators data, simplifies nine physical monitoring indicators to let the disabled physical quality testing to be conveniently proceeded so as to improve the disabled life quality and reduce their inconvenience in daily life.

2.1 Data collection

Data in Table 1 , Table 3 , Table 5 are from the article "Hearing disabled students' physical health test proxies study".

Table 1 Hearing disabled students' body mass index, grip of body weight, lung capacity of body weight

No.	Level of hearing disability	Body mass index	Grip of body weight	Lung capacity of body weight
1	Seriously	100 points	68	55.4
2	Seriously	60 points	58	51.3
3	Seriously	50 points	29	66.1
4	Seriously	60 points	50	62.8
5	Seriously	60 points	71	67.7
6	Seriously	100 points	57	47.6
7	Moderate	50 points	52	49.5
8	Seriously	50 points	38	49.5
9	Seriously	50 points	19	74.5
10	Seriously	60 points	39	45.9
11	Seriously	100 points	58	77.3
12	Seriously	100 points	48	40.7
13	Seriously	60 points	37	38
14	Seriously	100 points	53	45.1
15	Seriously	100 points	61	61.1
16	Seriously	60 points	57	55.4
17	Seriously	50 points	28	37.4
18	Seriously	60 points	33	46.6
19	Seriously	50 points	52	57.9
20	Seriously	60 points	56	60.9
21	Moderate	60 points	58	68.8
22	Seriously	60 points	40	41.8
23	Seriously	60 points	37	47.9
24	Seriously	50 points	6	58.1
25	Seriously	100 points	40	49.7
26	Seriously	60 points	31	50.7
27	Seriously	60 points	41	38
28	Seriously	50 points	29	71.6
29	Seriously	100 points	32	59.1
30	Seriously	50 points	37	50.8

Data in Table 1, No.1 to 10 are hearing disabled students' monitoring status in body mass index, grip of body weight and lung capacity of body weight, No.11 to 30 are hearing disabled students with hearing—aid(that are normal students) monitoring status in the three indicators. We respectively proceed with mean value solution of hearing disabled students and normal students' three indicators, it is found that hearing disabled students have no superiorities in body mass index, while they have absolute superiorities in grip of body weight and lung capacity of body weight. The specific data is as Table 2.

Mean value	Body mass index	Grip of body weight	Lung capacity of body weight
Disabled students	64	48.1	57.03
Normal students	69.5	41.7	52.845

Table 3 1000m or 800m, 25*2m test performance

No.	Level of hearing disability	1000m or 800m test performance	25*2m test performance
1	Seriously	3m48s	9.25s
2	Seriously	4m03s	11.59s
3	Seriously	4m02s	11.29s
4	Seriously	3m57s	10.21s
5	Seriously	4m03s	12.40s
6	Seriously	4m04s	12.40s
7	Moderate	4m05s	10.79s
8	Seriously	3m57s	11.59s

9	Seriously	3m43s	11.80s
10	Seriously	3m47s	13.31s
11	Seriously	4m07s	12.70s
12	Seriously	4m21s	13.41s
13	Seriously	4m09s	12.30s
14	Seriously	4m17s	13.57s
15	Seriously	3m56s	12.80s
16	Seriously	4m16s	11.80s
17	Seriously	4m14s	15.44s
18	Seriously	3m57s	12.30s
19	Seriously	4m19s	11.41s
20	Seriously	4m15s	13.70s
21	Moderate	4m07s	11.79s
22	Seriously	3m32s	15.55s
23	Seriously	4m28s	14.55s
24	Seriously	4m07s	12.96s
25	Seriously	4m21s	11.57s
26	Seriously	3m49s	14.53s
27	Seriously	3m59s	14.70s
28	Seriously	3m51s	15.10s
29	Seriously	3m49s	12.60s
30	Seriously	4m08s	11.50s

Data in Table 3, No.1 to 10 are hearing disabled students' monitoring status in 1000m or 800m, 25*2m; No.11 to 30 are hearing disabled students with hearing aid(that are normal students) monitoring status in the two indicators. We respectively proceed with mean value solution of hearing disabled students and normal students' two indicators, it is found that hearing disabled students have no superiorities in both indicators; the specific data is as Table 4.

Table 4	Mean	value o	of two	indica	tors

Mean value	1000m、800m test performance	25*2m test performance
Hearing disabled students	3.769	11.463
Normal students	3.921	13.214

No.	Level of hearing disability	Standing long jump	Throwing solid ball	Sit—up	Pull—up
1	Seriously	2.3m	5.0m	26times	13 times
2	Seriously	1.8m	6.2m	31 times	9 times
3	Seriously	1.9m	5.1m	39 times	4 times
4	Seriously	1.9m	4.4m	37 times	12 times
5	Seriously	1.7m	4.7m	27 times	13 times
6	Seriously	1.8m	4.8m	27 times	9 times
7	Moderate	1.7m	5.1m	38 times	12 times
8	Seriously	1.8m	4.5m	30 times	6 times
9	Seriously	1.4m	3.7m	22 times	4 times
10	Seriously	1.4m	5.5m	28 times	5 times
11	Seriously	1.7m	4.7m	31 times	16 times
12	Seriously	1.5m	4.3m	19 times	4 times
13	Seriously	1.5m	5.1m	29 times	7 times
14	Seriously	1.4m	4.8m	25 times	6 times
15	Seriously	1.7m	3.7m	24 times	11 times
16	Seriously	1.6m	5.4m	14 times	8 times
17	Seriously	1.0m	3.2m	18 times	5 times
18	Seriously	1.6m	4.6m	31 times	12 times
19	Seriously	1.7m	3.3m	20 times	9 times
20	Seriously	1.4m	4.1m	26 times	14 times
21	Moderate	1.4m	5.6m	28 times	4 times
22	Seriously	1.2m	3.1m	18 times	2 times

© ACADEMIC PUBLISHING HOUSE

23	Seriously	1.3m	3.2m	16 times	4 times
24	Seriously	1.2m	4.1m	20 times	2 times
25	Seriously	1.3m	4.1m	27 times	4 times
26	Seriously	1.4m	3.5m	25 times	4 times
27	Seriously	1.3m	4.3m	21 times	4 times
28	Seriously	1.6m	3.7m	28 times	6 times
29	Seriously	1.5m	4.3m	19 times	3 times
30	Seriously	1.3m	3.8m	27 times	3 times

Data in Table 5, No.1 to 10 are hearing disabled students' monitoring status in standing long jump, throwing solid ball, sit—up and pull—up; No.11 to 30 are hearing disabled students with hearing-aid(that are normal students) monitoring status in the four indicators. We respectively proceed with mean value solution of hearing disabled students and normal students' four indicators, it is found that hearing disabled students have no superiorities in the four indicators but the gap is not big ; the specific data is as Table 6. Table 6 Mean value of four indicators

Tuble o Weah value of four indicators						
Mean value	Standing long jump	Throwing solid ball	Sit—up	Pull—up		
Hearing disabled students	1.87	4.9	30.5	8.7		
Normal students	1.43	4.145	23.3	6.4		

~ ~	ъ · ·	1		. 1	•
- 22	Princi	nal cor	nnonen	t anal	VS19
2.2	1 1 11101	pui coi	mponon	i unun	y 011

Main idea of principal component analysis is reducing dimension of variables. It is a statistics analysis approach that transforms multiple variables into fewer principal variables. Generally, it is used as data compression, system evaluation, regressive analysis, weighted analysis and so on. Main way of principal component analysis is reducing dimension of variables, which is recombining original many variables with correlation into a group of uncorrelated variables to replace original variables. Therefore, we can pay attention to every time observation's variables that have maximum variation, to every time observation's small changed variables that can be used as constant to process and get rid of them, so that it reduces variables number in problem that needs to be considered.

Assume that there is m pieces of original indicators to do principal component analysis, which are recorded

as x_1, x_2, \dots, x_m , now it has n pieces of samples, corresponding observation value is x_{ik} ($i = 1, 2, \dots, n$) and $k = 1, 2, \dots, m$ takes ,and $k = 1, 2, \cdots, m$ takes

standardization transformation, and then transform x_k into x_k .that:

$$x_{k}^{*} = \frac{x_{k} - \overline{x_{k}}}{\underset{k}{s_{k}}}$$

Among them, x_k and s_k are respectively x_k average number and standard deviation, x_k^{\dagger} average number is 0, standard deviation is 1.

According to each sample original indicator observation value x_{ik} or after standardization observation value x_{ik}^* , it solves coefficient b_{kj} , establish indicator x_k^* that is transformed through standardization to express Z_i comprehensive indicator © ACADEMIC PUBLISHING HOUSE

$$z_j = \sum_k b_{kj} x_k^*$$

,which can also establish equation k equation that uses original indicator x_k to express comprehensive indicator Z_j :

$$z_j = \sum_k \tilde{b_{kj}} x_k^* + a_j \tag{2}$$

There are two requirements on defining b_{kj} : (1) Comprehensive indicators are mutual independent from each other or uncorrelated.

(2) Every comprehensive indicator reflected each sample gross information content is equal to corresponding feature vector(comprehensive indicator coefficient)feature values. In general, it is required that selected comprehensive indicator feature vales contribution ratios sum to be above 80%.

(1) According to observed data,

$$x_k$$
 $s_k(k, j = 1, 2, \dots, m)$

calculate x_k and $s_k(k, f)$

(2) By correlation coefficient matrix R , it can get feature value λ_j $(j = 1, 2, \dots, m)$ and each principal component variance contribution , contribution ratio and accumulative contribution ratio, and define principal component reserved number p with accumulative contribution ratio as evidence. (3)^m pieces of basic equation

$$\begin{cases} r_{11}x_{1}^{(j)} + r_{12}x_{2}^{(j)} + \dots + r_{1m}x_{m}^{(j)} = \lambda_{j}x_{1}^{(j)} \\ r_{21}x_{1}^{(j)} + r_{22}x_{2}^{(j)} + \dots + r_{2m}x_{m}^{(j)} = \lambda_{j}x_{2}^{(j)} \\ \dots \\ r_{m1}x_{1}^{(j)} + r_{m2}x_{2}^{(j)} + \dots + r_{mm}x_{m}^{(j)} = \lambda_{j}x_{m}^{(j)} \end{cases}$$
(3)

Among them, $j = 1, 2, \dots, m$. Proceed with Schmidt orthogonalization, for every solution $x_1^{(j)}, x_2^{(j)}, \dots, x_m^{(j)}$ its basic equations solution $x_1^{(j)}, x_2^{(j)}, \dots, x_m^{(j)}$ $(j = 1, 2, \dots, m)$, and then let: $b_{kj} = \frac{x_k^{(j)}}{\sqrt{1-x_j}}$

$$-\sqrt{\sum_k \left(x_k^{(j)}\right)^2}$$

It can get principal component $z_{j} = \sum_{k} b_{kj} x_{k}^{*}$ expressed by $x_{1}^{*}, x_{2}^{*}, ..., x_{m}^{*}$, or input $x_{k}^{*} = \frac{x_{k} - \overline{x_{k}}}{s_{k}}$ and

$$z_j = \sum_k b_{kj} x_k^* + a_j$$

then get principal component expressed by x_1, x_2, \dots, x_m .

(4)Input $x_1, x_2, ..., x_m$ observed values into principal component expressions ,calculate each component value. (5) Calculate original indicator and principal component correlation coefficient that is also factor

loading that use it to explain principal component significances. 2.3 Analyze SPSS computed result

Table 7 Factor contribution ratio table									
				Extrac	et squares sum	n and load			
	Ini	itial feature v	alue		in		Rotate	squares sum	and load in
Component	Total	Variance %	Accumu lation %	Total	Variance %	Accumul ation %	Total	Variance %	Accumul ation %
1	3.482	38.685	38.685	3.482	38.685	38.685	2.928	32.536	32.536
2	1.454	16.150	54.835	1.454	16.150	54.835	1.865	20.720	53.256
3	1.082	12.018	66.853	1.082	12.018	66.853	1.224	13.597	66.853
4	.913	10.146	76.999						
5	.669	7.437	84.436						
6	.491	5.459	89.895						
7	.429	4.766	94.661						
8	.287	3.184	97.845						
9	.194	2.155	100.000						

Table 7 is factor contribution ratio result. It is clear from Table 7 that factor 1, 2, 3 feature values are above 1, and other factors are lower that are 66.853%, so extract the factor 1, 2, 3 are principal factors that body mass index, grip of body weight and lung capacity of body weight are the largest influence factors. It is clear for us from Fig.1 the importance of each component.



Fig.1 is scree plot about basic information analysis. It is clear for us from the figure that slope is in the slightly mild status since the fourth factor, so body mass index, grip of body weight and lung capacity of body weight are principal factors, all the rest are secondary factors.

It is clear for us from Table 7 that the three principal factors feature values accumulated value is 66.853%. Among them, the first factor is 33.685%, the second factor is 16.15%, and the third factor is 12.018%. In order to clearly compare the three factors influence size, we draw Fig.2.



Fig.2 The importance of three factors chart It is clear for us from Fig.2 that when purely comparing the three factors' importance, factor1 (that is body mass index) covered proportion is 54%, factor 2(that is grip of body weight)covered proportion is 26% ,factor 3(that is lung capacity of body weight)covered proportion is 20%.

III. CONCLUSION

Factor analysis approach is a mathematical tool that seeking for principal factors under numerous factors influences, it can help us to objective seek for principal factors from numerous factors. The approach utilizes dimension reduction strategy that uses fewer variables to replace original multiple variables, these fewer variables concentrated reflect most information of original data. Due to simple theory and possessing corresponding software as well as easier to operate, the approach is widely applied in all problems.

The paper applies factor analysis approach in simplifying hearing disabled people's physical health indicator problem, the obtained result complies with practice. From Table 2, Table 4, Table 6, it is clear that for body mass index, grip of body weight and lung capacity of body weight these three indicators, healthy person and hearing disabled people have great differences, so the conclusion is reasonable that can be used as evidence in future hearing disabled people's physical monitoring.

REFERENCES

- XIAO Huan—yu,WENG Zhi—qiang,CHEN Yu—zhong.Basic Characteristics of Social and Sports Population Structures of Contemporary China[J].Journal of Shanghai Physical Education Institute,2005,29(2):10—14.
- [2] XIAO Huan—yu,FANG Li.Concept, Classification and Statistical Criteria of Sports Population[J].Sports Science
- XIAO Huan—yu, FANG El. Concept, Classification and Statistical Criteria of Sports Population[J]. Sports Science Research, 2005, 26(1):7—10.
 MIAO Zhi—wen, QIN Chun—lin. Sociological analysis of contemporary Chinese sports population structures[J]. Journal of Physical Education, 2006, 13(1):119—121.
 M.N. Da, with Database and the proster for all under circumstance of

- contemporary Chinese sports population structures[J].Journal of Physical Education,2006,13(1):119—121.
 [4] YAN De—yi.Development of sports for all under circumstance of building well—off society[J].Journal of Wuhan Institute of Physical Education,2006,40(1):15—19.
 [5] GUO Hong.Summary on Chinese Sports Population Research Since 1980s[J].China Sport Science and Technology,2007,43(3):36—40
 [6] LI Hong,XUE Hai—hong,FENG Wu—long.Sociological Analysis of Comparison of Chinese Population with the Sports Population of Chinese[J].Journal of Xi'an Institute of Physical Education,2007,24(4):25—28..
 [7] CHEN Po,QIN Zhong—Mei,YIN Ying,XIA Chong— De.Correlation Analysis of Current Situation of Regional Athletics Sports Development and Society Population Structure in China[J].Journal of Beijing Sport University,2007,30(12):1610—1613.
 [8] XUE Jin—xia,WANG Jing—tong.Analysis on Development Level of Competitive Sports of Eastern China in the "Eleventh Five—Year" Period[J].Bulletin of Sport Science & Technology.2011.19(4):57—59.
 [9] LI Lin,YANG Jie,YANG Tian,XU Lie—hui.A Research on the Sustainable Development of Evaluation Index System of Regional Sports Industry[J].Journal of Beijing Sport University,2010(9).
- University,2010(9).

Based on the Multiple Linear Regression Model Analysis the Influence Factors of Sports Industry Profits

Weiqi Jiang

Institute of Physical Education, Huanggang Normal University, Huangzhou 438000, China

Abstract—In recent years, with the improvement of people consumption level, sports consumption has become part of People's Daily consumption, for the Chinese sports industry, however, is not an advantage in the international market competition, the development trend is not optimistic. In this paper, based on the theory of multiple linear regression, the Chinese sports industry as a whole as the research object, the main business profitability and return on equity, asset—liability ratio, p/e ratio, and the relationship between the liquidity ratio. The results show that the profit margins have relations with the above four indexes. At the same time, respectively to hosa international, anta sports, li ning, the three companies as the research object, studies the influence factors of operating profit, the result shows that except li ning, the rest of the two companies all include the basic data involving the profit index.

Index Terms—Sports Industry, Operating Profit, Multiple Linear Regression, Influence Factors

I. INTRODUCTION

With China economy rapidly development, people's living standards are increasingly improving, sports industry as an important part in tertiary industry, its development status affects China overall economy development. In view of present situations, China sports industries are so oppressed by foreign sports industries.

In 2012, Zhao Chao in the article "China sports industries: industry listed company's operation performance and its influence factors empirical research", highlighted China sports industry didn't dominant in domestic and overseas sports industrial competitions. The author utilized factor analysis method, took China sports industry listed companies as research objects, used factor analysis to process with sales profit, net assets earnings, net profit and others seventeen indicators, selected company health factor, profit factor, growth factor as well as operating factor as main information, used variance contribution ratio to carry on weighted handling with each common factor, so as to obtain operation comprehensive indicator score, on this basis, explored China sports industry operation performance rules. In the aspect of exploring China sports industry listed influence relations, the author based on multiple linear regression models, verified their relations. And meanwhile, the author combined with China sports companies' operation scores status to carry out practical situation analysis on research objects. Result showed most companies had respective advantages and disadvantages in operation aspect, due to development imbalance; it caused companied overall operation not to be ideal. During year 2007-2010, in view of China overall sports industry, operation status was normal, and operation status optimal company and operation status worst company difference was larger. Sports industry good operating companies, all listed in Hong Kong, main land listed companies operation status was not going well. In 2013, Ma Ying in the article

"China sports industry strategic capital operation theory and empirical research", highlighted that with China economic rapidly development, sports industry booming development was inevitable trend. In China, sports industry capital operation included capital market, capital system and capital operation and others four aspects. The author through consulting domestic and overseas relative literatures, and took empirical research as examples, established comprehensive systematic sports industry operation frame. Presently, China capital market construction was not sound, enterprise every system was not complete, so established reasonable enterprise system was important guarantee to drive sports industry capitalization operation. The author also put forward reasonable suggestions and policies on problems that came across in current sports industry operation. In 2012, Zhang Lian—Xin in the article "Lining company China market competition strategy research", highlighted Lining as Chinese native brand, it developed in international competition, and should remain current advantages and positive create new competition advantages. The article based on modern enterprise management theory, researched on Lining company competition strategies from internal environment, external influence and management way three perspectives. In internal environment aspect, Lining company had clear major range, products had good qualities and researched techniques were higher, but enduring competitiveness was worse. The author targeted at Lining company management strategy problems, it carried out analysis, clearly pointed out problems and shortcoming of them, and put forward reasonable improving schemes to ensure Lining company enduring development. And meanwhile, the author also targeted at sports product industry development, put forward reasonable constructive opinions, further deepened China sports industrial management policies.

The paper works on from sports industrial companies, researches overall capital structure indicators relations, takes concrete sports industrial companies as an example, researches on each company internal capital structure indicators status.

II. MODEL ESTABLISHMENT BASE

The model aims to establish sports industries companies' capital structures variables relations. Take listed companies as research objects, study main business profitability and return on equity, asset—liability ratio, and price — earnings ratio as well as current ratio relations. Regard Hosa international limited, Anta Company, Lining Company as research objects; analyze operating profit and total assets, turnover as well as earning per share relations.

2.1 Data collection

Data in Table 1—4 is from the article "China sports listed companies capital operation research".

Company name	Price— earnings ratio	Current ratio	Main business profitability(%)	Return on equity(%)	Asset— liability ratio(%)
Lining	7.24	1.56	6.15	11.11	50
Anta sports	10.42	4.22	24.26	27.15	21.67
China Dongxiang	4.73	9.49	8.31	1.5	8.75
XTEP internation al limited	8.03	3.57	21.87	24.73	28.82
Pou Sheng internation al limited	30.67	1.67	0.46	—2.01	42.72
361degree	6.36	3.45	18.44	8.45	22.95
Peak sport	5.89	5.41	20.15	19.23	17.14
Meike internation al limited	6.63	3.5	11.86	6.09	24.03
Flyke internation al limited	3.14	4.31	17.46	26.1	21.72
Hosa internation al limited	7.89	5.86	45.41	31.2	15.96

Table 1 Hong Kong listed Chinese companied capital structure

From Table 1, we can see that in price—earnings ratio aspect, Pou Sheng international limited dominates, in current ratio aspect, China Dongxiang dominates; in main business profitability aspect, Hosa international limited dominates; in return on equity aspect, Anta sports dominates; in asset—liability ratio aspect, Lining company is higher. In order to clearly show every company capital structure. it draws Figure 1.



Fig.1 Sports industry's capital structure diagram In Figure 1, mark number"1—10" represents Table 1 company name item, from Figure 1, we can see that though Pou Sheng international limited price-earnings ratio is higher, its return on equity is negative.

Table 2 Hosa international	limited ca	apital parameters
----------------------------	------------	-------------------

Year	Total assets(Hu ndred million)	Turnover (Hundred million)	Operating profit (Hundred million)	Earnings per share (Yuan)
2009	3.6	1.59	0.3	0.02
2010	5.33	3.48	1.15	0.1
2011	10.44	6.95	3.17	0.22
2012	12.68	8.48	3.8	0.21

From Table 2, we can see that in total assets, turnover, operating profit and earnings per share the four items, total assets value is higher. In order to compare Hosa international capital parameters totality during 2009-2012, it draws bar figure as Figure 2 shows.



In Table 2, mark number"1-4" represents year 2009 -2012, from Table 2, we can see that the four indicators totality are increasing per year.

	ruole 5 minu company cupitur changes						
Year	Total assets(Hun dred million)	Turnover (Hundred million)	Operating profit (Hundred million)	Earnings per share (Yuan)			
2004	2.97	3.11	0.04	0.005			
2005	4.46	6.7	0.52	0.02			
2006	8.56	12.5	1.47	0.08			
2007	46.31	29.89	4.79	0.25			
2008	49.42	46.27	9.31	0.36			
2009	61.03	58.75	13.95	0.5			
2010	70.54	74.08	17.37	0.62			
2011	81.94	89.05	20.11	0.69			

Table 3 Anta company capital changes

From Table 3, we can see that Anta company turnover value during 2004 to 2006 is higher than all the other three indicators, total assets value during 2007 to 2009 are higher than other three indicators; year 2010 and 2011 turnover values are higher than all the other three indicators.



Fig.3 Changes in the company's capital Anta In Figure 3, mark number "1—8" represents year 2004–2011, from Figure 3, we can see that total assets, turnover, operating profit and earnings per share these four indicators values are increasing per year, but each indicator increasing ranges are not the same.

Table 4 Lining company capital changes							
Year	Turnover (Hundred million)	Operating profit (Hundred million)	Earnings per share (Yuan)	Inventory (Hundred million)	Store growth(%)		
2008	66.9	9.6	0.7	6.51	19.3		
2009	83.87	13.42	0.91	6.32	16.1		
2010	94.79	15.47	1.06	8.06	9.2		
2011	89.29	6.31	0.38	11.33	4.3		

From Table 4, we can see that during 2008 to 2010, operating profit is rising per year, in 2011, it appears declining. In inventory aspect, both year 2010 and 2011 appear obvious rising. In order to clearly express Lining company capital changes. it draws Figure 4.



Fig.4 Li Ning Company Capital changes

From Figure 4, we can see, for Lining Company, year 2008—2011 turnover universal is higher than other three indicators.

2.2 Multiple linear regression models Multiple linear regression analysis models are:

$$\begin{cases} y = \beta_0 + \beta_1 x_1 + \dots + \beta_m x_m + \varepsilon \\ \varepsilon \sim N(0, \sigma^2) \end{cases}$$
(1)

In formula $\beta_0, \beta_1, \cdots, \beta_m, \sigma^2$ all are parameters that are uncorrelated to x_1, x_2, \dots, x_m , all are unknown, from which $\beta_0, \beta_1, \dots, \beta_m$ are regression coefficients.

Now it has n pieces of independent observation data $(y_i, x_{i1}, \dots, x_{im})$, $i = 1, \dots, n, n > m$, by formula (1), it gets:

$$\begin{cases} y_i = \beta_0 + \beta_1 x_{i1} + \dots + \beta_m x_{im} + \varepsilon_i \\ \varepsilon_i \sim N(0, \sigma^2), i = 1, \dots, n \end{cases}$$
(2)

Record:

$$X = \begin{bmatrix} 1 & x_{11} & \cdots & x_{1m} \\ \vdots & \vdots & \cdots & \vdots \\ 1 & x_{n1} & \cdots & x_{nm} \end{bmatrix}, \quad Y = \begin{bmatrix} y_1 \\ \vdots \\ y_n \end{bmatrix}$$
(3)
$$\varepsilon = \begin{bmatrix} \varepsilon_1 & \cdots & \varepsilon_n \end{bmatrix}^T, \quad \beta = \begin{bmatrix} \beta_0 & \beta_1 & \cdots & \beta_m \end{bmatrix}^T$$

Formula (1) can also express as:

$$Y = X\beta + \varepsilon \tag{4}$$
$$\varepsilon \sim N(0, \sigma^2 E_r)$$

Among them, E_n is n order unit matrix.

III. MODEL ESTABLISHMENTS

Multiple linear regression models are on the basis of lots of data, utilizing regression way to express data that has no rules to have certain function relationship. The model will respectively consider Hosa international limited, Anta Company, Lining Company and China sports industry company the four companies capital structure indicators function relationships. 3.1 China sports industry companies

For Lining, Anta and others ten sports companies, it carries on researching. Regard return on equity as

dependent variable y , regard price—earnings ratio x_1 , current ratio x_2 , main business profitability x_3 as

well as assets—liability ratio x_4 as independent variables, carry out multiple linear regression analysis. Used basic data is as Table 5 shows. Table 5 China sports industry companies' capital structure handling result

Mark numbe r	Price— earnings ratio	Current ratio	Main business profitability	Return on equity	Assets— liability ratio
1	7.24	1.56	0.0615	0.1111	0.50
2	10.42	4.22	0.2426	0.2715	0.2167
3	4.73	9.49	0.0831	0.015	0.0875
4	8.03	3.57	0.2187	0.2473	0.2882
5	30.67	1.67	0.0046	0.0201	0.4272
6	6.36	3.45	0.1844	0.0845	0.2295
7	5.89	5.41	0.2015	0.1923	0.1714
8	6.63	3.5	0.1186	0.0609	0.2403
9	3.14	4.31	0.1746	0.261	0.2172
10	7.89	5.86	0.4541	0.312	0.1596

Utilize Matlab to program above multiple linear regression models, by calculating, it gets following results.

b = (0.1760, 0.0018, -0.006, 0.8044, -0.4619)

By consulting table, it is clear that R2 is on behalf of decision coefficient(R represents correlation coefficient), its value is around 1, it shows the equation is highly linear correlated.

By Matlab calculated result, it is clear:

$$y = 0.176 + 0.001 \aleph_1 - 0.006 \kappa_2 + 0.8044 \kappa_3 - 0.4619 \kappa_4 \quad (5)$$

From formula(5), it is clear that return on equity is related to all the other four indicators.

3.2 Hosa international limited

For Hosa international limited capital structure, it carries out multiple linear regression analysis, regard operating profit as y, total assets as x_1 , turnover as x_2 , earnings per share as x_3 , used basic data is as Table 2

shows.

For Table 2 contents, utilize Matlab to program above multiple linear regression models, by calculating, it gets following results.

b = (-0.8532, 0.2943, 0.0076, 4.082)

By consulting table, it is clear that R2 is on behalf of decision coefficient(R represents correlation coefficient), its value is around 1, it shows the equation is highly linear correlated.

By Matlab calculated result, it is clear:

$$y = -0.8523 + 0.2943x_1 + 0.0076x_2 + 4.082x_3$$
 (6)

From formula (6), we can see that Hosa international limited operating profit is related to total assets, turnover and earnings per share.

3.3 Anta sport company

For Anta sport company capital structure, it carries out multiple linear regression analysis, regard operating

profit as \mathcal{Y} , total assets as x_1 , turnover as x_2 , earnings

per share as χ_3^{3} , used basic data is as Table 3 shows. According to Table 3 data, utilize Matlab to program above multiple linear regression models, by calculating, it gets following results.

b = (-0.5679, -0.1016, 0.1081, 27.9176)

By consulting table, it is clear that R2 is on behalf of decision coefficient(R represents correlation coefficient), 1, it shows the equation is its value is around highly linear correlated.

By Matlab calculated result, it is clear,

$$v = -0.5679 - 0.1016x_1 + 0.108k_2 + 27.9176x_3$$
 (7)

From formula (7), we can see that Anta sport company operating profit is related to total assets, turnover and earnings per share.

3.4 Lining sport company

For Lining sport company capital structure, it carries out multiple linear regression analysis, regard operating

profit as
$$\mathcal{Y}$$
, turnover x_1 , earnings per share as x_2 ,

inventory as x_3 , store growth as x_4 , used basic data is as Table 4 shows.

According to Table 4 data, utilize Matlab to program above multiple linear regression models, by calculating, it gets following results.

b = (-1.7645, 0.0815, 11.326, -0.3096)

By consulting table, it is clear that R2 is on behalf of decision coefficient(R represents correlation coefficient), its value is around 1, it shows the equation is highly linear correlated.

By Matlab calculated result, it is clear,

 $y = -1.7645 - 0.0815x_1 + 11.3226x_2 - 0.3096x_3 \quad (7)$

From formula (7), we can see that Lining Sport Company operating profit is related to turnover, earnings per share and inventory, but is unrelated to store growth.

VI. CONCLUSION

Linear regression analysis is a mathematical tool that researches variables correlations; it can help us to use variable assigned value to estimate another variable assigned value. The model application field is very wide, such as talents demand problem, engineering technical problem and other aspects analysis problems.

The paper applies multiple linear regression model in researching sports industry profit influence factors problem, researches overall capital structure indicators relations, researches on sports industry profit influence factors respectively from sports industry entity and individual company, research finds, for sports industry entity, return on entity is relate to price—earnings ratio, current ratio relationships, main business profitability and assets—liability ratio; for individual company, Hosa international limited and Anta sports profit influence factors include total assets, turnover and earnings per share, Lining company profit influence factors include turnover, earnings per share and inventory. The model obtained result provides certain theoretical basis of relative problems further researching.

REFERENCES

 LIU Bao, HU Shan—lian, XU Hai—xia, GAO Jian hui.Indices of the equality of essential public health services in China[J].Chinese Journal of Health Policy, 2009, 2(6):13—17.

- ZHANG Da—chao, LI Min.Studies on Evaluation Index System of Public Sports Facilities Development Level in China[J].China Sport Science, 2013, 33(4):3–23.
 CAI Jing—tai, FAN Bing—you, WANG Ji—shuai.A
- [3] CAI Jing—tai, FAN Bing—you, WANG Ji—shuai.A Survey of Residents' Satisfaction Degree for Urban Public Sport Services[J].Journal of Beijing Sport University, 2009(6).
- [4] Wang Guo—hong, Zhang Wen—hui.Construction of the Evaluation Index System of City Community Sports— Taking Shanghai as an Example[J].Journal of Chengdu Physical Education Institute, 2010, 36(2).
- [5] ZHANG Jie, WU Ying The Evaluation Index System of Extracurricular Sports Activities in Secondary Schools in Shanghai under the Background of "Sunshine Sports"[J].Journal of Shanghai Physical Education Institute, 2012(6):80—82.
- [6] HE Ying, XU Ming.Study on Evaluating System of Sports Consciousness of Community Residents in Southwest Cities[J].Journal of Chengdu Physical Education Institute, 2007, 33(2):43–45.
- [7] HE Ying, XU Ming.Theoretical and empirical study on evaluation mode of sports service satisfaction degree in city community[J].Journal of Wuhan Institute of Physical Education, 2007, 41(11):40—42.
- [8] CHEN Yang, MA Ge—sheng.An Empirical Study on Community Sports Service Residents' Satisfaction Index Model[J].China Sport Science and Technology, 2009, 45(4).
- [9] HÈ Ying, XU Ming.Theoretical and empirical study on evaluation mode of sports service satisfaction degree in city community[J].Journal of Wuhan Institute of Physical Education, 2007, 41(11):40–42.

The Development Status of Cloud Computing

Dai Lu¹, Zhang Gang²

School of computer, Dongguan university of technology, Dongguan, China, 523808
 School League committee, Dongguan university of technology, Dongguan, China, 523808

ABSTRACT—This paper aims to set a proper and reliable energy consumption model for the server of the Could Data Center based on the cloud infrastructure, as well as analyze the effects of different sample modes and mathematical methods on the energy consumption model. Firstly, this paper introduced the characteristics of the nonlinear energy model; then verifies the validity of the energy consumption model proposed by this paper based on the research achievements of this model in terms of the algorithms and experiments. This energy consumption model can also be applied to other researches on energy.

Index Terms — cloud computing; energy consumption model; nonlinear regression model

I. INTRODUCTION

Cloud computing is derived from grid computing and takes it as its backbone and basic structure. Under the support of special fund project "study of load balance strategy based campus grid resource sharing platform" of basic scientific and research operating outlay of central universities hosted by the applicant, resource sharing model[1], heuristic resource allocation algorithm^[2], resource allocation and load balancing mechanism[3] and stability and redundancy of immune algorithm are intensively studied. The above studies focused on performance indices of time span and load balance and carried out preliminary exploration. However, the above studies didn't take full account of key problems that how to structure energy efficient data center, design and optimization of dynamic energy consumption, resource allocation optimization model and heuristic algorithm under energy consumption of system and these contents have to be further studied.

With respect to problems of resource allocation and energy consumption optimization, this project will explore key factors that have influence on resource allocation performance and uncover internal relationship among dynamic energy

© ACADEMIC PUBLISHING HOUSE

consumption and resource computing capability, supply voltage strategy of resource, the amount of resource, supply voltage and CPU frequencies by integrating applicant's pilot study in aspects of cloud computing resource allocation optimization model, convergence and quality factor of immune algorithm and dynamic voltage and frequency regulating technologies and the latest results of this subject. Key study contents include: key technology analysis modeling of resource allocation under key energy cloud computing; analysis of consumption optimization factors of resource allocation under cloud computing environment and performance modeling and; design of multi objective resource allocation optimization model and heuristic resource allocation algorithm that integrates time span, load balancing and optimization of energy consumption. It will achieve original scientific research results and provide scientific basis for allocation methods of cloud computing resources that are based on energy consumption optimization and immune algorithm. With Chinese government brought cloud computing into key development direction of strategic emerging industry, new technologies, new products, new modes and new business types of cloud computing are constantly emerging such that this project is greatly significant to further studying resource allocation and optimization of energy consumption under cloud computing environment.

This subject plans to carry out the study with the method of integrating theoretical analysis, simulation verification and practical arrangement. Three study groups of theoretical analysis, simulation test and test data analysis are set as a whole[4]. The theoretical analysis group is responsible for establishing performance analysis model for cloud computing resource allocation, designing relevant algorithm and optimizing heuristic allocation algorithm. The simulation test group is responsible for realizing resource allocation algorithm, designing test methods, testing platform and realizing software, implementing test, analyzing and maintaining simulation simulation data. The test data analysis group is main responsible for designing and arranging test scheme, collecting, analyzing, accounting and sorting test data as well as discussing existing problems and possible method of improvement together with simulation test group. See figure 1 for the technical route that this study plans to take and the detailed content is as following



Fig. 1 The relationship among objects, contents and objectives of study

ACKNOWLOGEMENT

This paper was supported by the science innovative and development of Guangdong Province (NO.3XZ151004)

REFERENCE

- [1] Fan X, Weber WD, Barroso LA. Power provisioning for a warehouse—sized computer. ACM SIGARCH Computer Architecture News, 2007,35(2):13 23.
- [2] Hsu CH, Poole SW. Power signature analysis of the SPECpower_ssj2008 Benchmark. In: Proc. of the 2011 14th IEEE Int'l Symp.on Performance Analysis of Systems and Software (ISPASS). IEEE, 2011. 227 236.
- [3] Lewis AW, Ghosh S, Tzeng NF. Run—Time energy consumption estimation based on workload in server systems. HotPower, 2008,8:17 21.
- [4] Kliazovich D, Bouvry P, Khan SU. GreenCloud: A packet—level simulator of energy—aware cloud computing data centers. The Journal of Supercomputing, 2012,62(3):1263 1283.

Measurement Technology for Impedance Parameters of Aircraft Parts Based on DSP

Mao Jiajun, Fu Yuyang, Ji Chenxu, Tang, Yu, Yuan Haoming Civil Aviation University of China, Tianjin300300, P.R.China

Abstract — The existing digital impedance measurement methods require that the excitation signal is the low distortion sine wave signal degree. Usually, higher frequency of low distortion sinusoidal signal is very difficult to obtain, which restricts the expansion of traditional impedance measurement method to improve the accuracy and measuring range. This paper presents a new impedance parameters measurement way by digital signal processing technology and has been carried based on the theoretical analysis. Simulation experiments also have been implemented using the new measurement algorithm. The method is proved in the excitation signal for the nonsinusoidal periodic signal in low SNR circumstance, still can get higher measurement precision components parameters than existing digital impedance method for measuring.

Index Terms — impedance measurement; driving signal; digital signal processing; digital filter

I. INTRODUCTION

In the sensors, instrumentation and distribution of printed circuit parameter analysis technology, high precision impedance measurement technology occupies a very important position. At present, the modern digital measurement technology of impedance is mainly digital bridge, vector amplitude phase difference method and so on. But the existing digital impedance measurement methods require that the excitation signal is a low distortion sine signal. Usually, the low distortion sinusoidal signal is very difficult to get under high frequency, which limits the traditional impedance measurement method to improve the accuracy and the expansion of the measurement range.

Using digital signal processing theory, this paper proposes a new high precision measuring method of impedance parameters. The excitation signal can be sinusoidal wave which has large distortion, and can also be square wave or triangular wave and other nonsinusoidal periodic waveform. And when the excitation's signal to noise ratio threshold is very low, it still can get higher accuracy than the existing digital impedance measurement method of the original parameters of the (RLC)parameter measurement.

II. IMPEDANCE MEASUREMENT METHOD BASED ON THE HILBERT TRANSFORM AND FOURIER TRANSFORM

The measurement circuit of impedance parameters is figure 1. In this figure,Z is component to be measured(capacitance, inductance or resistance), R is known as standard resistance. U(t) is measuring excitation signal. In the traditional measurement circuit, U(t) is sine signal. $U_1(t)$ is sine signal of the measured component, $\tilde{U_2}(t)$ is sine signal of the standard resistance.



Fig1.Measurementcircuit of impedance parameters Expression of analytical is: $U_1(t) = I_1(t) + jQ_1(t)$ (1) $U_2(t) = I_2(t) + jQ_2(t)$ (2)In the expression, $I_1(t) = A_1 \cos\varphi_1(t) \cos(\omega_0 t)$ and $Q_1(t) = A_1 \sin\varphi_1(t) \sin(\omega_0 t)$ are

 $U_1(t)$ signal synthetic and quadrature component. $I_2(t) = A_2 \cos \varphi_2(t) \cos(\omega_0 t)$ $Q_2(t) = A_2 \sin \varphi_2(t) \sin(\omega_0 t)$ are $U_2(t)$ signal synthetic and quadrature component. We can use voltage signal

 $U_1(t)$ and $U_2(t)$ of anytime to express resistance value.

$$Z_{x} = \frac{U_{1}(t)}{U_{2}(t)}R = \frac{I_{1}(t) + jQ_{1}(t)}{I_{2}(t) + jQ_{2}(t)}R$$
 (3)

The excitation signal U(t) of the new impedance measurement method can be any periodic signal. Periodic signal can be expanded into Fourier series form. In other words, the periodic signal spectrum is discrete line—spectrum.According to digital signal processing theory, the periodic signal is sampled discrete. As long as the total sampling time is integer cycle of periodic signal, and spectrum estimation based on the discrete Fourier transform (DFT) is unbiased estimation, we can get the exact signal processing results. The following analyze is the impedance measurement principle of a non-sinusoidal periodic excitation signal. Any excitation signal U(t) can be expanded into the form of Fourier series.

First we need to make equal interval sampling with $U_1(t)$ and $U_2(t)$ respectively. The sampling points is N and the sampling sequence is $s_1(t)$ and $s_2(t)$. The core of the new method is making band—pass digital filter and quadrature sampling for two sequence to get the time domain analytical sequence $g_1(t)$ and $g_2(t)$ of baseband component. Because periodic signal spectrum is discrete, so band pass digital filter can carry on in the frequency domain. Then we usereal sequence $s_1(t)$ and $s_2(t)$ toget discrete Fourier transform, respectively: $S_1(k) = DFT[s_1(n)]$, $S_2(k) = DFT[s_2(n)]$. So frequency domain sequence $S_1(k)$ and $S_2(k)$ are conjugate symmetric sequence.Set k_0 as the corresponding serial number of complex sequence $S_1(k)$'s modulus maximum value, assuming that:

$$Z_{1}(k) = \begin{cases} S_{1}(k), & k = k_{0} \quad or \quad k = N - k_{0} \\ 0, & k \neq k_{0} \quad and \quad k \neq N - k_{0} \end{cases}$$
(4)
$$Z_{2}(k) = \begin{cases} S_{2}(k), & k = k_{0} \quad or \quad k = N - k_{0} \\ 0, & k \neq k_{0} \quad and \quad k \neq N - k_{0} \end{cases}$$
(5)

By the above two formula, the signal baseband component is retained, and higher harmonic is filtered. So it can finish band—pass filter in the frequency domain. Compared with traditional vector impedance method, filtering algorithm in frequency domain makes the dynamic range of signal be further improved. Especially, when the measured impedance voltage or current signal is very weak, it also can obtain good accuracy of measurement. $Z_1(k)$ and $Z_2(k)$ are complex sequence which are conjugate symmetric. Their inverse of Fourier transform are all real sequence:

$$z_{1}(n) = I_{1}(n) = IDFT[Z_{1}(k)],$$

$$z_{2}(n) = I_{2}(n) = IDFT[Z_{2}(k)]$$
(6)

Analytic signal is represented as

$$\begin{cases} g_{1}(n) = I_{1}(n) + jQ_{1}(n) \\ g_{2}(n) = I_{1}(n) + jQ_{2}(n) \end{cases}$$
(7)

In the above formula, $I_1(n)$ and $I_2(n)$ is respectively the in—phase component of signal $g_1(n)$ and $g_2(n)$. $Q_1(n)$ and $Q_2(n)$ is respectively the orthogonal component of signal $g_1(n)$ and $g_2(n)$. These four real sequences can be obtained by the HILBERT transform. Assuming that, $x(n) = I_1(n)$, it's discrete Hilbert

Assuming that, $x(n) = I_1(n)$, it's discrete Hilbert transformation is x'(n). Then the analytical formula is:

y(n) = x(n) + jx'(n) = x(n) + jx(n) * h(n)(8)

*is On behalf of convolution operation in above formula. And

$$h(n) = \begin{cases} 2\sin(n\pi/2)/n\pi, & n \neq 0\\ 0, & n = 0 \end{cases}$$
(9)

The characteristics of frequency spectrum are:

$$H(e^{j\omega}) = \begin{cases} -j, 0 \le \omega < \pi \\ j, -\pi \le \omega < 0 \end{cases}$$
(10)
$$Y(e^{j\omega}) = X(e^{j\omega}) + jX'(e^{j\omega})$$
$$= X(e^{j\omega}) + jX(e^{j\omega}) \cdot H(e^{j\omega})$$
$$(11)$$

$$\left[0,-\pi\leq\omega<0\right]$$

The sequence y(n) 's Fourier transform is the sequence Y(k):

$$Y(k) = \begin{cases} 2X(k), k = 0, 1, \dots, N/2 - 1\\ 0, k = N/2, \dots, N-1 \end{cases}$$
(12)

Do inverse Fourier transform to the sequence Y(k) to get the sequence y(n), which real and imaginary sequence is corresponding to in—phase and orthogonal sequences:

$$\begin{cases} x(n) = I_1(n) = \operatorname{Re}[y(n)] \\ x'(n) = Q_1(n) = \operatorname{Im}[y(n)] \end{cases}$$
(13)

The process diagram as shown in the Fig.2:



Fig. 2 impedance parameters DSP process

$$Z_{x}(n) = \frac{I_{1}(n) + jQ_{1}(n)}{I_{2}(n) + jQ_{2}(n)} R_{0} = \frac{A(n)}{C(n)} R_{0} + j\frac{B(n)}{C(n)} R_{0}$$
(14)

$$= R_{x}(n) + jX(n)$$

In the above formula,

$$A(n) = I_1(n) \cdot I_2(n) + Q_1(n) \cdot Q_2(n)$$

$$B(n) = Q_1(n) \cdot I_2(n) - I_1(n) \cdot Q_2(n)$$

$$C(n) = [I_2(n)]^2 + [Q_2(n)]^2$$
. $R_x(n) = A(n)/C(n) \cdot R_0$ and

 $X(n) = B(n)/C(n) \cdot R_0$ are the resistance and reactance of Z_x .Real component represents resistance of an unknown impedance and imaginary component represents reactance of an unknown impedance. According to the symbol of the imaginary part, we can judge that the unknown impedance is inductive or capacitive reactance. If the symbol is positive, it proves the reactance is the inductive reactance. On the contrary, it is proved that the reactance is capacitive reactance. Later, according to component's connection form and the frequency of the excitation signal measurement circuit, we can get the corresponding impedance parameters by table 1.

Table.1 the impedance formula						
Measured	Series equivalent	Parallel				
parameters	_	equivalent				
L	X/ω_0	X/ω_0				
С	$1/(\mathbf{X} \cdot \boldsymbol{\omega}_0)$	$1/(\mathbf{X} \cdot \boldsymbol{\omega}_0)$				
R	Rx	Rx				

This method reduces the requirement of excitation signalfundamentally. It also dispenses that the traditional impedance tester excitation signal must be high accuracy sine signals. As a result, the excitation source part of the hardware circuit is greatly simplified. I/Q sequence solving algorithm based on DFT hasalmost completely mirror frequency inhibiting capability. It is good for improving the accuracy of measurement of impedance parameters.

III. THE IMPEDANCE MEASUREMENT BASED ON MATLAB SIMULATION

We have selected microwave sensor measure circuit principle diagram of the common doppler radar on aircraft for the simulation. Through both MATLAB and MULTISIM software platform, we get the I/Q signals according to the above method.



IV.VERIFICATION OF HARDWARE PLATFORM In this experiment, the hardware system mainly includes:32 bit floating—point digital signal processor (TMS320C32), 24 ultra—high precision of analog digital converter (CS5396), general microcomputer (PC) and © ACADEMIC PUBLISHING HOUSE

universal serial bus (USB).CS5396 is used to realize the high precision sampling of the voltage signal of the measured impedance and the range resistance. DSP (TMS320C32) receives the data from the CS5396 and processes it, and then passes the result (RLC value) to the PC for display by the USB.

In order to guarantee the measurement of the integer multiple relationship of the DSP's A/D sampling frequencyand the excitation signal frequency. During the system design, the excitation signalis obtained by the division of sampling clock signal of A/D (4 frequency division and 64 frequency division in this experiment).

Because DSP can change the A/D's sampling signal frequency of ADCLK by programming. The DSP system can also change the frequency of the excitation signal for RLC measurements. When we designs, the hardware takes the ADCLK frequency into four kinds of different values: 93.75kHz, 46.9kHz, 23.4kHz and 11.7188kHz. The corresponding values of the excitation signal in the 4 division and 64 division have a total of eight different values (from 183. 1Hz to 23. 4kHz).

The accuracy of the measured results is higher when the voltage drops of the measured impedance are almost the same with the range resistance. Therefore, in this experiment, the range resistor R is provided with three different numerical (100Ω ,1K Ω and10K Ω), which are used for measuring different levels of impedance. Also, it can achieve automatic switching. When the range resistance is the smallest and the signal amplitude of the detected element is still weak, it is needed to amplify the signal amplitude of the components to a certain number of magnitude in order to improve the accuracy of the A/D transform. In order to solve this problem, the system uses a programmable amplifier AD526. Its gain can be controlled by DSP programming.

We choose three different excitation frequency, esponding to LF(low frequency),MF(medium corresponding frequency) and HF(high frequency) for different types of unknown impedance measurements. The table 4-11ists the relative error during the resistance measurement.From the table,we can see that we should use the LF excitation source signal to measure the resistance. The precision can be blow 0.03%. Thetable 4-2 lists the relative errorduring the capacitance measurement.From the table,we can see that we should use the HF excitation source signal for low capacitance measuring and we should use the LF excitation source signal when we measure high capacitance. In this way, we can control the relative error in the permissible range of 0.5%. The table 4—3 lists the relative error during theinductance measurement.Selecting the HF is a suitable way to control the relative error in the permissible range of 0.08% error of resistance measurements

1 4010. 2 1	ne renau		i of feststat	lee measurements								
R	10	$\Omega \Omega$	lkΩ	10kΩ								
183.1Hz	0.0)1%	0.019%	6 0.027%								
1465Hz	0.0	29%	0.035%	6 0.038%								
23.4kHz	0.0	38%	0.042%	6 0.045%								
Table. 3 th	Table. 3 the relative error of capacitance measurement											
С	0	.1nF	22uf									
183.1Hz	Z	0.	76%	0.23%								

1465Hz	0.48%	0.87%
23.4kHz	0.29%	2.6%
Table. 4 the relativ	e error of inducta	ince measurement
L	1mH	1H
183.1Hz	0.39%	0.031%
1465Hz	0.24%	0.037%
23.4kHz	0.081%	0.044%

V. CONCLUSIONS

The paper provide a brand new method about high precision resistance parametermeasurement in this text. The excitation signal can be any periodic signal of low signal—to—noise ratio. Theresultof test makes it clear that this method has a great capability of anti—jam and has a very high mirror frequency rejection ratio. The hardware circuit has a simple structureandingenious design. It is proved that he hardware platform has the ability of automatic identification of R, L, C components and can convertrangeautomatically. Also, it is able to select amplifier gain coefficient and the measuring signal frequencyautomatically. Measuring error is controlled between 0.02% and 0.05% and has a relative high precision. The new method is a kind of innovation and development of impedance parameter measurement. It canbe used as a more universal method for high precision impedance parameter to popularize and apply.

ACKONWLEGEMENT

We would like to express our gratitude to the anonymous reviewers of this paper for their helpful comments and suggestions. The work was sponsored by CAUC (Grant No.IECAUC14008).

References

- [1] Bengtsson, Lars E.A microcontroller—based lock—in amplifier for sub—milliohm resistance measurements.REVIEWOFSCIENTIFIC INSTRUMENTS,2012.
- [2] Hongyan Wu, Guohong Gao, Waveletpacket noise reduction in industrial signal preprocessing, China Academic Journal Electronic, Vol. 3, 2010, pp. 115–117.
- [3] Anonymous. IEEE Standard for Terminology and Test Methods for AnalogtoDigital Converters. IEEE Std. 1241—2011.The Institute of Electrical and Electronic Engineers, New York,2011.
 [4] Angelini,E.Carullo.A.Handheld—impedance measuremets/sterm/ibs/standard.com/abs/11/2011.
- [4] Angelini, E. Carullo, A. Handheld—impedance measurementsystemwithsevendecadecapability and potentiostaticfunction. IEEE TRANSACTIONS ON INSTRUMENTATION ANDMEASUREMENT, vol.55.no.1, pp.436—441, APR 2006
- [5] Davidson, J.N.; Stone, D.A.Improved bandwidth and noise resilience in thermal impedance spectroscopy by mixing PRBS signals. IEEE Transactions on Power Electronics.vol. 29, no. 9, pp. 4817–28, Sept. 2014.
 [6] T. Radil, P. M. Ramos, and A. C. Serra, "Impedance
- [6] T. Radil, P. M. Ramos, and A. C. Serra, "Impedance measurement withsine—fitting algorithms implemented in a DSP portable device," IEEETrans. Instrument. Meas., vol. 57, no. 1, pp. 197–204, Jan. 2008.
 [7] F. M. Janeiro and P. M. Ramos, "Impedance
- [7] F. M. Janeiro and P. M. Ramos, "Impedance measurements using geneticalgorithms and multi—harmonic signals," IEEE Trans. Instrument. Measure .vol. 58, no. 2, pp. 383–388, Feb. 2009.
 [8] A. Barrow, M. K. Barrow, M. K. Barrow, M. K. Barrow, M. K. Barrow, C. S. Barrow,
- [8] Airbus Company. Wiring Diagram Manual of Airbus 320. Airbus Company, 2005.

Chinese Microblog Key—Sentence Analysis Based on SVM

Wen-Feng Liu

Computer and Information Engineering Department of Heze University, Shandong, China 274015

Abstract—because of Chinese microblog comments having large number of comments information, I proposed summary of a SVM Chinese microblog emotion key sentence—based construction program, using to construct a summary of the microblog emotion, the experiments show that the results have greatly improved than the base classifier.

Index Terms—sentiment analysis; microblog comments; SVM

I. INTRODUCTION

February 3, 2015, China Internet Network Information Center (CNNIC) released "35th Statistical Report on Internet Development in China", as of December 2014, the scale of China reached 649 million Internet users, the annual total of 31.17 million new users people, the Internet penetration rate of 47.9%, compared with the end of 2013 improved 2.1 percentage points (42.1% end 2012). The scale of China's mobile phone users reached 557 million, representing an increase of 5672 million in 2013. Internet users in the proportion of people using mobile Internet increased from 2013's 81.0 percent to 85.8 percent. Survey shows that in 2014, 60% of Internet users on the Internet for sharing behavior positive attitude, 43.8 percent of Internet users like to comment on the Internet. With the free cyberspace and the rapid dissemination of information, Internet has been integrated into people's work and life, become an important tool for people to exchange information, events happening in the real world is also vast amounts of storage on the Internet.

II. THE STATUS OF RESEARCH

Chinese microblog comment emotion summary is to analyze and comment summary Chinese microblog binding Chinese microblog comment emotion. Zhao Yan—Yan et al. [1] proposed a text to identify the first with emotional comments sentence polarity, then extract the positive and negative emotions summary class. Carbonell J. et al [2] proposed a method for constructing summary MMR. Radev DR. et al [3] proposed CSIS method to determine whether a candidate sentence containing information in summary sentence, if the candidate sentence already contains information, then the candidate sentence is deleted from the summary.

Liu D. et al [4] proposed a progressive multidocument summary of the model that simultaneously maximize both coverage and content of the minimum redundancy topic. The model which using semantic analysis and a variety of statistical techniques to extract concepts, after the adoption of the concept of cohesion between computing sentence similarity conditions, to establish the relationship between sentences with between documents, thereby generating summary. In[5] proposed a work based on PageRank and HITS algorithms to take advantage of clustering to the sentence ordering information. Wang H. and Zhou G major work in [6], the use of probability shallow semantic indexing (PLSI) model on the text multiple documents were text summarization, use PLSI model document into multiple topics, then Choose topic sentence from the highest score as an initial summary, then the greedy algorithm sentence gradually add different themes sentence merged into final summary.

III. ABOUT MY JOB

Existing research focuses on Chinese microblog comment emotional bias, and can be put into practice, and achieved good results. The emotion Abstract comment on Chinese microblog emotion key—sentence has just begun.

Due to the current Chinese microblog text summary analysis mainly in the narrative objective facts and other scientific literature and journalism, emotional summary sentence for Chinese microblog subjective too few key sentences, how to grasp quickly generate large amounts of data control is currently letter problem to be solved.

For the current study Chinese microblog key sentence emotion sentence recognition supervised learning method is relatively small, the use of an effective based on Chinese microblog emotion key—sentence SVM supervised learning method of automatic identification method.

Chinese microblog evaluation words used in different areas vary, and vary greatly, even some emotional words mean the opposite in different areas representative. Traditional emotion caused dictionary transplanted directly to Chinese microblog review poor results, it is necessary for different areas of Chinese microblog comment establish corresponding fields emotions dictionary. Therefore, building a Chinese microblog emotional realm dictionary is an essential element of the subject.

IV. CHINESE MICROBLOG EMOTION EMOTIONAL KEY— SENTENCE SUMMARY EXTRACT

A. Determining the Emotional Key—Sentence

Chinese microblog users attitude views on a particular issue, by analyzing user reviews emotions get the key sentence. Chinese microblog content of pretreatment, analysis of each sentence to be evaluated, as well as evaluate the correlation term evaluation object and evaluation of the word, in order to determine whether it is a valid emotion key—sentence under the theme, it is a very challenging the work. Analysis of how to extract the emotional key—sentence summary of the user's emotional extraction process is a key issue.

B. Integration of Emotional Consistency Emotional Key— Sentence Ordering Process

In order to obtain a valid emotion abstract, emotional key—sentence must be treated, but the emotional sort key—sentence is an essential link. Problems involved in the sort of emotional consistency issues that must be considered, such as before and after a question or two diametrically opposite attitude, or implied satire, irony and other information would interfere with the emotional key—sentence results will be sorted. Therefore, the integration of emotional consistency emotional key—sentence summary of scheduling problems in emotional generation is a key element.

C. Construction of Emotional Summary

Emotion is a Chinese microblog Abstract comment text concise and summary, emotional summary of the build is not for the emotional key-sentence of simple addition, but relates to the evaluation object consistency, semantic consistency, the consistency of a comprehensive evaluation of polar issues. We need to calculate the statistics subject information and emotional information and other related content on their effective integration. Emotion abstract construct, is a central element in the integration of emotion emotional consistency keysentence on the basis of the sort.

VI. CHINESE MICROBLOG TOPICS RELATED TO CHINESE MICROBLOG EMOTION TENDENTIOUSNESS RECOGNITION

A. The Evaluation Object Extraction

Identification of Chinese microblog emotion tendentious comment, you must extract the Chinese microblog emotion tendentious comment text evaluation object or a property to be evaluated, the correlation here relates to the topic. Because some statement contains a lot of elliptical sentence, the same themes expressed in different language fonts, as well as evaluation of unrelated objects or object attributes evaluated typos. In Chinese microblog emotion recognition propensity to cause, although the same topic, but in many cases were considered to be unrelated topic. Although, the extraction of evaluation object appears to be a very simple task, it is a tendency to identify the most basic content of Chinese microblog emotion.

B.Evaluation of the Emotional Word Extract

Evaluation of emotional words are Chinese Microblog user-specific attitudes towards specific topics, is a task almost simultaneously extracted in the evaluation of object recognition on the basis of this work is dependent on the emotional front dictionary and garbage areas dictionary. Evaluation of emotional words in the extraction, the evaluation overlapping emotional words, negative modification, modification and other phenomena strength is a key content of this paper.

C. the Orientation Identification of Chinese Microblog Emotion

The main task of Chinese microblog emotion tendency recognition is based on the evaluation object extraction and evaluation of the word on the combination of topics related evaluation object and evaluation of the word, effectively identified. In Chinese microblog emotion tendentiousness recognition mechanism, evaluation objects and evaluation of words and themes term evaluation object and evaluation, focusing on the evaluation object and evaluation Ci consistency in the full contrast, and then identify the Chinese microblog emotional tendency comment. This content is another core of the subject.

VII. EXPERIMENT

Experimental utilization LIBSVM this machine learning toolkit, artificial labeling and standard data collection methods training methods and improved algorithms, natural language processing methods and other key technologies, techniques used in this study overall route divided into the following steps:

(1) This paper first studied Chinese microblog comments feature vector representations of text, use this method represents pending Chinese microblog comment text. In order to more effectively carry out the analysis of model tests, the data set is divided into training and test sets

Foundation (2) (1) of the feature vector representation of feature vectors simplify, to remove noise effects.

(3) Using clustering algorithm to cluster the training set data processing to extract the K key-sentences extracted M keywords. K and M size and the size of the data set.

(4) Using an algorithm for the K key pieces sorting, sorting the results based on the use of N—sentence summary as emotional; the M key extracted for analysis and processing, as the first step (5) to prepare.

(5) The data test sets pretreatment in (3) and (4) based on a Chinese microblog for each test set classification, while computing the M among which Chinese microblog with the home category Key words and the N key topic of the sentence, according to the value of correlation calculated as the judgment which is of a valid Chinese microblog comments or spam.

In this paper, COAE2015 published datasets, choose the 1000 micro-blog comments content. 500 as the training set, 500 as a test set. This paper uses Bayesian classifier as a basis for classification.

Table—1 the experimental results												
	accuracy	F—value										
This method	70.8%	71.6%	71.2%									
Bayesian classifier	60.3%	62.1%	61.2%									

Table can be drawn by the method used in this paper, there are more substantial increase than the base classifier, demonstrate the feasibility of the method.

VII. CONCLUSION

This paper researches on Chinese microblog comment Chinese microblog platform under the same theme of a lot of comment information. Summary of proposed construction scheme emotion SVM Chinese microblog emotion key-sentence is based, to build emotional summary of key-sentence based on emotion, there is much room for improvement than the base classifier. But from the test results of this point of view, there is still much room for improvement, under a combination of deep learning method for further study.

REFERENCES

 Zhao.Yan—Yan, qinbing, "liuting text sentiment analysis", *Journal of Software*, 2010, 21 (8): 1834—1848.
 Carbonell J., Goldstein J.."The use of MMR, diversity—based reranking for reordering documents and producing reranking for reordering documents and producing summaries,"//Proceedings of the 21st annual international ACM SIGIR conference on Research and development in information retrieval. ACM,

1998: 335—336. [3] Radev D. R., Jing H., Budzikowska M.. "Centroid—based summarization of multiple documents:sentence extraction, utility based evaluation, and user studies,"//Proceedings of the 2000NAACL-

based evaluation, and user studies,"//Proceedings of the 2000/NAACL— ANLP Workshop on Automatic Summarization. Association for ComputationalLinguistics, 2000: 21—30.
[4] Liu D., Wang Y., Liu C., et al.."Multiple documents summarization based on geneticalgorithm,"//Fuzzy systems and knowledge discovery. Springer Berlin Heidelberg, 2006:355—364.
[5] Wan X., Yang J.."Multi—document summarization using cluster— based link analysis,"//Proceedings of the 31st annual international ACM SIGIR conference on Research and development in information retrieval ACM 2008: 299—306 retrieval. ACM, 2008: 299-306.

retrieval. ACM, 2008: 299—306.
[6] Wang H., Zhou G., Topic—driven Multi—Document Summarization, "//Asian Language Processing(IALP), 2010 International Conference on. IEEE, 2010: 195—198.
[7] Shen D., Sun J. T., Li H., et al., "Document summarization using conditional randomfields,"//IJCAI. 2007, 7: 2862—2867.
[8] Xie S., Liu Y.," Improving supervised learning for meeting summarization using sampling andregression," Computer Speech & Language, 2010, 24(3): 495—514.
[9] Wong K. F., Wu M., Li W., "Extractive summarization using supervised data semi-supervised learning,"/Proceedings of the 22nd

[7] Wong K. T., Wu M., El W.: Exhactive summarization using supervised and semi—supervised learning,"//Proceedings of the 22nd International Conference on Computational Linguistics—Volume 1. Association for Computational Linguistics, 2008: 985—992.
 [10] Li C., Qian X., Liu Y.,"Using supervised bigram—based ILP for

extractive summarization,"//Proceedings of ACL. 2013: 1004-1013.

How to optimize the location of sealing wall in crossheading for fully mechanized caving face

Hai—Tao Li, Xiao—kun Chen, Yong—fei Jin

College of Energy Science and Engineering, Xi'an University of Science and Technology (XUST), Xi'an, Shaanxi, PR China

Ministry of Education Key Laboratory of Western Mine Exploration and Hazard Prevention, Xi'an University of Science and Technology (XUST), Xi'an Shaanxi, PR China

Abstract—Sealing wall in crossheading underground mine is one of the requisite barriers for hazards prevention and an effective isolation facility for gob away from the external environment, which is the key ventilation between two neighbor working face. However, how can we determine and optimize the location of sealing wall in crossheading? Needless to say, it is related to the stability of crossheading. And the location of sealing wall in 1# Crossheading of 3255 workingface in Shaanxi QINGSHUIYING coal mine needs to be urgent decided. In this paper, a 3D model of 3255 workingface excavation was established. Firstly, the thickness of sealing wall was calculated according to Theoretical Mechanics. The pressure distribution of roof in crossheading was simulated, then, different simulating working conditions are calculated. To verify the program designed above, displacement field and plastic zone of the certain condition were obtained. Results showed that as the length of crossheading is 20m and the thickness of sealing wall is 5.4m, the rational position of airtight wall is the distance to intersection is 15m.

Index Terms—Mine fire, Mechanical Properties, Filling Airtight, Characteristic parameters, Numerical simulation, Constitutive model

I. INTRODUCTION

With the adjustment of China's energy structure and development of coal mining technology, huge economic benefits had been brought by new production processes technology. Whereas, hazards prevention and faced with numerous underground mine has unprecedented challenges[1]. However, serious damage happened on sealing walls while they were compressed and attacked when massive roof caving, thus causing frequent accidents of coal spontaneous combustion, crossheading are large in number, once the sealing walls were severely damaged after compression, which would do greater impact on regular production. As to the location and thickness of traditional sealing walls were basically determined unreasonably by empirical values, so it is easily for new air-leakage and crack propagation in sealing walls.

Scholars at home and abroad had launched a lot of theoretical and experimental studies on sealing wall in recent years, and had put forward a series of sealing wall of high—strength, low—cost, and highly elastic. Wangguang Hong[2] caculated the reasonable section of sealing wall combined with mechanical parameters of coal and rock physical and geological conditions based on theoretical analysis and numerical simulation. LU Hai — chao[3] established the numerical model and studied the laws of stress — strain under different conditions. Huang Jianjun[4] analyzed the mechanical properties of backfilling slurry and the special features of airtight wall, induced the calculation model of airtight walls. Zhang jie and Li yu[5] analyzed stress state of the sealing wall structure under the condition of air bursting

stress and obtained the relations between the structure parameters and stress state for permanent sealing wall.SU Fu—peng and ZHOU Xin—quan[6] adopted the comprehensive research method of theoretical analysis, field measurement, and numerical calculation, studied the influence law of the periodical change of the atmospheric pressure on the airtight—wall leakage rate. TANG Zi—Bo[7—9] based on the theories and models related to the foamed concrete and blasting shock load, using the numerical analysis method, this study obtains the new material's mechanical and destruction laws through analyzing its reaction to different conditions of load. However, recent research is seldom focused on the location and thickness of sealing wall, but the two parameters can be solved or not is closely correlated to the prevention effectiveness of fire underground mine.

This paper investigated the mechanism, Damage index and stability judgement index. Combined with mechanism of perpetual sealing walls, the mechanical models of the sealing wall was founded. In accordance with perpetual sealing walls mechanism and failure theory, we built the mechanics and mathematical models of sealing walls and determined the relevant boundary conditions. FLAC 3D was adopted to simulate the stress field, displacement field and failure field of sealing walls under different working conditions. By analysis on the numerical simulation results, we calculated the reasonable thickness of the wall.

II . ANALYSIS OF THE FACTORS THAT INFLUENCE THE SEALING WALL

The crossheading was usually designed in the adjacent sections roadway in working face, in order to block the ventilation connection between the workingface and other mining face and even the prepared mining face, it is necessary for us to build a sealing wall in the proper location in the crossheading. The sealing wall in crossheading is good or not is not only affected the normal ventilation, but also related to the spontaneous combustion in goaf. The main factors that affect the stability of the sealing wall are as follows: the stability of coal pillar, the location of sealing wall, the influence of mining, the mining conditions and the sealing materials.

During the construction process of a sealing wall, the stability of sealing wall was deeply affected by the strength and deformation of pillars, so it is very necessary to analyze the stress distribution and deformation laws of pillars when determining the reasonable location of a sealing wall.

III. THE OPTIMIZATION OF LOCATION OF SEALING WALL IN THE CROSS—HEADING

A. Numerical model

According to geological conditions of 3255 working face, numerical model was established with FLAC 3D. Based on modeling requirements and the actual situation, choosing the center of airtight wall the return airway intersections as the coordinate axis. The direction of mining is X positive direction, N center the crossheadings to the 3255 workingface is Y positive direction, vertical upward is Z positive axis, numerical simulation range were selected as X direction 300m, Y direction 140m, Z direction 110m, intake airflow roadway and return airway of 3255 face are both rectangular, width × height = $5.3m \times 3.6m$. The crossheading: width × height = $3.7m \times 3.1m$. Numerical models of original rock geology, working face excavation and airtight wall were shown in figures 1 to 3 below.

Boundary conditions for the calculation model: Model X direction at the edges, y direction is not generated at the edge of the displacement, the bottom of the top of the screen Z—axis displacement constraints, the model for the free boundary.



Figure 1. Numerical model of original rock geology

B. Numerical simulation results

1. Stress distribution

According to the simulation results, when the 3255 working face was mined basically, with the change of original rock mass stress state, resulting in collapse of overlying strata until the goaf was totally brimminged. If the crossheading has not been supported, the vertical stress at different crosssection were shown in Fig 2.





Figure 2. The vertical stress distribution at different sections

As can be seen from figure 2, if it takes no support measures for the crossheading, the vertical stress distribution of crossheading roof goes to variation in linear trend. Monitoring sections shows that peak stress of 1 is 15.5 MPa, peak stress is of 2 is 16.2 MPa, the peak stress of 3 to 14.9 MPa. There is no denying that the comparison above of the vertical stress at each cross—section are reduced to varying degrees.

2. Displacement distribution

Influenced by 3256 working face, roof and floor moved by under the mined pressure, the deformation of roof and floor at different sections was shown in figure 3.



Figure 3. The vertical displacement distribution at different sections

As can be seen from figure 3, influenced by 3256 working face, roof of crossheading in 3255 working face subsidenced at last. if it takes no support measures for

the crossheading, the vertical stress distribution of crossheading roof goes to variation in linear trend. Numerical simulation results showed that the distance preclude the empty area at the edge of the 15m, the maximum vertical stress of roof and floor is rather small, so the 15m distance to the intersection along the crossheading maybe the optimal location.

3. The types and proportion of failure

According to the research in reference 9, the reasonable thickness of the sealing wall is 5.4m, failure volume and failure percentages of tension, shear and tension—shear was extracted with fish function, shown in figures 4 and 5, respectively.



Figure 4. Damage volume of Airtight wall of different conditions



Figure 5. Damage ratio of Airtight wall of different conditions

As can be seen from figures 4 and 5, the failure volume V, V' and failure percentages of tension, shear and tension - shear and the thickness of sealing wall H follows the law of nonlinear; if air impact load is a certain value, with the increase of wall thickness, the shear failure, tensile failure and total destruction volume gradually decreases, the proportion of the 4 parameters has the similar trend. But the tension and shear failure played a major role, which shows that roof collapse behind air impact is the direct cause of the destruction of sealing wall, deadweight and underground pressure cause indirect damage. The failure volume V, V' and failure percentages of tension, shear and tension-shear and the thickness of sealing wall H follows the law of nonlinear. The volume and percentage of shear failure, total destruction, tension failure decrease with the increase of wall thickness, as wall thickness increases, its bearing capacity increases, the volume and percentage of shear failure reduce at first and increase thereafter.

IV. THE VERIFICATION OF NUMERICAL SIMULATIONS

A. Numerical model

The numerical model of sealing wall in crossheading was shown in Fig 6.



Figure 6. Numerical model of original rock geology

B. Analysis of simulation results

1. Vertical Stress

The vertical stress of sealing wall in crossheading was shown in Fig 7.



Figure 7. Vertical stress distribution of sealing wall in the crossheading

As can be seen from fig7, the concentration areas of vertical stress are mainly located in four corners of the closed wall, reached 10^7 magnitude. On the one hand, due to the closed wall by superimposing four corners near the work stress and the impact on the mining overburden pressure and roadway intersection, on the other hand, the wall the presence of the end surface effects. So the material of sealing wall should be optimized in the occasion that the location and thickness of sealing wall is determined.

2. Vertical Displacement

The vertical displacement of sealing wall in crossheading was shown in Fig 8.



Figure 8. Vertical stress distribution of sealing wall in the crossheading

Due to the underground pressure, stress superposition and adjacent intersections, the deformation of sealing wall is rather unacceptable. The concentration area was at the top of sealing wall, owing to wall material, strength and other mechanical parameters is much smaller than the roadway around rock and overburden strength, leading to a greater deformation of the whole under the combined effect of several forces. Along the Z—axis direction, the displacement gradually decreases, on the one hand, because of the internal stress of the closed transfer backfill occurs, on the other hand, the strength of the wall at the bottom of the upper part than in large, and it is difficult to produce a large amount of deformation.

3. Plastic distribution

The damage zones of sealing wall in crossheading was shown in Fig 9.



Figure 9. Distribution of damage zones of sealing wall in the

crossheading

Due to stress superposition of tunnel intersections and face mining, there are three types of failure, namely: tension, shear and tension — shear. Numerical results indicates that the position and thickness are the two main factors that leads to the failure of sealing wall. If the wall thickness was 5.4m, the crack did not perforation the entire wall.

V. CONCLUSIONS

One of the most important reasons why the sealing wall built in crossheading fractured is that the unreasonable location. It has been proved that influence on sealing wall caused by coal mining and distribution of lateral support pressure is truely different, therefore, it is better to avoid the peak stress area when building a sealing wall. The stress distribution of different sections of surrounding rock according to the numerical simulation, the results showed that the stress at the edge of 15 m is lower, and the surrounding rock is the elastic, it is the best choice to build a sealing wall. According to the simulation and fitting results of sealing wall under different conditions, there are 3 types of failure: tension, shear and tension—shear.

ACKNOWLEDGEMENTS

This work was supported by National Natural Science Foundation of China (Grant NO 51504187), the Ministry of Education Funded Project of Innovation Team (Grant NO.IR0856), the postdoctoral scientific foundation of china (Grant NO.2014M552466), Natural Science Foundation of Shaanxi Province (2014JM7276).

References

- Lv Zhihai, Wang Zhanyuan. Prevention for Mine Fire. Beijing:Coal industry Press,pp 221–223, 2007.
 Wangguang Hong.Suancigou airtight roadway surface
- [2] Wangguang Hong Suancigou airtight roadway surface coal Pillars Design Liaoning: Liaoning University, pp 201–202, 2013.
- [3] LU Hai chao,HE Tao.Definition of reasonable pa rameters of airtight wall in crossheading of fullymechanized caving face. Coal technology, Vol 42, pp 118~120, sep, 2014.
 [4] Huang Jianjun, Qiao Dengpan, etal. Calculation and Dengpan.
- [4] Huang Jianjun, Qiao Dengpan, etal. Calculation and Optimizing Analysis of the Force of Filling Airtight wall for Underground Mined — out Area, METAL MINE, Vol 31, pp 32—36, 2014.
 [5] Zhang Jie, Li Yu. On sealing wall to prevent air bursting
- [5] Zhang Jie, Li Yu. On sealing wall to prevent air bursting disaster in gob areas. China coal. Vol21, pp 94~96, Jan 2010.
- [6] SU Fu—peng, ZHOU Xin—quan, etal. Influence of Atmospheric Pressure Fluctuation on Air Leakage Rate of Airtight—wall. The 5th Conference on Performance based Fire and Fire Protection Engineering, Vol 11, pp 410— 408, Dec. 2011.
- 408, Dec, 2011.
 [7] TANG Zi—Bo, ZHAO Yong—Liang. Study and application of a new type of foamed concrete wall in coal mines. Journal of Coal Science & engineering, Vol 19, pp 345~352, July, 2013.
- [8] LUO Zhenmin, DENG Jun, et al. Experimental Study and Property Analysis of Seal—filling Hydrogel Material for Hermetic Wall in Coal Mine. Journal of Wuhan University of Technology, Vol 25, pp 152 — 160, Jan, 2010.
- [9] XU Liangji, Xu Shanwen,etal.Optimum soil coverage thickness of reclamation land filled with fly ashJournal of the China Coal Society, 2012,37, p485—488.

Numerical Simulation of CFD in Research for the Oil Industry

Kankan Chen Yangtze University, Wuhan, China Longfei Ruan PetroChina Xinjiang Oilfield Company, Karamay, China Liang chen PetroChina Jilin Oilfield Company, Songyuan, China

Abstract—In oil and gas production fields, oil, water and natural gas are generally produced simultaneously and sent in form of gas—liquid two phases. Recently, existing numbers of advanced international software for turbulent flow simulations have been test on their capacity to solve practical problems in petroleum domain. As one of them, Computational Fluid Dynamic (CFD) software is applied to analyzing the fluid dynamic analysis. In paper, the application status and achievements made by CFD in three aspects including oil and gas field development, pipeline engineering and attachment equipment of oil field are discussed. It is of great practical meaning for the further and effective application of CFD technology in the field of oil.

Index terms—CFD, petroleum industry, application, simulation.

I. INTRODUCTION

In recent years, some professional software have been used in the oil industry, such as Eclipse and CMG in oil reservoir, Petrel in reservoir formation and Geology in logging interpretation etc. CFD software, because of its outstanding advantage for the fluid simulation, has been mainly developing in aerospace and other high—tech fields at the first. Since the 20th century, with the highly speed developing of CFD theory and the higher calculation accuracy of the computer, the scope of its application in oil dusty is becoming more and more widely.

With the development of computing technology and the aerospace craft, the Computational Fluid Dynamics (CFD) has experienced three important stages. In the 1950s, under the background of the universe space research of hypersonic flight vehicle field, the subject of CFD was appeared as an independent discipline and it is the theoretical basis of all CFD commercial software. In the 1970s, since various novel algorithms were imported and computational precision became higher, the application of CFD software be from simple laminar flow to more complex simple laminar flow. In the 21st century, in order to the facilitate application of engineering and technical personnel, CFD commercial software, like other large commercial software, formed an integrative mature numerical software packages to seek for a widely recognition. Now, the mainstream commercial CFD software include PHOENICS, CFX, FLUENT and STAR—AD etc^[1].

In practical engineering applications, PHOENICS software is specialized in low—speed heat transfer phenomenon and not suitable for high speed and compressible fluid. Since this software comes with a large number of examples which can be found in the engineering application, it would spend less time during modeling than others. In the CFX software, the

© ACADEMIC PUBLISHING HOUSE

characteristic is that the user can add their own physical model. CFX is mainly used in turbine and nuclear engineering. FLUENT software was firstly adopt the unstructured grid and sliding grid in modeling unsteady flow and multiphase flow. STAR — AD mainly are widely used in the calculation of the internal combustion engine of the car industry ^[2].

CFD software is mainly composed of three modules: pre—processor, solver and post—processor. Figure 1 is the general workflow. Pre—processor, such as GAMBIT software, work at the establishment of the geometric model and mesh generation. Main job of the solver is to calculate three physical equations including the equation conservation of mass, conservation of momentum and conservation of energy. CFD software attached simple post—processing function, if need high quality images or a deeper analysis of the results, some professional post—processing software would be needed. such as Tecplot.



Figure 1. The general workflow of general CFD software

II. THE APPLICATION OF CFD IN PETROLEUM ENGINEERING

Since a large amount of physical models, advanced numerical methods as well as strong post—processing function, CFD software is widely used in aerospace, nuclear reactions, vehicle design and oil and gas industry ^[3]. The application in the petroleum industry includes analysis of downhole, pipeline design and transformation security mostly covering every area of the whole oil and gas industry.

A. The application in oil—gas field development.

In the development of oil and gas field, more and more deep or ultra—deep well technology were used in complex geological situation. In order to meet the drilling quality and rock erosion efficiency, some new downhole tools would need to be designed. In the design process, CFD had become a very strong supporting role. In the design of downhole tool and the production string, the traditional method to determine the structure and size of tubing string is to the effect of fluid on the string in the form of the frictional resistance, but there is always a certain deviation since the fluid flow pattern not be considered. CFD technology will be used to simulate the flow pattern on the tube in order to obtain the internal flow characteristics (Fig.2 is the contours of velocity magnitude). CFD software is a reliable theoretical guidance.



Figure 2. the contours of velocity magnitude in the downhole choke

B. The application in the pipeline engineering.

Since CFD software is good at solving the problem of multiphase flow, existing mass transfer and heat transfer flow, the software now has played an increasingly important role in the pipeline engineering operation phase and safety management $^{[4-5]}$.

1. In pipeline operation stage, CFD software would be used to solve the transportation problem that different oil need to be orderly transported at same time in one pipeline ^[6]. The simulation results provided guidance for the delivery order of different oil. The traditional method of the study of friction loss in the tube is determined by a variety of instruments and equipment in the laboratory record the related data about local friction ^[7]. The precision degree of instruments and the experimental operator's quality have a great influence on simulation results. By using CFD software to simulate the flow can verify the experimental data to some extent. The contours of fluid velocity and turbulence intensity in the sudden enlargement can be found in the Fig.3 that clearly show the complex vortex system on the corner of tube. It is the obvious advantage of CFD software.

2. In safety management of oil pipeline, the application of CFD software is becoming more and more widely. In oil field production, for example, the pipeline bunkering events occurred frequently, seriously influencing on the normal order of oilfield production, and causing great loss to national property. CFD software, biased on the characteristics of the laying of buried stealing pipeline and the heat transfer analysis, can predict if stolen oil event occurs or not through simulating the change of the temperature field around the pipe. The simulation results and the actual infrared image temperature field distribution is same. Fig. 4 is the temperature contours around the buried pipe. So the application of CFD software could be well predict the feasibility of stealing oil incident [8]. Pipeline leakage, rupture, fire and other accidents were often occurred in the long-distance transmission of natural gas pipeline. One of them occurred would pose a threat to the national property and the ecological environment, even the Life safety of nearby residents. Using CFD software study the gas leakage diffusion rule in the air after, we can found when gas leakage accident happen, how formulate, then to decide the emergency rescue measures and provide theoretical guidance for risk management ^[9], Fig. 5 is the methane component distribution in the air after the natural gas leak under no windy conditions.



Figure 3. the complex vortex system on the corner of tube



Figure 4. the temperature contours around the buried pipe



Figure 5. the methane component distribution in the air

C. The application of key equipment in oil field.

1. With the oil production well deeper and deeper, the moisture content in natural gas speed up year after year, so gas and water separation processing become more and more prominent and important. Downhole hydro-cyclone separator has a very high economic benefits because of executing gas production, gas-liquid separation and produced water reinjection at the same time, and with the characteristics of simple structure, small volume and high efficiency. The mature multiphase flow model in the CFD software would simulate the motion of the fluid and the distribution of every phase in the separator (Fig. 6 is the contour of fluid velocity vector, Fig. 7 is the particle tracks). Then, the relationship between the separation efficiency and the structural parameters of separator can be obtained. Using CFD To improve the separator performance and decrease the cost of gas recovery has a very important practical significance ^[10].



Figure 6. the contour of fluid velocity vector



Figure 7. the curve of particle tracks

2. The performance of the reheating burner and the combustion characteristic of heating is of great importance to the furnace's efficient work. In order to meet the requirements of the flame shape and the stability of flame, the structure of burner need to be frequently optimized ^[11]. CFD software, as a main tool, would be used to study the fuel composition, structure of burner and the excess air coefficient how to influence on the temperature field, velocity field and the distribution of the components in the burner. Fig. 8 is a simplified model of the burner. Fig. 9 shows the thermal distribution of different cross section. The figures show that the temperature of the outlet is obviously higher than that of other parts. This part under compressive strength is larger and belongs to the weak part. So additional reinforcement measures need to be added in this part.



Figure 8. a simplified model of the burner



Figure 9. the thermal distribution of different cross section

VI. SUMMARY

In this paper, the development of CFD technology and work process firstly had been introduced. Then some application examples of CFD software in the field of petroleum industry were carried on the summary. These examples were divided into three aspects, oil and gas field development, ground pipeline engineering and oilfield application of key equipment in three aspects, namely oil and gas production, ground pipeline engineering and the key equipment in the oil field. Although these are only the tip of the iceberg, these mean that the application of CFD software in the petroleum industry would have a very broad prospects. Believe that along with the computer operation speed is accelerating, many problems in the oil industry currently not be solved through theoretical analysis or experimental research have a chance to be study using CFD software. On the other hand, software is just a assistive tool which can help researchers analyse experimental and theoretical results. The deep understanding of the problem physical essence is necessary.

REFERENCES

- Yao Zheng, Chen Kangmin. Review on the Commercial CFD Software [J]. University of Shanghai for Science and Technology, Vol. 24 (2002) No. 2, p. 137—142.
- [2]. Wang Fujun. Computational Fluid Dynamics Analysis
 [M]. Bei Jing: Tsinghua University Press, 2004, p. 2–3.
- [3]. Jin Junqing, Zheng Yunping. Application of FLUENT Software in Oil and Gas Storage and Transportation Engineering Design [J]. Natural Gas and Oil, Vol. 31 (2013) No. 2, p. 27–30.
- [4]. Yu Bo, Ling Xiao. Study on Laying Technology of Products Pipeline Along with Hot Crude Pipeline in One Ditch [J]. ACTA Petrolei Sinica, Vol. 28 (2004) No. 5, p. 149—153.
- [5]. Du Mingjun, Ma Guiyang, Chen Xiaohan. Numerical Simulation for Temperature Drop of Buried Hot Oil Pipeline during Shutdown in Permafrost Region [J]. Natural Gas and Oil, Vol. 28 (2010) No. 4, p. 54–57.
- [6]. Zhao Haiyan: CFD Simulation of Contamination on Batch Transportation Pipeline [D]. Da Qing: Da Qing Petroleum Institute, 2010.
- [7]. Zhao Yue: Numerical Simulation on Local Resistance Based on CFD [D]. Da Qing: Northeast Petroleum University, 2011.
- [8]. Li Dong: Numerical Simulation of Buried Stealing Pipe lines Based on CFD in Oil Field [D]. Da Qing: Da Qing Petroleum Institute, 2006.
- [9]. Ma Shihai. Numerical Simulation of Diffusion and Explosion Risk Analysis of Urban Nature Gas Pipeline Leakage [J]. Journal of Safety Science and Technology, Vol. 7 (2011) No. 7, p. 26–30.
- [10]. Li Lei, Jin Junqing, Chen kun, etc. Structure Optimization of Cyclone Separator Based on FLUENT
 [J]. Natural Gas and Oil, Vol. 32 (2014) No. 3, p. 27-30
- [11].[11]. Zheng Zhiwei: Numerical Simulation and Optimization of the Furnace with Fluent Software [D]. Qing Dao: China University of Petroleum (East China), 2010

Research of AC Servo System Parameters Setting

Jianhong Zhou, Zeming Li*

University of Science and Technology Liaoning, Anshan, Liaoning

Abstract—The thesis introduces the three—phase ac permanent magnet synchronous motor field—oriented vector control system, using MATLAB/Simulink to have a model building and simulation of three—phase ac permanent magnet synchronous motor servo drive system of the current loop, speed loop and position loop, carrying out a large amount of simulation research of parameters of each controller PI, providing the parameter value range of the regulator for the use of three—phase ac permanent magnet synchronous motor servo drive system .

Index Terms—ac permanent magnet synchronous motor, vector control, MATLAB simulation, PI regulator

I. INTRODUCTION

With the development of science and technology, the improvement of industrial modernization, the requirement of precise control is becoming higher and higher in industry control field. With simple structure, light weight, small size, low dissipation, high efficiency, and permanent magnet synchronous motor excitation is not required, three—phase ac permanent magnet synchronous motor thus has a higher power factor, lager moment of inertia, the rotor performance parameters can be measured, and in comparison the control performance is better, it avoids the shortcomings of internal dc motor commutator and brush[1]. Therefore, it makes the application of three-phase ac permanent magnet synchronous motor servo control system becomes more and more widely, and being widely used in various occasions, such as industrial robots, instrumentation, and numerical control machine [2]. Each manufacturer has developed permanent magnet synchronous motor (alldigital fuzzy) servo control system, servo drive. The setting of PI regulator parameter in servo control system is crucial; it has a direct impact on the performance of servo system. This paper analyzes servo motor mathematical model, discusses the basic principle of three-phase ac synchronous motor vector control, sets up a permanent magnet synchronous motor ac servo system control model MATLAB/Simulink in environment, and with the aid of MATLAB/Simulink simulation, it determines the effect of the scope of a servo drive controller PI parameters on the performance of the system, therefore provides basis for the selection of regulator PI parameters in various situations.

II. Composition and Working Principle of the Three phase Ac Servo Control System

A Composition of the Three—phase Ac Servo Control System

Three—phase ac permanent magnet synchronous motor servo control system adopts the technology of Space Vector Pulse Width Modulation (SVPWM), the control system from the inside out, respectively, using current loop, speed loop and position loop, finally realizes the accurate control of position servo[3]. Three—phase ac permanent magnet synchronous motor servo control system principle block diagram is shown in figure 1, PARK is the transformation from α — β two—phase stator coordinate system to the two—phase d—q rotor coordinate system, PARK — 1 is the reverse transformation of PARK, CLARK is the transformation of α — β two—phase stator coordinate system for the three—phase stator coordinate system, SVPWM is the space vector pulse width modulation, encoder is the incremental grating encoder[4].



Figure.1 The principle diagram of AC servo control system

B. The Principle of Vector Control

The most commonly used control methods of three phase ac permanent magnet synchronous motor is field orientated vector control. Its basic principle is to divide the three—phase permanent magnet synchronous motor stator current into two way current through coordinate transformation. One way current generates magnetic field, the other way current produces torque, and then control the current amplitude and phase of the two roads in order to achieve the control of stator current[5]. Field oriented vector control system has good torque response and accurate speed control[6]. There are a lot of kinds of field—oriented vector control methods, which weak magnetic control and maximum torque/current ratio control, id=0, is the most commonly used control methods. This paper adopts the id=0 control method[7].

C. Three—phase Ac Permanent Magnet Synchronous Motor Mathematical Model

Three—phase permanent magnet synchronous motor stator winding is similar to ordinary induction field of three—phase synchronous motor stator winding; and they are all belong to the strong coupling of high order nonlinear system[8]. The mathematical model of three phase permanent magnet synchronous motor includes flux equation, the voltage equation, electromagnetic torque equation and the equation of motion[9]. Three phase windings are short of each other 120 degrees in the space of 360 degrees. Transfer three phase stator coordinate system A - B - C into two phase stator coordinate system $\alpha - \beta$ through CLARK, two—phase stator coordinate system into two phase rotor d — p coordinate through PARK, use id = 0 control mode[10], the electromagnetic torque:

$$T_{e} = p \psi_{f} i_{q}$$

Te stands for electromagnetic torque, p represents motor pole logarithmic, Ψf is the rotor flux amplitude. P Ψf is constant, so as long as id = 0 in the running of three—phase permanent magnet synchronous motor, the electromagnetic torque is directly proportional to the iq. This vector control method greatly simplifies the mathematical model of three—phase permanent magnet synchronous motor, and at the same time, makes the three—phase permanent magnet synchronous motor control more flexible and accurate[11].

III. The Establishment of Three—phase Ac Permanent Magnet Synchronous Motor Servo System Simulation Model

A. The Set of Main Circuit Modeling and Parameter

Choose three—phase ac permanent magnet synchronous motor model and bridge converter module

in SimPower System, they formed main circuit model as shown in Figure 2. Set the dc voltage source 300V, A, B and C are three—phase voltage interface respectively. Tm is load torque given entry; m is the output end for variable test end, which can be set to detection interface of speed, current, torque and position. Take three—phase permanent magnetism synchronous motor ECMA—1060 as an example, motor simulation parameter is set to: the stator winding resistance Rs=18.7 Ω , d phase winding inductance Ld = 0.02682 H, q phase winding inductance Lq = 0.02682, the rotor magnetic flux Ψ f = 0.1852 Wb, moment of inertia J = 0.0001 Kg.m2, logarithmic p = 2, the friction coefficient F = 0.



Figure.2 Main circuit module

B. The Set of Control Circuit Modeling and Parameter Control method uses space vector pulse width modulation (SVPWM) ,as is shown in Figure 3, the model is mainly composed of coordinate transformation module, SVPWM module and PI regulator module[12]. module Coordinate transformation consists of trigonometric function module and arithmetic module. Convert the rotor voltage component uq and ud into two phase stator voltage uαand uβ, then goes into SVPWM module for sector selection and the calculation of vector voltage effect time[13]. SVPWM module mainly contains voltage vector switch point calculation module, voltage vector conduction time module and SVPWM output module[14]. The quantity of feedback of current loop, speed loop and position loop mainly comes from

the main circuit of variable testing interface[15]. The current regulator positive limited value is 500v, negative limited value is -500v. The main function of current regulator limited value is to prevent the rotor voltage component from too large. The speed regulator's positive limited value is 8A, negative limited value is -8A. The output of the speed regulator is given by the current controller. The limited value guarantee the maximum motor current is 8A, which plays an overcurrent protection role. Position regulator's positive limited value is -2500rpm. The output of position regulator is set by speed regulator. Position limited saturated output value makes the speed to its maximum 2500rpm.

<Stator current is a (A)



C. Servo Control System Model

Figure.3 Control circuit model

Do a research on the set of regulator parameter taking a certain servo drivers as an example. According to the above control methods. set up three—phase ac permanent magnet synchronous motor servo control system model under MATLAB/Simulink as shown in Figure 4. The inner loop is current loop, and then the speed loop. and the outer is the position loop[16].



Figure.4 Tricyclic PMSM AC servo control system model

IV. Position, speed and current regulator parameter setting

The current loop, speed loop and position loop in AC servo system are set as the PI regulator, various aspects of the PI regulator parameters are complied with MATLAB / Simulink simulation approach to tuning, in tuning the entire servo system PI regulator parameter process, parameters to be from the inside to the outside of each ring gradually tuning regulator, tricyclic PI regulator parameter tuning without disturbing each other, independent tuning[17].

A. The Set of Current loop PI Regulator Parameter The transfer function of current loop PI regulator

$$W_{ACR}(s) = \frac{K_i(\tau_i s + 1)}{\tau_i s}$$
, K_i is

proportionality coefficient, \mathcal{T}_i is integral time constant. Increase proportionality coefficient will speed up the response of the system, too faster will make the system oscillated or unstable, otherwise, and will lengthen the time of response. Increasing the integral time constant is helpful to reduce the error. Current loop servo control system is mainly to improve the system dynamic response speed, stabilize output torque and increase system's anti—interference ability. Figure 5 shows current loop simulation model.



parameter is

Figure.5 Current loop servo system model

Set a certain servo drive current regulator default PI parameters to $K_{i=900}$, $\tau_{i=10}$, input given step signal under the parameter, when 0s from 0 step to 4 ampere (A),the current simulation waveform is shown in Figure 6, calculated by the current waveform, the dynamic following performance indicators are: ts =0.65ms $\$

 $\sigma_1^{\%} = 2.25\%$, ess = 0.1.

Choose parameters near the current regulator PI parameter default values, through a large number of simulation experiments, it is conclude that current dynamic follows performance indicators as shown in

Table 1. L_s is adjusting time, unit: ms; σ_i % means overshoot; e_{ss} stands for steady—state error.



rig.	o me current	Simulation	waveloin
TABLE I.			

$K_{\rm i}$		700)		8	00			900			1000		1	200
$ au_{ m i}$	1	10	50	1	10	50	1	10	50	1	10	50	1	10	50
ts	1.31	127	1.25	1.18	1.17	1.13	0.71	0.65	0.87	0.86	0.87	0.9	0.97	1.1	1.16
$\sigma_{ m i}^{\%}$	0	0	0	0	0	0.12	1.17	2.25	1.25	2.75	3.15	3.15	4.25	4.75	4.75
e _{ss}	0.15	0.16	0.16	0.14	0.14	0.15	0.07	0.1	0.11	0.07	0.08	0.09	0.06	0.07	0.07

TI IDEE I.												
OLLOWING PERFORMANCE INDEX O	CURRENT REGULATOR	R WITH DIFFERENT PI PARAMET	ERS									

As is shown in Table 1, When $K_{i=900}$, $\tau_{i=10, \text{ ts}}$ =0.65ms, ess =0.1, the adjusting time is the shortest.

When $K_{i=1200}$, $\tau_{i=1}$, ts =0.97ms, ess =0.06, the steady—state error is the least. The current regulator in the servo system is usually to modify the quickness of

the system, so the PI parameters are $K_{i=900}$, $\tau_{i=10}$. B. The Set of Speed loop PI Regulator Parameter The transfer function of speed loop controller is $W_{ASR}(s) = \frac{K_n(\tau_n s + 1)}{K_n(\tau_n s + 1)}$

$$V_{SR}(s) = \frac{\sigma_n}{\tau_n s}$$
, K_n stands for speed

regulator proportional coefficient, \mathcal{T}_n is speed regulator integral time constant. The response of speed ratio coefficient changes according to the speed regulator proportional coefficient. Adjusting the internal time constant can change the size of the steady state error. Adding the speed loop based on current loop servo system, speed and current double closed -loop simulation model is shown in Figure 7.

Figure.7 The speed and current double closed—loop servo system model Set a certain servo drive speed regulator PI parameter t

default value: $K_{n\ =1}$, $\mathcal{T}_{n\ =1.5}$, When the speed regulator and current regulator PI parameters are using the default value, input given step signal, at 0S, it steps from 0 to 1500rpm, Figure 8 shows the speed of the simulation waveform, the rotational speed of the dynamic following performance indicators is concluded:

 $t_{s=16.9ms}, \sigma_{n}^{\%} = 1.32\%, ess = 0.$

Choosing parameter near the speed regulator PI parameters, and through a large number of simulation experiments, the author concluded the dynamic speed following the performance indicators as shown in table 2.

 t_{s} is accommodation time, unit: ms, $\sigma_{n\%}$ is overshoot amount and e_{ss} is speed steady—state error.



Figure.8 the waveform of speed simulation

TABLE II. Following performance index of different PI parameters of the speed regulator

K _n	0.1 0.5				1			1.5			2				
$\tau_{\rm n}$	1	1.5	2	1	1.5	2	1	1.5	2	1	1.5	2	1	1.5	2
ts	17.1	17.2	18.5	17.1	17.3	17.5	16.8	16.9	17.1	16.9	17.2	17.3	16.7	17.1	17.3
$\sigma_{n}^{\%}$	0	1.77	4	0.91	1.32	1.75	1.32	1.32	1.75	1.32	1.32	1.75	1.32	1.32	1.73
e _{ss}	17	21	41	1.4	5	12	5	0	4	4	4	5	7	6	6

:0

As is shown in table 2, when $K_{n=2}$, $\mathcal{T}_{n=1, \text{ ts}}$ = 16.7ms, ess = 7, speed setting time is the least, when K

 $K_{n=1}$, $\tau_{n=1.5, ts} = 16.9 \text{ms}$, ess =0, steady—state error of the speed is the minimum. Speed regulator PI parameters can be adjusted according to the system's demand for accommodation time, overshoot and steady—state error.

C. The Set of Position loop PI regulator Parameter

$$W_{APR}(s) = \frac{K_P(\tau_P s + 1)}{\tau_P s}$$
, K_p is position regulator

proportional coefficient, and τ_p is position regulator integral time constant. Position controller parameters adjustment is extremely important. Because the position servo system's most important indicator is the accuracy of position. It is helpful to reduce the position offset and adjust the integral time constant to eliminate the position error that increasing the position regulator proportional coefficient as far as possible as long as no volatility[18]. The simulation system model is shown in Figure 4.

Set a certain servo drive controller position default

parameters: $K_{p_{=700}}$, $\tau_{p_{=10}}$, input the given step

signal under the condition of three—ring controller are all adopting the default value. At 0s, step from 0 to 100, 100 is mechanical angle, unit: rad, position simulation waveform is shown in Figure 9. The position dynamic following the performance indicators is concluded: ts



Choose parameter near position regulator PI parameters, through large amounts of simulation experiments, the position of the dynamic following the performance indicators is conclude as shown in table 3.

 t_s is accommodation time, unit: ms, $\sigma_{p\%}$ is Overshoot amount and e_{ss} is position steady—state error.

TABLE III.

POSITION TRACKING PERFORMANCE INDEX FOR DIFFERENT PI PARAMETERS OF POSITION REGULATOR

Kp	500			600			700			800			900		
$ au_{ m p}$	5	10	15	5	10	15	5	10	15	5	10	15	5	10	15
ts	440	430	430	430	430	440	410	400	410	430	420	420	450	440	440
$\sigma_{ m p}^{\%}$	0.35	0.54	0.75	0.31	0.48	0.64	0.28	0.32	0.56	0.25	0.38	0.5	0.23	0.34	0.45
e _{ss}	1.32	0.48	0.72	0.27	0.44	0.61	0.24	0.21	0.52	0.21	0.33	0.45	0.18	0.30	0.41

It is shown in Table 3 that when $K_{p=700}$, $\tau_{p=10, ts}$ =400ms, ess =0.21, position adjustment time is the least,

and when $K_{p=900}$, $\tau_{p}_{=5, ts} = 450$, ess =0.18, the location of the steady-state error is the minimum. The selection of position regulator PI parameters can be adjusted according to the system's demand for accommodation time, overshoot and steady-state error.

V. CONCLUSION

This thesis analyzes the basic principle of threephase ac permanent magnet synchronous motor vector control, establishes the mathematical model of threephase ac permanent magnet synchronous motor, builds up three-phase ac permanent magnet synchronous motor servo control system simulation model based on **SVPWM** simulation the using platform MATLAB/Simulink and does a simulation study on the setting range of current, speed and location of PI regulator parameter. The parameters setting range given by simulation provides a good empirical parameter for using servo driver.

REFERENCES

- [1] Wang Qinglong, Zhang Xing, and Zhang Chongwei, "Double Sliding—mode Model Reference Adaptive System Speed Identification for Vector Control of Permanent Magnet Synchronous Motors," Journal of China Electro Mechanic Process, vol. 34, pp. 897-899, 2014.
- [2] Yao Xiaoxian, Servo System Design. Beijing: China Machine Press, 2013.
- Gao Fengyang, Qin Chao, Zhuang Shengxian, and Dong Weiguang. "Sliding mode variable structure control of PMSM based on novel exponential rate reaching law," [3] Computer Engineering and Applications, vol. 50, pp. 238-242, 2014.
- [4] Li Aiping, Deng Haiyang, Xu Liyun. "Fuzzy PID based PMSM vector contor simulation," Chinese Journal of Construction Machinery, vol. 11, pp. 26–27, 2013 Wang Yanchao, Zhao Xiaopeng, "Design of Flux-
- [5] weaking Control System for Servo Permanent Magnet

Synchronous Motor," *Micromotors*, vol. 48, pp. 98–99, 2015.

- Wang Lin, "Vector Control and Direct Torque Control Technology," Value Engineering, vol. 28, pp. 64-65, [6] 2014.
- [7] Yuan Yi, Chen Boshi, Electricity Pull Automation Control Systems - Motion Control System. Beijing: China
- Machine Industry Press, 2009.
 [8] Luo Wenming, Wang Shaojie, Chen Wei, Li Jixiao, "Simulation Analysis of Permanent Magnet Synchronous Servo Motor Speed System Based on the Fuzzy PI Control," Pattern Recognition and Simulation, vol. 33, pp. 68-69, 2014.
- [9] Li Huade, Li Qing, Bai Jing, Electricity Pull Automation Control System. Beijing: Machinery Industry Press, 2008. [10] Chao Hui, Luo Feng, Zhou Pan, Yuan Yisheng,
- "Simulation R esearch on Maximum Torque per Ampere Control of Permanent Magnet Synchronous Motor,'
- Micromotors, vol. 48, pp. 55–56, 2015. [11] Zhou Yuanshen, Song Yongying, AC and DC speed control system and MATLAB simulation. Beijing: China Electric Power Press, 2007. [12] Ji Mingcheng, "R esearch of Perm anent m agnet
- [12] J. Mingeleng, R. escaler of Ferm and the magnetic synchronous m otor based on space voltage vector constant torque control m ethod," *Design and Development*, vol. 11, pp. 3–5, 2015.
 [13] Nan Lin, Long Xiaohong, Feng Xu, "Position Controller Design of Permanent Magnet Synchronous Motor Based on SynChward understand control control control and the synchronous of the sy
- on SVPWM," *Industrial control computer*, vol. 27, pp. 137–138, 2014.
- [14] Liu Sheng,Qi Lei, Li Bing, "PMSM Space Vector Control Method Design and Implementation," Control Engineering, vol. 16, pp. 247–250, 2009.
- [15] Wang Chunmin, Ji Yanju, Luan Hui, "Simulation of PMS M Vector Control System Based on MATLAB /SIMULI
- NK," Journal of *Jilin University*, vol. 27, pp. 18–19, 2009. [16] Li Yan, "Simulation of asynchronous generators fuzzy direct torque control system based on SVPWM," *Electronic Design Engineering*, vol. 22, pp. 35–36, 2014.
 Wang Yaru, Song Xiaomei, He cheng, "The simulation of hyperblace DC states."
- Journal of Xi'an Polytechnic Uniwersity, vol. 29, pp. 336–369, 2015.
- [18] Li Kang, Zhang Lei, Li Pengfei Jing Junfeng, "Research on a parameter self-turning fuzzy PI control of PMSM," Journal of Xi'an Polytechnic Uniwersity, vol. 29, pp. 328–330, 2015.

Identification Of Spam Microblog Sentiment Based Hierarchical Key—Sentences Model

Wen-Feng Liu

Computer and Information Engineering Department of Heze University, Shandong, China 274015

Abstract—The presence of a large number of spam against microblog data, as used herein, emotional key sentence extraction methods were studied to establish the relevant model; set reasonable parameters, the last generation micro—blog comment emotions summary, according to a summary of the data generated in the identification of spam comments deal with. The experimental results show the feasibility of the approach.

Index Terms—Microblog Comments; Key—Sentence; Spam;Sentiment Analysis

I. INTRODUCTION

Analysis and processing of emotional tendencies microblog comment for safeguarding national stability, grasp attitudes and timely response to the public network public opinion has great significance. Microblog contains a user event for emotion, emotional attitude toward containing the contents of microblog expression, opinion and evaluation on the microblog comment for rapid extraction and analysis summary emotions, behavior can be a good mining law network groups. By fluctuation analysis, enabling the network to monitor abnormal or emergency help to improve and perfect the Internet public opinion monitoring system; and to provide timely and effective information on the functional departments. It has great significance for maintaining national stability and security, to avoid unreasonable group events.

II. THE STATUS OF RESEARCH

Some experts and scholars to introduce the idea of graph theory screened abstracts and emotional feelings among the key sentence. Mihalcea R. In [1], his main idea is to first build a graph that each sentence is a node, right on the edge between nodes weight is calculated through the respective two similar sentences degree, while pointing to a sequence sentences appear; then adopt the sentence ordering graph-based sorting algorithm HITS and PageRank, which represents the sort of result the importance of the sentence. Varadarajan R. and Hristidis V. In the literature [2] is also used the method based on the graph, but the vertices used to represent text blocks, rim reason to express the relationship between the text blocks, by calculating the TF--IDF values Methods node weights set. Finally, they used the largest spanning tree diagram to generate a summary text.

In the [3], LDA model using a hierarchical level as the subject word to express a theme, each sentence distribution in three themes, eg. background vocabulary distribution, content distribution, and document distribution vocabulary. Using Gibbs Sampling obtains model parameters to KL divergence select sentence, and add a sentence with the greedy algorithm.

In the [4] that studied the supervised learning method in a multiple document text summary of emotion in ROUGE value achieved significant improvement. In the [5] which proposed a level of emotional chapter for key sentence extraction method, and learning through the integration of key sentence judgment emotional polarity to achieve the emotional key sentence extraction and automation polarity discrimination, and has good results.

III. ABOUT MY JOB

Current research microblog automatic text summary extracted mainly emotional tendencies of most users, the study microblog spam comments less. How to extract or filter out spam classified information processed in the mass of microblog review, it is an urgent problem.

For now there are a lot of micro—blog comments spam, the lack of explicit definition of the program, resulting in the presence of a large number of pseudo relationship, seriously interfere with the extraction of valid topic, this topic is presented based on the microblog topics related to spam identification methods.

Dynamic spam dictionary build is a very important element. Microblog comment contains a large number of irrelevant comments, or there are a lot of pseudo relationship between advertising, friends and other information, as well as these comments, these extraneous information affect our comments on Weibo correct analysis and extraction. Due to spam comment widespread, and those who deliberately evade spam comment spam detection rule, resulting in the proliferation of spam comments. Therefore, in order to correctly grasp the microblog and spam processing emotional information, it is necessary to establish an effective spam dictionary. Establish reasonable and effective spam dictionary is the basic content of the subject.

The key issue from the micro—Bo emotion emotional summary sentence as a starting point, the subject comes to microblog pre—text content, text sentence evaluation object extraction, extraction emotional words and sentences and generating emotion emotional polarity summary judgment based on emotion and other key sentence research content.

A. machine learning methods

Due to the huge amount of data microblog comment, that using the traditional statistical methods cannot extract an effective "knowledge", the subject of the use of
machine learning method, first efficient use of machine learning algorithms for clustering data collected on clustering The results were evaluated. Microblog emotion extracted key sentences, with automatic generation method summed up the emotional summary of microblog. It provides an important basis for the spam recognition and public opinion analysis. The theory and practice of machine learning algorithms are required as a support.

B. artificial labeling and standard data collection research methods training methods and improved algorithm

In order to increase research methods and results rigor and reliability, this paper reviews the use of the Seventh Chinese propensity analysis (COAE2015) published standard data set. At the same time, by three experts in the field of emotion on the part of the data set Abstract artificial label and extract key sentences microblog emotion, as a result of using the best standard training algorithm, using machine learning methods for these data sets for training. According to the results the error rate to improve and optimize algorithms. The use of training algorithm test and eventually provide support for the extraction algorithm microblog comment emotion emotional key sentence summary. According to the summary to determine that is spam or not.

C. Natural Language Processing Method

This issue is data processing microblog platform in the Internet, a lot of these colloquial, personalized, free of data analysis and processing depends on natural language processing methods. Natural language processing includes natural language understanding and natural language generation in two parts. History of natural language of understanding studied more, but natural language generation study less. This coincides precisely with this issue, through the data on the micro—Bo will be "understanding", and then on the micro—blog content "Generate" emotion based on emotion key summary sentences..

IV. DEALING WITH SPAM BASED KEY SENTENCE EXTRACTION

In order to express the emotional relationship between the sentence and the sentence, we introduce the concept of transition probability. In order to express the emotional relationship between the sentence s_i and the sentence $s_{j,i}$ the transition probabilities represented by the following formula :(formula—1)

$$p(i \rightarrow j) = \frac{f(i \rightarrow j)}{\sum_{k} f(i \rightarrow k)} \quad (1)$$

In formula—1, the numerator represents the sentence relating to the similarity between i and j sentence, the sentence i and the denominator represents all other possible relevant sentences and similarity. The ratio between the sentence s_i and the sentence s_j is used transition probabilities. Not difficult to see from the formula, i and j transition probabilities sentence is the key similarity calculating sentences i and j, we calculate this value by extending each sentence feature vector mode.

In order to more effectively consider the impact of the emotional key sentence, the subject attempts to add emotional factor Q_{ij} , by judging whether the sentence with emotion, with emotion if you add an "emotional" feature in the sentence feature vector. "Emotion" feature to add significant weight to 0. Improved following formula (formula 2):

$$p(i \rightarrow j) = \frac{f(i \rightarrow j, Q_{ij})}{\sum_{k} f(i \rightarrow k_{ik})}$$
(2)

By adding the "emotion" feature, enabling two sentences more closely linked with emotion, the same degree of influence of two same polarity of emotion sentence is also higher, according to the calculation result of the formula, emotional sentences i and j similarity also increased, the probability of such a sentence as emotional key sentence is high.

 $f(i \rightarrow j)$ is similarity of sentences i and sentence j, we use cosine similarity as a similarity algorithm: (formula 3)

$$f(i \rightarrow j) = \frac{s_i s_j}{|s_i| |s_j|}$$
(3)

If there is a relationship of two sentences, the transition probabilities of the two sentences greater than 0, using $f(i \rightarrow j) = 0$ to avoid transfer between themselves, but under normal circumstances, $f(i \rightarrow j)$ is always not equal with $f(j \rightarrow i)$.

In order to generate effective emotional summary of key sentences based microblog emotion, we use a hierarchical mechanism, we were divided into three layers, namely, cluster level, sentence level and the expansion level. We integrate information and emotion information about topics, consider the relationship between sentences and clustering, emotional relationship between sentences and other information.



Figure 1 models based on emotional information

In the model for the expansion of the upper layer, the middle of a sentence layer, the bottom is layer clustering. Cluster centers and emotion information is the central node, and the sentence is authoritative node. Theme through clustering algorithm clustering, clustering central theme obtained clustering of sentences emotion detection, and then extended feature vector space. Through Optimal few sentences for processing, and then construct the microblog emotion emotional summary of key sentences. (formula 4):

$$Hub^{t+1}(s_{i}) = \sum_{c_{j} \in C} Auth^{t}_{cluster}(c_{j}) + \sum_{o_{j} \in O} Auth^{t}_{opinion}(o_{j}) + \sum_{r_{j} \in R} Theme^{t}_{related}(r_{j})$$
(4)

 $Hub^{t+1}(s_i)$ is the value of the sentence of t+1 times, $Auth_{cluster}^t(c_j)$ is the value of themes related to the value of the t—th cluster center node, $Auth_{opinion}^t(o_j)$ is the value of t times emotional information, Theme^t_{related}(r_j) is between sentences of t times. The formula used to calculate the above model.

VII. EXPERIMENT

Based on the analysis of the characteristics, namely the first sentence usually contains the most important information directly select sentence as the topic sentence. This method is particularly simple and, in some cases with good results, but obviously will be affected by the wording of. Title rich amount of information, so you can use the title to find the most similar sentence reported as topic sentences. In this paper, the vector angle cosine similarity calculations. The title of the first sentence and appropriately increase the weight.

In this paper, we use COAE2015 published datasets, We use the datasets of task 3,which contains HOTEL,PHONE and RESTAURANT.In each area we choose the 1000 micro—blog comments. 500 as the training sets,500 as a test sets.

Table-	-1	our	experimental	results
1 4010		our	enpermientu.	rebuilt

A.maa	Dunginian	Dagall	E magazina	A
Area	Precision	Recall	r-measure	Accuracy
HOTEL	0.97	0.73	0.83	0.86
PHONE	0.92	0.87	0.89	0.88
RESTAURANT	0.95	0.67	0.79	0.82
AVERAGE	0.94	0.76	0.84	0.86

Tabl	e-2	medium	results

Area	Precision	Recall	F measure	Accuracy

HOTEL	0.71	0.60	0.73	0.74
PHONE	0.92	0.78	0.85	0.84
RESTAURANT	0.85	0.68	0.67	0.66
AVERAGE	0.86	0.64	0.70	0.75

Table—1 is our experimental results, Table—2 is the Official medium results. Seen from the table, my results far exceeded the average, demonstrate the feasibility of our approach. But in different areas of precision and recall rates are very different, that our approach has some extent dependent on the field.

VII. CONCLUSION

This paper presents a micro—Bo emotion based on hierarchical key sentence spam configuration program for building emotion Summary of key sentences based on emotion. This project focused on the microblog comment microblog platform in a large number of reviews information, how quickly and efficiently extract the relevant information in the comment information, and irrelevant comments identified as spam issues research. Research results can be applied to the analysis of public opinion microblog, microblog opinion mining, spam comment filtering and so on. The main work of the next step, the integrated use of deep learning methods, the method is further optimized and improved.

REFERENCES

- Mihalcea.R.." Language independent extractive summarization" //Proceedings of the ACL 2005 on Interactive poster and demonstration sessions. Association for Computational Linguistics, 2005:49—52.
- [2] Varadarajan R., Hristidis V.. "A system for query specific document summarization"//Proceedings of the 15th ACM international conference on Information and knowledge management. ACM,2006: 622—631
- [3] HaghighiA, Vanderwende L. "Exploring content models for multi—documentsummarization"//Proceedings of Human Language Technologies: The 2009 Annual Conference of the North American Chapter of the Association for Computational Linguistics. Association for Computational Linguistics, 2009: 362—370.
- [4] Li Yan—cui. et al," supervised learning method based on a multi—document text emotion Abstract", *Chinese Information Technology*, 2014.11 (6): 143—149
- [5] Zhao Hong—jie., et al, "news—oriented emotion key sentence extraction and polarity discrimination", *Shanxi University (Natural Science)*, 2014, 37 (4): 588—594
- [6] Liu D., Wang Y., Liu C., et al.."Multiple documents summarization based on geneticalgorithm"//Fuzzy systems and knowledge discovery. Springer Berlin Heidelberg, 2006:355–364.
- [7] Wan X., Yang J.."Multi—document summarization using cluster—based link analysis"//Proceedings of the 31st annual international ACM SIGIR conference on Research and development in information retrieval. ACM, 2008: 299—306.

Transfering Phenomenon Polar Research Based On User Reviews Of Emotion

Wen-Feng Liu

Computer and Information Engineering Department of Heze University, Shandong, China 274015

Abstract—Through reviews of users online personalized, colloquial, loose structure of grammar, and negative emotion words, also including overlapping of emotional words, this paper proposed a polar shift model that a lot of emotional words overlap, according to the conventional method only the number of negative words repeatedly reversed, effective solution to the reversal of the traditional limitations brought negative words, compared with the traditional way greatly improved.

Index Terms—sentiment analysis; microblog comments; SVM

I. INTRODUCTION

Sentiment analysis in the field of natural language processing research received a significant development, and linguistic phenomena associated expression is one of the important tasks, such as emotional transfer phenomenon, affecting the final result of sentiment analysis. However, sentiment analysis of linguistic phenomena such automatic identification is a very challenging task. Internet gradually promote usercentric, user actively involved in open architecture philosophy. Internet users simply by a simple reading of the page, the page turning publish, comment interactive Internet age. Polar shift structure, for example, the package quality is good, but the color is too brilliant for that. "But," turn the sentence polarity. In the Internet age, people are more inclined to express their views and feelings on the network, also there are a lot of text with emotional bias on this network, so emotional textual analysis requires special emotion expressed by the document Sex for analysis.

II. THE STATUS OF RESEARCH

Sentiment analysis since 2002 by the Pang et al [1], although obtaining a large degree of research, especially in the online reviews of emotional orientation analysis achieved great development. Text emotional polarity classification exists a notable feature is the relevance of the text in different areas represent areas of emotion emotional way the text is different, consider a situation in many fields is the "adaptation field" problem. More and more are turning to research work in this area. Adaptability is an emerging hot spot areas in sentiment analysis, and the main difficulty is how to find the mapping between the two areas from the feature vectors perspective, it is how to find the corresponding feature between the two areas of the question relationship. Adaptability research on sentiment analysis begins Blitzer et al [2], and the introduction of SCL (structural Correspondence Learning). In[3] proposed alignment algorithm features SFA (Spectral Feature Alignment), with Domain—Independent word as a bridge, the term given to the different areas of their fields into a unified Cluster, in order to find the mapping between different fields between the features . [4] by inference structure inspired by semantic components incorporated into the learning process. Experiments show that this combination can improve the accuracy of sentiment analysis of machine learning methods.

But these are the traditional text, the text due to less product reviews, and there are a lot of emotional words overlap, need to improve the way the traditional text.

III. CONSTRUCTION POLARITY TRANSITION MODEL

A. Trigger vocabulary

Firstly, rule—based approach, the application of the appropriate trigger word list, for each emotion polar shift structure made of different types of automatic feature detection; at the same time, the transfer of corpus—based emotional polarity marked on the binding step, based on statistical machine learning method validation Automatic feature detection. As part of the concept of subjective expression language, we need to use some of the subtle intricacies of speech and expression in multiple languages. This is why the concept of automatic learning needs fine—grained expression language analysis techniques, and the results of a large number of research—based learning method or rule system features extraction machine, but this result is not very satisfactory display.

So the need for pre-sentence internal emotional words.

Examples 1, "No, no I like to listen to the song." If you follow the reversal effect of negative emotion words, due to the negative word number is an odd number, the machine learning to understand as I do not like to listen to songs.

Examples 2, "No, no I do not like to listen to the song." If you follow the reversal effect of negative emotion words, due to the number of negative words is an even number, the machine learning understood as I like to listen to songs.

Examples 3, "I am very, very fond of listening to the songs." Corresponding prepared statements should be, "I really like to listen to the song."

Examples 4, "they say the book is good, but I do not like." According to the evaluation objects and evaluation of the word "I" attitude is negative direction. Those words caused polar trigger metastasis are divided into two categories: the sentence—based transfers (such as: 'not', 'never', etc.) and comments based transfers (such as: 'but', 'however', etc.). Therefore, we want to build a negative polarity modified Thesaurus and Thesaurus.

B.vector space representation

Each document is represented by D (Document); feature items (Term, represented by t) is pointed out that the document D, and is now able to represent the basic unit of language content of the document is mainly composed of the word or phrase, you can use the text feature items Set expressed as D (t1, t2 ..., tn), n is the number of feature item, for example a document in a, b, c, d, e, f features a total of six items, then this document can be expressed as D (a, b, c, d, e, f). N features for text containing items, usually give a certain weight to each feature item weight to indicate their importance. Wi Ti respectively corresponding to the weight, the value of i from 1 to n. In the vector space model, the cosine of the angle between the two texts correlation between the content of Sim (D1, D2) commonly used in vector representation.

$$Sim(D1, D2) = \frac{\sum_{k=1}^{n} W_{1k} \times W_{2k}}{\sqrt{\left(\sum_{k=1}^{n} W_{1k}^{2}\right) + \left(\left(\sum_{k=1}^{n} W_{1k}^{2}\right)\right)}}$$
(1)

Where, n is the number of features, ranging from k is [1, n], W_{1k} is in D_1 features an integrated feature weights to the value, W_{1k} is in D_1 features an integrated feature weights to the value.

A feature information gain actually describes it contains properties that can help predict the category of information. In theory, the information gain is the best feature selection methods, but in fact a lot of information gain is relatively high due to the characteristic frequency of often relatively low, when the number of features selected using information gain relatively small, often sparse data problems exist In this case the effect is relatively poor classification. Therefore, to achieve some systems, the first of each word appearing in the training corpus to calculate the information gain, and then specify a threshold, removing those below this threshold information gain entry from the feature space, or specify the characteristics to be selected The number, in order of descending gain selection feature composed of eigenvectors.

$$Gain(t_i) = Entropy(S) -$$

$$ExpectedEntropy(S) = \{-\sum_{j=1}^{M} P(C_j) \times$$

$$\log P(C_j)\} - \{P(t_i) \times [-\sum_{j=1}^{M} P(C_j | t_i) \times$$

$$\times \log P(C_j | t_i)]P(\bar{t}_i) \times [-\sum_{j=1}^{M} P(C_j | \bar{t}_i) \times$$

$$\times \log P(C_j | \bar{t}_i)]\}$$
(2)

Where, $P(C_j)$ represents the probability C_i that issue appear in the corpus $P(t_i)$ represents the probability that a document feature item t_i that corpus contains, $P(C_j|t_i)$ indicates C_j conditional probability that document contains feature item t_i belongs, $P(t_i)$ represents corpus does not contain a feature item ti probability document, $P(C_j|t_i)$ indicates that the document does not contain feature item t_i that the conditional probability of belonging C_j , M is the number of categories.

Corpus each polarity shift occurred sentence are used to mark the following vector formats:

(1) in — sentence: When the polarity of the transfer phenomena occur within a sentence when

<Type, emotional words, causing trigger word polar shift of>

(2) between the sentences: When the polarity of the transfer phenomenon through multiple sentences, this major transition phenomena in contrast to more

{Type, [transfer before the sentence], [after the transfer of the sentence], emotional words, causing trigger word polarity transfer}

Two forms together contain the three component elements. The first component is the type of sign, indicating the type of information.

C. topics related to model representation

For a given sentence, first determine whether the late topic, irrelevant if not marked otherwise determine whether the sentence is subjective sentence, if the sentence is subjective, and further to determine whether it contains polar, if it does not contain polarity callout. Also need to determine whether it is the fact that the polarity of the sentence, the sentence refers to the fact that the polarity of a comment period, although not subjective sentence, but implicitly express an emotional polarity, such as "My phone every day collapse", obviously this is not a It expected and, therefore, implicitly expressing a negative emotion.

We need to extract commentators view, the evaluation object, the evaluation term evaluation of these four attributes polarity. Views commentators evaluate holder; Evaluation word is the attitude of the evaluation object, we evaluated by using dictionary and thesaurus assist extraction; Evaluation polarity is the view of commentators emotional attitude to the evaluation object, we use 1 represents the forward positive attitude, with 0 negative, negative attitude.

Such as, "It is a good book that leaves you feel happy."

Examples marked Results: <Sentence> It is a good book that leaves you feel happy. <Evaluation—of— Objects: "book", Emotional Words: "good" Polarity: "1" /> </ Sentence>

In marked results, marked by a four—tuple information represented respectively represent the views of commentators, the evaluation object, the evaluation term evaluation of emotional tendencies. Listen, the evaluation object is a 'book'; evaluate the words as 'good'; evaluation polarity is 1, this evaluation expresses a positive emotional tendencies.



i igure i moder structure

VII. EXPERIMENT

We collect electronic products from Taobao user reviews, after pretreatment, to retain 2000 user reviews, transfer phenomenon within the 1000 sentence, the sentence between 1000 transferred comment. Conduct commentators view, the evaluation object, the evaluation term evaluation of emotional tendencies extracted four attributes. Vector space usage will be represented. We put 50% of the data of each part of the training set 10% as the development set 40% as the test set. Since SVM classification method has a good effect, we use SVM classifier, we use IIBSVM toolkit. By using the polar and non—polar metastasis model metastasis model were compared. By the results it can be seen in Table 1, to consider the issue of the transfer polarity results clearly in a dominant position.

Table-1 the experimental results

Polarity transition model	recall	accuracy	F—value
used	78.8%	80.4%	78.6%
unused	50.3%	53.7%	52.0%

VII. CONCLUSION

This paper documents the full analysis of corpus linguistic phenomenon, consider the emotional polarity shift in user comments affect polar, mainly based on local sentiment words polar relations and global paper analyzes the cause polar shift expression trigger word, established the corresponding model. Because users online review statement highly personalized, can not simply be treated with a written text language sentiment analysis. We need to be modeled statement users online reviews. Since the Chinese metaphor is very common, such as "You're great!" In different contexts, it may express a completely different meaning. The next step that we should consider the impact on Chinese Metaphor of user comments.

In future work, we will explore better Way produce less noisy polar shift Training data. In addition, because our approach Language—dependent, it is very easy to apply Emotional classification tasks other languages. In future work, we should give full consideration to the language—independent, improve our models.

REFERENCES

- Pang B.,Lee L.,and Vaithyanathan S."Thumbs Up?Sentiment classification Using MachineLearning Techniques".In Proceedings of EMNLP—2002.2002:79— 86.
- [2] Blitzer J.,Dredze M.,and Pereira E Biographies, Bollywood."Boom—boxes and Blenders:Domain Adaptation for Sentiment Classification". In Proceedings of the ACL—2007
- [3] Pan S.,Ni X.,Sun J.,Yang Q.,and Chen Z."Cross—Domain Sentiment Classification Via Spectral Feature Alignment".In Proceedings of the WWW — 2010.2010: 751—760.
- [4] Chio Y, and Cardie C."Learning with Compositional Semantics as Structural Inference for Subsentential SentimentAnalysis". In roceedingsofEMNLP — 2008.2008: 440—447.
- [5] Jia L.,Yu C.,and Meng M."The Effect of Negation on Sentiment Analysis and Retrieval Effectiveness". In Proceedings of the CIKM—2009.2009:1827—1830.
- [6] Wiegand M.,Balahur A.,and Roth B."A Survey on the Role of Negation in Sentiment Analysis". In Proceedings of the Workshop on Negation and Speculation in Natural Language Processing—2010.2010:60—68.
- [7] Na J.,Sui H.,Khoo C.,Chan S.,and Zhou Y."Effectiveness of Simple Linguistic Processing in Automatic Sentiment Classification of Product Reviews".In Proceedings of the ISKO-2004.2004:49-54.
- [8] Kennedy A.,and Inkpen D."Sentiment Classification of Movie Reviews using Contextual Subsentential Sentiment Analysis". In Proceedings of the MNLP—2006.2006:793— 801.
- [9] Ding X.,Liu B.,and Yu p."A Holistic Lexicon based Approach to Opinion Mining".In Proceedings of the WSDM—2008.2008:64—7 1

Efficient Implementation to Floyd Arithmetic Based on Traffic Network

Lijin.Guo, Xuesi.Cao, Jiefei.Duan and Bailing.Song Tianjin Polytechnic University, Tianjin, China

ABSTRACT—Issue of the optimal path is the key point of traffic network, Floyd is the common algorithm to seek for the optimal path between any of two nodes in the network. Because the Time—complexity of Floyd is $o(n^3)$, Floyd is not suitable for the traffic network with too many nodes. This paper gives the optimized Floyd and offers the specific method, which is applied to the traffic network without negative loops. the experiment proves that ,compared the Floyd, the optimized Floyd algorithm can seek for the optimal path in a shorter time.

Index Terms—Floyd arithmetic, Optimal path, traffic network.

I. INTRODUCTION

The purpose of the intelligent traffic network is to reduce the traffic jam, traffic accidents and environmental pollution with high efficiency. Intelligent traffic network is studied by many scholars and research institutions home and abroad, which are authorities in those fields like traffic network and IT, system science and engineering applications. Thus intelligent traffic network has a good prospect.

Some practical context with different network features, application requirements and concrete software and hardware, caused the algorithms with various space complexity and time complexity applied to different situations. Those algorithms can deal with the issue of choosing the optimized path with specific feather, and have a limited range of application.

The real—time change of traffic situation make the optimized path dynamic. the continued calculation with high efficiency is needed to determine the optimized path. The efficiency of algorithm is vital to those calculations. Paper will study the Floyd applied to traffic network and find the optimized path.

II. FLOYD ARITHMETIC

A. Algorithm basic idea

Floyd, a classical algorithm, is realized by the adjacent matrix. the basic idea of the Floyd: Assuming that there is a directed and weighed graph G = (V, E) with n vertices and no negative loop, the question is to find out the optimal path between each pair of vertices. The corresponding weighted adjacent matrix is expressed by W[N][N]. If there is a path, not the shortest one between V_i and V_j . Try to add a vertex as intermediate vertex between them, if the distance of (V_i, V_k, V_j) is shorter than the (V_i, V_j) , use the new path replace the old one. If the weigh of (V_i, V_k, V_j) is greater than (V_i, V_j) , the value of W[i][j] stay same. And choose another vertex as a new one to repeat the same operation ,until all the vertex except the V_i and V_j have the same operation. The result after all the operation is a matrix sequence $W^{(k)}[N][N](k = 0, 1, 2, \dots, N-1)$. The initial adjacent matrix W[N][N] is taken as $W^{(-1)}[N][N]$, it offers the value of weigh between each pair of vertex. $W^{(k)}[N][N](0 \le k \le N-1)$ offers the weigh value of the optimal path ,noticed that

the index of each middle vertices less than k. $W^{(N)}[N][N]$ offers the weigh value of the optimal path including all the vertices.

For getting the optimal path between each pair of vertices, matrix path is used to record the concrete paths. $path^{(-I)}$ gives the directed path, and $path^{(N-I)}$ gives the optimal path between each pair of vertices. $path^{[I][J]}$ stores the precursor vertex of V_j . The traditional Floyd can be expressed as follow: a)



the end.

B. The bottleneck of Floyd

Floyd consists of the initialization and triple loops. and the time complexity is O(N3), apparently, Floyd needs to promote the time complexity. and the promoted Floyd can be adjusted automatically. the triple loops is the bottleneck for the practical application of Floyd. The efficiency of Floyd can be promoted by reducing the loops. the implementation process is illustrated by the following example : Example:

$$\begin{array}{c} \text{Example.} \\ G_{I} = \{V, E\} \\ V = \{V_{0}, V_{1}, V_{2}, V_{3}, V_{4}\} \\ \text{E} = < V_{0}, V_{1} > < V_{0}, V_{2} > < V_{0}, V_{3} > < V_{1}, V_{3} > < V_{2}, V_{1} > < V_{2}, \\ V_{4} > < V_{3}, V_{2} > < V_{3}, V_{4} \end{array}$$

FIGURE 1. The weighed and directed Graph Calculation process as follows :

aiculatio	յու	proc	1033	as	1011	10WS.						
	0	12	5	15	×		0	1	2	3	4]	
	~	0	∞	4	s		0	1	2	3	4	
$W^{(-1)} =$	~	16	0	x	3	$path^{(-1)} =$	0	1	2	3	4	
	~	×	8	0	5		0	1	2	3	4	
	∞	×	×	x	0		0	1	2	3	4	
	0	12	5	15	~		0	1	2	3	4]	
	~	0	s	4	×		0	1	2	3	4	
$W^{(0)} =$	~	16	0	×	3	$path^{(0)} =$	0	1	2	3	4	
	∞	×	8	0	5		0	1	2	3	4	
	∞	∞	∞	∞	0		0	1	2	3	4	

	0	12	5	15	~		0	1	2	3	4]	
	~	0	∞	4	∞		0	1	2	3	4	
$W^{(1)} =$	~	16	0	20	3	$path^{(1)} =$	0	1	2	1	4	
	~	s	8	0	5		0	1	2	3	4	
	∞	s	×	so	0		0	1	2	3	4	
	0	12	5	15	8		0	1	2	3	2]	
(2)	~	0	ŝ	4	∞		0	1	2	3	4	
$W^{(2)} =$	∞	16	0	20	3	$path^{(2)} =$	0	1	2	1	4	
	~	24	8	0	5		0	2	2	3	4	
	∞	∞	∞	x	0		0	1	2	3	4	
[0	12	5	15	8		0	1	2	3	2]	
	x	0	12	4	9		0	1	3	3	3	
$W^{(3)} =$	∞	16	0	20	3	$path^{(3)} =$	0	1	2	1	4	
	∞	24	8	0	5		0	2	2	3	4	
	×.	x	∞	×	0		0	1	2	3	4	
[0	12	5	15	8]		0	1	2	3	2]	
	∞	0	12	4	9		0	1	3	3	3	
$W^{(4)} =$	00	16	0	20	3	$path^{(4)} =$	0	1	2	1	4	
	∞	24	8	0	5		0	2	2	3	4	
	_∞	00	x	x	0		0	1	2	3	4	

III. SOLUTIONS FOR SOLVING BOTTLENECK

A. Analysis of the implied conditions

Some implied conditions can be found through analysis the main job of the triple loops. assuming the middle vertex is V_k . The first loop implies that the values of in—degree and out—degree of V_k , k=0, 1, 2, 3, 4 are not zero. The second implies that $\langle V_i, V_j \rangle$, the middle vertex is V_k , and $i \neq k$, $W[i][k] \neq \infty$. the third implies that : $\langle V_i, V_j \rangle$, the middle vertex is V_k , and $i \neq k$, $W[i][k] \neq \infty$. the third implies that : $\langle V_i, V_j \rangle$.

B. Rectangular algorithm

Through the analysis of the A, rectangular algorithm is created based on Floyd .and the new algorithm is understand easily and intuitive. The core idea of the rectangular algorithm is to build a set of rectangular with vertices.



The calculation process as follows :

In Figure 1, The in—degree of V_0 is zero, so V_0 must not the middle vertex. and $W_1 = W_0 path^1 = path^0$, W^2 and $path^2$ can be gained through rectangular algorithm k = 1, so the second line and the second row of W^2 and W^1 have the same value. W[1][3], W[1][4], W[1][5], W[3][1], W[3][4], W[3][5], W[4][1], W[4][3], W[4][5], W[5][1], W[5][3], W[5][4] need to gain through calculation, and the value of W[2][1], W[2][3], W[2][5] is ∞ . when V_1 is the middle vertex, W[1][4] and W[3][4] are just gained. As shown in Figure 3.



FIGURE 3. Filter element weights

In Figure 3, the elements on the line stands for the weights of vertices when V_1 is taken as the middle vertex . those elements on the line in W_2 and W_1 have the

same value .

A rectangular is needed to create in W1 to gain the W[1][4], the upper left corner of the rectangular is W[1][4], the lower right corner should be W[2][2]. The constructed graph is shown in Graph 4.and $W[1][4] = MIN(15,4+12), W[3][4] = MIN(\infty, 4+16)$, shown in Figure 5. W^2 , path² can be gained.

	0	12	5	15	∞]		0	1	2	3	4]
	~	0	∞	4	s		0	1	2	3	4
$W^2 =$	×	16	0	20	3	$path^2 =$	0	1	2	1	4
	~	x	8	0	5		0	1	2	3	4
	x	x	×	x	0		0	1	2	3	4

Rectangular algorithm get the same result compared the traditional Floyd with a better time complexity .To sum up, for the weighted directed Figure 1, the execute times of statement 1 in triple loops will decrease from 5^3 to 14 times, whole execution frequency decrease by 88.8%.





C. Floyd algorithm to optimize

The purpose of analysis the implied conditions of Floyd ,and the introduction of rectangular algorithm is to promote the Floyd . the main job of optimized the traditional Floyd is to reduce the loops .

Auxiliary queue is created to store the index of vertex ,and the in—degree and out—degree of vertex are not zero. When the total number of nodes is not zero in the auxiliary queue, top node can be taken out and get the index of vertex . the optimized process as follows :

	0	12	5	15	×		0	1	2	3	4]	
	x	0	00	4	x		0	1	2	3	4	
$W^{(1)} =$	∞	16	0	20	3	$path^{(1)} =$	0	1	2	1	4	
	∞	∞	8	0	5		0	1	2	3	4	
	_∞	x	x	s	0		0	1	2	3	4	
	0	12	5	15	8		0	1	2	3	2]	
	x	0	∞	4	×		0	1	2	3	4	
$W^{(2)} =$	~	16	0	20	3	$path^{(2)} =$	0	1	2	1	4	
	~	24	8	0	5		0	2	2	3	4	
	∞	∞	∞	∞	0		0	1	2	3	4	
	0	12	5	15	8		0	1	2	3	2]	
	x	0	12	4	9		0	1	3	3	3	
$W^{(3)} =$	x	16	0	20	3	$path^{(3)} =$	0	1	2	1	4	
	~	24	8	0	5		0	2	2	3	4	
	x	x	x	s	0		0	1	2	3	4	

For the second and third loops it is useful to use the specific data structure to record the information of each node, and each data structure is set as follows:

typedef struct vertex { int outdegree; Int indegree;

LinkQueue* queue; LinkList* list; }Vertex;

The informal expressions of optimized Floyd algorithm:

Enter: G = (V, E).

Output: matrix W and matrix path, W stores the weigh of the optimal path, path stores the optimal path

Y٢.	milar pain								
	id		queue		list				
	1		NULL		3				
	2		NULL		1	3	4		
	3	0	1	2	1	2	1		

Begin:

a)

initialization : *W*[*N*][*N*], *path*[*N*][*N*], vertex[*N*];

b)

Define *queue*; If

 $vertex[i].outdegree \neq 0$ and $vertex[i].indegree \neq 0$ Do

Put the node *i* into *queue*;

WHILE queue is not empty DO

Draw the first element k from the known queue; WHILE vertex[k].queue is not empty DO

Draw the first element u from the known vertex[k].queue;

For
$$i := 0$$
 to $vertex[k]$.list —>length

Draw the i — th element from the known *vertex*[k].*list*, denoted *v*;

If
$$u \neq v$$
 Then
If $W[u][k] + W[k][v] < W[u][v]$ Then
If $W[u][v] == \infty$

Then

If u > k Then Put the node

v into *vertex*[*u*].*list*;

If
$$v > k$$
 Then
Put the node u into
 $vertex[v].queue;$
 $W[u][v] = W[u][k] + W[k][v];$
 $path[u][v] = k;$

d)

the end.

The process information of Figure 1 as follows :

ΓABLE IV.	INFO	DRMATION WI	THOUT INSERTING VERTEX
id	que	eue	list
1	0	2	3

1	0		2	3				
2	0		3	1			4	
3	0		1	2			4	
TABLE V.	. INFORMATION WITH INSERTING VERTEX V1							
id			li	st				
1		3						
2		NULL	,	1	3	3	4	
3	0	1	2	2			4	
TABLE VI.		INFORM	MATION W	ITH INSE	RTIN	G VI	ERTEX V2	
id		queue		list				
1		NULL	,		3	3		
2		NULL		1	3	3	4	
3		NULL	,	1	2	2	4	

IV. EFFICIENCY ANALYSIS

Assuming that the directed graph can be illustrated by adjacent matrix, and the in—degree and out—degree of each vertex can be gained through calculation .and then initiate the auxiliary queue . each vertex can be initiated by a specific function .the time — complexity of the promoted Floyd is $O(n^2)$.

Assuming the total number of vertices (both in — degree and out — degree are not zero) is $m, m \le n$; the

numbers of edges is *I* in average, $I = A/m(I \le n - 1, A)$ means thetotal number of vertices). the accessible vertices of each vertex is O = B/m ($O \le n - 1, B$ means the total number of Accessible vertices). so the execute frequency of getting all the shortest path between all the vertices is AB/m. the time—complexity of promote Floyd is $O(n^2 + AB/m)$.

Thus, the optimized Floyd will make adjustment dynamically according to the vertices with specific features. Now assuming that the biggest number of vertices whose in — degree and out — degree are bigger than zero is n. because the out — degree in average in traffic network less than or equal 4, the estimation is reasonable that the number of edges of traffic network with n vertices is 4n. A comparisons between the traditional Floyd and promoted Floyd shown below, and it is easy to see the promoted one is better than the old one.

As shown in table v, the optimized statement execution frequency Floyd algorithm is far less than the traditional Floyd algorithm.

ABLE	VII.	A COMPARISON BETWEEN TRADITIONAL FLOYD
	ALG	FORITHM AND OPTIMIZED FLOYD ALGORITHM

л	AEGORITIM AND OF TIMIZED I LOTD AEGORITIM									
Ν	frequ	iency	compare							
	Algorittm1	Algorittm 2	Algorittm 2/							
			Algorittm 1							
50	125000	34914	0.279312							
100	1000000	267342	0.267342							
150	3375000	977264	0.289560							
200	8000000	1879581	0.234948							
250	15625000	3741117	0.239431							
300	27000000	6131300	0.227085							
350	42875000	12251122	0.285740							
400	64000000	16993512	0.265524							
450	91125000	25695043	0.281976							
500	125000000	28684686	0.229477							

V. CONCLUSION

This paper studies the practical application of promoted Floyd in traffic network, and expresses a train of thought of promoting the Floyd. Depend on the theoretical analysis and practical test, the superiority of the new Floyd is proved in dealing with the issue of getting the optimal path. Noticed that the decrease of execute efficiency is at the cost of extra space.

REFERENCES

- Wei D. "An Optimized Floyd Algorithm for the Shortest Path Problem", J.Journal of Networks, 2010.
 Biedl T, Held M, Huber S, et al. "A simple algorithm for
- [2] Biedl T, Held M, Huber S, et al. "A simple algorithm for computing positively weighted straight skeletons of monotone polygons", J.Information Processing Letters, 2015, 115:243 - 247.
- [3] Edmonds N, Breuer A, Gregor D, et al. "Single—source shortest paths with the parallel boost graph library", J.The shortest path problem, 2009:219—248.
- [4] Wang Z, Xiao D, Li W, et al. "A DNA procedure for solving the shortest path problem", J. Applied Mathematics and Computation, 2006, 183(1):79 - 84.
- [5] L. Lima Pinto and Marta M.B. Pascoal, "On algorithms for the tricriteria shortest path problem with two bottleneck objective functions", J.Computers and Operations Research, vol. 37, no. 10, pp. 1774–1779, 2010.
- [6] L. Pinto, C. Bornstein, and N. Maculan. "The tricriterion shortest path problem with at least two bottleneck objective functions", J. European Journal of Operational Research, vol. 198, pp. 387–391, 2009.
- [7] N. Azi, M. Gendreau, and J.Y. Potvin, "An exact algorithm for a vehicle routing problem with time windows and multiple use of vehicles", European Journal of Operational Research, vol. 202, no. 3, pp. 756—763, 2010.
- [8] T. Garaix, C. Artigues, and D. Feillet, "Vehicle routing problems with alternative paths: An application to ondemand transportation", J.European Journal of Operational Research, vol. 204, no. 1, pp. 62–75, 2010.

Research And Application Of A New Dsp_FPGA Series And Parallel Communication Method

Jianhong, Zhou, Hongchuang, Chen and Ming, Zhao University of Science and Technology Liaoning, Anshan, China

Abstract—The serial and parallel combination of DSP and FPGA is introduced in this paper as a new communication method. The external interface (XINTF) data bus and serial communication interface(SCI) of TMS320F28335 chip are connected with EP4CE10E22C8N to complete transmission of the data and instruction. The paper describes the hardware interface and the principle of software program DSP and FPGA, moreover, the FPGA module is simulated by modelsim. Through the simulation result and application in the reactive power compensation control circuit, this method is verified as feasible and meets the communication requirement.

Index Terms—DSP, FPGA, External interface, modelsim, serial and parallel communication

I. INTRODUCTION

With the development of embedded system, the combination of DSP and FPGA are required in more and more workplaces to meet the needs of the complex algorithm and system [1] [2], in the traditional system of DSP and FPGA combination, FPGA is purely used as a computing core and DSP as the main control core with adopting single parallel or serial communication mode [3] [4]. However, when DSP and FPGA operate simultaneously but independently, the single communication mode can not effectively fulfill the requirement of data communication, thus this paper introduces a new mode with serial and parallel combination.

To achieve reactive calculation and capacitive & inductive switching in the embedded system requires to sample voltage and current signal of power system[5], conduct fast Fourier transform of the sampled signal, calculate the reactive power of the system and finally output the switching signal based on certain strategy. Because of the complicated algorithm of the whole process, FPGA is selected to carry out algorithms [6]. Considering FPGA has no sufficient external interface, the co-processing of dual-core DSP and FPGA is adopted in this system. DSP is mainly for data acquisition, general data processing and real-time display of voltage and current waveforms of power system while FPGA is responsible for the operation of the core algorithm and the switching of capacitance and inductive. There is a large amount of data and instruction exchange in DSP and FPGA dual-core architecture of reactive power compensation control processing system, therefore, the efficient and stable communication channel between the dual cores is the key factor that affects the system performance.

II. PROJECT OVERVIEW

In this design, the FPGA chip is Cyclone IV family EP4CE10E22C8N (hereinafter referred to as the FPGA) with 10320 logic units (LEs), 23 18 x 18 multiplier, and so on, which can meet the requirement of system design.

DSP chip uses TI C2000 series of TMS320F28335 (hereinafter referred to as DSP), the chip is rich in resources with the FLASH of $16 \times 256k$ chip, 12 bit high speed AD, SPI, SCI, parallel interface XINTF, etc. The structure of reactive power compensation control system based on DSP and FPGA is shown in Figure 1:





The specific workflow of the system is as follows:

1)Voltage and current signals of power network is converted into a voltage signal with certain amplitude through analog signal conditioning circuit for being sampled by DSP [8].

2)In a period of the power grid, three—phase voltage and current are respectively sampled for 128 times by the high frequency A/D of DSP, converted into a series of signed 16—bit binary number, and then DSP transmits data to FPGA and informs FPGA to read data.

3) After reading the data and completing FFT calculation, FPGA gets the system reactive power and controls capacitor switching, then changes TCR conduction angle according to the corresponding switching rule, finally transmits the spectrum information to DSP and informs DSP to read data.

4)DSP receives data ,then analyzes and displays the spectrum information.

III. HARDWARE CONNECTION OF DSP AND FPGA

In this control system, the analog voltage is sampled and converted by the 12 bit high—speed AD of DSP. In the power grid of power frequency 50Hz, every single cycle is required to carry out three 128—point FFT computations, AD conversion for 38400 times per second, amount of data transferred in one direction reaches 614400bps, if the dual core communicate in traditional serial mode, the CPU needs to waste a lot of time on data transmission, the efficiency is low, therefore, the system adopts the parallel interface XINTF of DSP for data exchange with FPGA [9]. For multi clock domains, different bit wide data communications, asynchronous FIFO or dual—port RAM for data stream buffer is generally adopted, but the read or write operation of ram require large amount of address operation, it also increases the difficulty of the physical connection, so the system uses asynchronous FIFO for data cache. DSP XINTF is mapped to 3 pieces of fixed space with 20—bit width address bus XA, extensible 16 or 32 bit data bus XD, read and write enable wires, independent regional chip select signal wire. It is convenient to achieve different rates of communication with various external memory units or equipment by setting up registers of XINTF interface, ZONE 0 space is used in the system; due to the complex connection of external FIFO, this system defines two synchronous FIFO with RAM resources of FPGA, maps the corresponding pins to external pins of FPGA, and connects to chip select wire, read/write enable wire, data bus of DSP, then a 16 bit parallel data bus transmission channel is built between the dual core.

In this program, FPGA is as a signal piece of SOC system rather than a pure computation core [10]. FPGA and DSP work independently. Some non—data information needs to be transmitted while a large number of data communications are done between the dual processor. If data cache is not read in time, and some new real-time information needs to be read at the same time, a conflict will occur since too little information could be expressed by the traditional interrupt mode, therefore a serial data channel UART is set up to complete the transmission of various commands between the dual cores except parallel communication channel XINTF, a single byte of data content can be as high as 256 kinds of commands, which could fully meet the needs of instruction content. The hardware connection between DSP and FPGA is shown in Figure 2.



Figure 2. Hardware connection of DSP and FPGA

IV. REALIZATION OF SERIAL AND PARALLEL COMMUNICATION

The time sequence of read or write operation of DSP XINTF space can be divided into three stages: Lead, Active, Trail. In order to be able to synchronize the low-speed peripheral interface, XTIMING register of each XINTF space can be set to various XTIMCLK waiting periods for different stages with the timing sequence of read and write access operations being configured independently. In the Lead stage, the chip select signal of Zone0 space becomes a low level and the address signals are output to the XA at the same time. In the Active stage, if read access is enabled, the read enable signal (XRD) becomes low level and the data is valid in the last period and latched into the DSP, if a write operation is conducted, write enable signal (XWE) becomes a low level and data output on the data bus (XD). Trail period refers to the duration which keeps chip select signal and address signal valid when read or write enable signal is deasserted. In the configuration process, parameter settings are based on the minimum waiting state of XINTF interface, its own timing characteristics, the timing characteristics of external device and the additional delay between DSP and the peripheral. Read and write cycle of XINTF interface is shown in Figure 3.



Figure 3. Read and write cycle of XINTF interface

The corresponding design software for FPGA in the system is Quartus II. Altera provides configurable FIFO IP core generated inside the FPGA chip. The interface of FIFO is shown in Figure 4, in which DATA is 16 bit write data port, rdclk/wrclk are read / write clock, rdreq/wrreq are write/read enable signal(high—level active), aclr is asynchronous low—level clear signal and q is 32 bit read data port.



Figure 4. Interface of FIFO

Through the analysis of FIFO and XINTF interface timing characteristics, the communication could not be achieved after the two ports are directly connected. It requires a certain logic process to complete read or write, detailed process of DSP read FIFO is as follows:

1)Pull down chip select signals and output address signals when DSP needs to read data from FPGA.

2)Make chip select signal XZCS0 logic NOT in FPGA, XZCS0 goes high and takes it as FIFO read enable signal rdreq.

3)Make read enable signal XRD logic NOT in FPGA, takes it as FIFO read clock rdclk, Figure 3 shows XRD changes from a high level to a low level in the Active period, so rdclk converts low level to high level. FIFO outputs data to data bus XD, data is valid for DSP.

4)DSP latches data from XD during the last cycle of Active period and pulls XRD high, then rdclk appears a falling edge.

5)DSP chip select signal XZCS0 converts low level to high level, and rdreq changes from a high level to a low level. At this time, DSP has completed data read for once.

The process of DSP writing data to FIFO through XINTF interface is as follows:

1)Pull down chip select signals and output data and address signals when DSP needs to write data from FPGA.

2)Make chip select signal XZCS0 logic NOT in FPGA, XZCS0 goes high and takes it as FIFO read enable signal wrreq.

3)The write enable signal XWR is directly assigned to write clock wrclk of FIFO. Figure 3 shows that data is valid during entire Active and Trail period. FIFO latches data from data bus XD when wrclk converts low level to high level and completes a write operation.

4)By the end of Trail period, XZCS0 jumps to high level, DSP has completed a write operation.

After the one—way data communication between DSP and FPGA is achieved, define a read & write cache

with ping-pang structure and decode the address line by defining the read or write state of data with an address of DSP, then the bi-directional line data communication between DSP and FPGA can be realized correspondingly.

When the system works, cycle of power grid and zero-crossing point of current are captured by DSP, but the time of FPGA switching inductance is not fixed, at this time, sending zero-crossing signal to FPGA through parallel bus may lead to FIFO buffer conflict, and as a result of large amount of FFT calculation, transmitting three-phase voltage and current data at one time will cause irrational use of CPU, and high-capacity internal FIFO will waste the limited RAM resources of FPGA, so it's advised to transmit threephase data separately, FPGA starts FFT calculation and reads the next-phase data after it has read one phase data, it not only improves the efficiency of the system but also reduces resource consumption of large FIFO. By defining a char type data symbol Date_Flag in DSP to represent the status of sending data, the process of completing the data transmission is as follows:

When the system is initialized, assign Data Flag to 0xDA, which indicates A phase current and voltage data need to be sent next time., (since lots of statuses need to

be sent in this system, the high four bits of Data Flag will be defined as D to indicate voltage, current data).

When data transmission flag is 1, DSP sends A phase data through parallel port XINTF, when the transmission is completed, sends 0xDA to FPGA through serial port UART and sets Data Flag to 0.

FPGA reads data in FIFO and sends 0xDB to DSP through UART after FPGA receives 0XDA. DSP matches the high four bit of received data (D indicates the data information is received), then assigns 0XDB to Data_Flag. When change of Data_Flag is detected, the program will send voltage, current data of B phase.

V. SIMULATION VERIFICATION

According to the timing characteristics of XINTF interface and the FIFO interface, the simulation in Modelsim is carried out by establishing the corresponding module in Quartus II. Simulation program has a total of four modules, in which input convert module is chip select, enable, clock processing module, paper f and paper fifo are instantiated FIFO module and inout convert is bidirectional data processing module, as shown in Figure 5.Simulation results of XINTF interface read and write FIFO is as shown in Figure 6.



Figure 5. Bidirectional data processing module

Wave									_						
Messages	[
/paper_tb/XA	-No Data-							L							
	-No Data-	300	(400)0		808		0	258	0	(900
/paper_tb/XRD	-No Data-														
/paper_tb/XWR	-No Data-														
/paper_tb/XZCS0	-No Data-									1		1		1	
/paper_tb/CLK_F	-No Data-														
/paper_tb/RDREQ	-No Data-														
/paper_tb/WRREQ	-No Data-							1							
paper_tb/DATA	-No Data-	308					258	(900							
	-No Data-	jo l	(300)2621470	0										
	-No Data-	00													

Figure 6. Simulation results of XINTF interface read and write FIFO

First, write 16-bit-integer 300 and 400to FIFO in sequence through data bus XD, and get combined 32bit-integer 26214700 from output port Q of FIFO.Then, write 32-bit 808, 258, and 900 data into another FIFO and obtain the corresponding data on the XD line.

VI. CONCLUSION

This paper introduces the method of achieving bidirectional serial and parallel data communication between FPGA and DSP. It enriches command transmission between dual cores and improves the transmission efficiency while conducting large amount of data transmission, and. This method is verified in the actual reactive power compensation control circuit board. The parallel transmission speed can reach 800Mbps and serial communication baud rate can be as high as 937500 with 0 symbol error rate.

REFERENCES

Shunfan He, Kaicheng Li and Ming Zhang, "A Real-Time [1] Power Quality Disturbances Classification Using Hybrid Method Based on S—Transform and Dynamics", IEEE Transactions on Instrumentation and Measurement, vol. 62, pp. 2465—2475, Sep 2013

- [2] Le Li, Zhihui Xiong, Bin Wang, Maojun Zhang, Lidong Chen, "High—Speed Data Communication Between DSP and FPGA in Embedded Panoramic Video Processing System", Journal of Electronics & Information Technology, vol. 32, pp.649-654, Mar 2010
- [3] Jun Zhu, Qingwei Gao and Lu Han, "Solution of data communication based on DSP and FPGA", Electronic Measurement Technology, vol. 32, pp. 102—104, Jan 2009
- Yu Lei, "Design of an Effective Structure of DSP and FPGA Data Exchange", Value Engineering, vol. 32, pp. 196-196, Nov 2011
- Yannan Yu, Rongfeng Yang, Jichi Yan and Chang Qu, "Research on Cascaded H—bridge SVG", Journal of Networks, vol. 9, pp. 1941—1947, Jul 2014 [5]
- Chengzhu Shi and Yihong Yin, "The Development of Voltage Reactive Power Fuzzy Controller Based on FPGA", Power Electronics, vol. 46, pp.98–100, Nov 2012 [6]
- Murugesan. K, Muthu. R, Vijayenthiran. S and Mervin. J. B, "Prototype hardware realization of the DSTATCOM for reactive [7] power compensation", International journal of electrical power and energy systems, vol. 65, pp. 169–178, Feb 2015
- and energy systems, vol. 65, pp. 169–178, Feb 2015
 [8] Maofa Gong, Yuqing Lin, Bingqian Liu, Feng Qiu, Huiting Ge and Ningxia Yang, "Three—Phase Reactive Power Measurement Based on DSP and FPGA", Electrical Measurement & Instrumentation, vol. 51, pp. 75–78, Jul 2014
 [9] Nan Jiang, Yingjian Ma and Xiang Feng, "Research on parallel communication between DSP and FPGA", Electronic Measurement Technology, vol. 31, pp. 146–148, Oct 2008
 [10] Yu Peng, Honglan Jiang, Zhiming Yang, Liyan Qiao and Wang Liu, "Design of general digital signal processing system based on DSP and FPAG", Foreign Electronic Measurement Technology, vol. 32, pp. 17–21, Jan 2013

The Structure And Graphic Of The Solution Of Linear Equations

Lv You, Zhang Hua, Yang Ai-min*

College of Science, North China university of science and technology, Tangshan, 063000, China

Abstract— Linear algebra is an important basic course in science and engineering education. Solving linear equations is an important content of linear algebra. The understanding of the structure of the solution set of the system of linear equations is the key to learn to solve the system of linear equations. This paper gives the visual image of the solution set of homogeneous linear equations set and the visual image of the solution set of inhomogeneous linear equations.

Keywords— Linear algebra; System of linear equations; Nonhomogeneous linear equations; The solution vector space

I. INTROUDUCTION

Linear algebra is an important basic undergraduate course in colleges and universities of science. The theory of linear algebra is widely applied in in engineering, finance, production optimization, information technology and other fields. Theoretical is the characteristic of linear algebra. The theory of the system of linear equations, an important part of Linear algebra, is more abstract. Understanding the structure of the solutions of the system linear equations is the key to learn the theory of the system of linear equations well, which also remains a challenging problem to be solved in the process of learning Linear algebra.

II. CONCEPT OF VECTOR SPACE

A vector space

A vector space [1] (over R) consists of a set V along with two operations "+" and "." subject to these conditions.

(1) For any, $\vec{\alpha}_1, \vec{\alpha}_2 \in V$ their vector sum $\vec{\alpha}_1 + \vec{\alpha}_2$ is an element of V.

(2) If
$$\vec{\alpha}_1, \vec{\alpha}_2 \in V$$
 then $\vec{\alpha}_1 + \vec{\alpha}_2 = \vec{\alpha}_2 + \vec{\alpha}_1$.
(3) For any $\vec{\alpha}_1, \vec{\alpha}_2, \vec{\alpha}_3 \in V$
 $(\vec{\alpha}_1 + \vec{\alpha}_2) + \vec{\alpha}_3 = \vec{\alpha}_1 + (\vec{\alpha}_2 + \vec{\alpha}_3)$.

(4) There is a zero vector $0 \in V$ such that $\vec{\alpha} + \vec{0} = \vec{\alpha}$ for all $\vec{\alpha} \in V$.

(5) Each $\vec{\alpha} \in V$ has an additive inverse $\vec{\beta} \in V$ such that $\vec{\alpha} + \vec{\beta} \in V$

(6) If r is a scalar, that is, a member of R and $\bar{\alpha} \in V$ then the scalar multiple $r \cdot \bar{\alpha}$ is in V.

(7) If
$$r, s \in R$$
 and $\bar{\alpha} \in V$ then
 $(r+s) \cdot \bar{\alpha} = r \cdot \bar{\alpha} + s \cdot \bar{\alpha}$

(8) If
$$r \in R$$
 and $\overline{\alpha}_1, \overline{\alpha}_2 \in V$, then
 $r \cdot (\overline{\alpha}_1 + \overline{\alpha}_2) = r \cdot \overline{\alpha}_1 + r \cdot \overline{\alpha}_2$

(9) If
$$r, s \in R$$
 and $\bar{\alpha} \in V$, then
 $(rs) \cdot \bar{\alpha} = r \cdot (s \cdot \bar{\alpha})$.
(10) For any $\bar{\alpha} \in V$, $1 \cdot \bar{\alpha} = \bar{\alpha}$.

C. Base of vector space

where

Set
$$V$$
 as a vector space, if any $\bar{\alpha}_1, \bar{\alpha}_2, \cdots, \bar{\alpha}_m \in V$ meet to

(1) $\vec{\alpha}_1, \vec{\alpha}_2, \cdots, \vec{\alpha}_m$ linear independence,

(2) any vector of V can be represented by $\vec{\alpha}_1, \vec{\alpha}_2, \cdots, \vec{\alpha}_m$ linearly,

Then the vector set of $\vec{\alpha}_1, \vec{\alpha}_2, \dots, \vec{\alpha}_m$ is said the base of vector space of V, m is the dimension of V, and V is said m — dimensional vector space.

III. STRUCTURE OF THE SOLUTION OF THE HOMOGENEOUS LINEAR EQUATIONS

The matrix form of the homogeneous linear equations $A\vec{X} = \vec{0}$,

$$A = (a_{ij})_{l \times n}, \quad \vec{X} = \begin{pmatrix} x_1 \\ x_2 \\ \vdots \\ x_n \end{pmatrix}$$

The solution of homogeneous linear equations $A\vec{X} = \vec{0}$ has the following properties [2]:

(i) If \overline{X}_1, X_2 are two solutions of homogeneous linear equations (1), then $\overline{X}_1 + \overline{X}_2$ is also its solution.

(ii) If X_0 is a solution of homogeneous linear equations (1), then $c\bar{X}_0$ is also its solution (c is a constant).

(iii) If $\vec{X}_1, \vec{X}_2, \dots, \vec{X}_s$ are solutions of homogeneous linear equations (1), then $c_1\vec{X}_1 + c_2\vec{X}_2 + \dots + c_s\vec{X}_s$ is also its solution. (c_1, c_2, \dots, c_s are constants). Any homogeneous linear equations must has zero

Any homogeneous linear equations must has zero solution. If a system of homogeneous linear equations has nonzero solutions, then it will be infinitely many solutions. According to the definition of vector space, this infinitely many solutions constitute a n-r — dimensional vector space, n is the number of unknowns of the system of homogeneous linear equations, r is the rank of the coefficient matrix A of the system of homogeneous linear equations. The base of the vector space of the solutions is called

the basic system of solutions, Any solution of the system of homogeneous linear equations can be expressed in the linear combination of its basic system of solution.

A. Structure of the solution of the system of binary homogeneous linear equations

(1)

Example 1.

Solving binary homogeneous linear equations

$$x_1 + x_2 = 0.$$

The coefficient matrix of Eq. (1) is
 $A = \begin{bmatrix} 1 & 1 \end{bmatrix}$,
the Eq. (1) is equivalent to
 $x_1 = -x_2$,
a basic system of solution of Eq. (1) is
 $\vec{X}_1 = \begin{bmatrix} -1 \\ 1 \end{bmatrix}$.

Then the general solution of Eq. (1) is $\vec{X} = c\vec{X}_1$, *c* is a constant.

B. Structure of the solution of the system of ternary homogeneous linear equations

Example 2.



Fig. 1 The structure of the solution of binar homogeneous linear equations Solving ternary homogeneous linear equations

$$x_1 + x_2 + x_3 = 0. (2)$$

The coefficient matrix of Eq. (2) is $\begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}$

 $A = \begin{bmatrix} 1 & 1 & 1 \end{bmatrix},$

the Eq. (2) is equivalent to

$$x_1 = -x_2 - x_3$$

a basic system of solution of Eq. (1) is



Fig. 2 The structure of the solution of ternary homogeneous linear equations



binar nonhomogeneous linear equations

We draw all the solutions of Eq. (2) starting at the origin of the space rectangular coordinate system, then all the ends of the vectors form a plane OAB. Moreover, the plane OAB happen to be the image of Eq. (2) in the space rectangular coordinate system. All the vectors which start at the origin O and end at the point on the plane OAB constitute a $(n-r=3-1=2)_{2-}$ dimensional vector space. See Fig.2.

We point out that homogeneous linear equations may has only a zero solution which constitute a zero vector space.

IV. STRUCTURE OF THE SOLUTION OF THE NONHOMOGENEOUS LINEAR EQUATIONS

The matrix form of homogeneous linear equations is $A\vec{X} = \vec{b}$, $A\vec{X} = \vec{0}$ is called the derived system of $A\vec{X} = \vec{b}$. $A\vec{X} = \vec{b}$ has solutions if and only if the rank of A equal to the rank of Ab which is called the augmented matrix of homogeneous linear equations $A\vec{X} = \vec{b}$

The properties of the relation between the solution of $A\vec{X} = \vec{b}$ and the solution of $A\vec{X} = \vec{0}$ are as follow[1,2]:

(I) If η is a solution of nonhomogeneous linear equations $A\vec{X} = \vec{b}$, and $\vec{\alpha}$ is a solution of homogeneous linear equations $A\vec{X} = \vec{0}$, then $\vec{\alpha} + \vec{\eta}$ is a solution of nonhomogeneous linear equations $A\vec{X} = \vec{b}$.

(II) If $\vec{\eta}_1$ and $\vec{\eta}_2$ are solutions of nonhomogeneous linear equations $A\vec{X} = \vec{b}$, then $\vec{\eta}_1 - \vec{\eta}_2$ is a solution of homogeneous linear equations $A\vec{X} = \vec{0}$.

(III) If $\overline{\eta}_0$ is a solution of nonhomogeneous linear equations $A\overline{X} = \overline{b}$, and $c_1\overline{\alpha}_1 + c_2\overline{\alpha}_2 + \dots + c_{n-r}\overline{\alpha}_{n-r}$ (c_1, c_2, \dots, c_{n-r} are constants, n is the number of unknows, and r is the rank of A) is the general solution of homogeneous linear equations $A\overline{X} = \overline{0}$, then $\overline{\eta}_0 + c_1\overline{\alpha}_1 + c_2\overline{\alpha}_2 + \dots + c_{n-r}\overline{\alpha}_{n-r}$ is the general solution of nonhomogeneous linear equations $A\bar{X} = \bar{B}$.

Where the set of $\vec{\alpha}_1, \vec{\alpha}_2, \dots, \vec{\alpha}_{n-r}$ is a basic system of solution of $A\vec{X} = \vec{0}$ which constitute a n-r —dimensional vector space. The nonhomogeneous linear equations $A\vec{X} = \vec{b}$ has no zero solution, all solutions of $A\vec{X} = \vec{b}$ can not constitute a vector space.

A. Structure of the solution of the system of binary nonhomogeneous linear equations

Example 3.

Solving binary nonhomogeneous linear equations

 $x_{1} + x_{2} = 1.$ (4) $\vec{\eta}_{0} = \begin{bmatrix} 0\\1 \end{bmatrix}$ Obviously, is a solution of Eq. (3). From Example 1, a basic system of the solution of the derived system of Eq.(3) is $\begin{bmatrix} -1 \end{bmatrix}$

$$\vec{\alpha} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}_{.}$$

From the property (III), the general solution of Eq. (3) is $\vec{\eta} = \vec{\eta}_0 + c\vec{\alpha}$ (*c* is a constant). When c = 1

$$\vec{\eta}_1 = \vec{\eta}_0 + \vec{\alpha} = \begin{bmatrix} -1 \\ 1 \end{bmatrix}$$

is a solution of Eq.(3).

We draw all the solutions of Eq. (3) starting at the origin of the plane rectangular coordinate system, then all the ends of the vectors form a straight line O'A'. Moreover, the straight line O'A' happen to be the image of Eq. (3) in the plane rectangular coordinate system. All the vectors which start at the origin O and end at the point on the line O'A' can not constitute a vector space. See Fig.3.

B. Structure of the solution of the system of binary nonhomogeneous linear equations

Example 4.

Solving ternary nonhomogeneous linear equations $x_1 + x_2 + x_2 = 1$ (4)



Fig.4 The structure of the solution of ternary nonhomogeneous linear equations

$$\vec{\eta}_0 = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$$

Obviously, is a solution of Eq. (4).

From Example 2, a basic system of the solution of the derived system of Eq.(4) is

$$\vec{\alpha}_1 = \begin{bmatrix} -1\\1\\0 \end{bmatrix}, \qquad \vec{\alpha}_2 = \begin{bmatrix} -1\\0\\1 \end{bmatrix}.$$

From the property (III) , the general solution of Eq. (4) is

$$\vec{\eta} = \vec{\eta}_0 + c_1 \vec{\alpha}_1 + c_2 \vec{\alpha}_2, \quad (c_1, c_2 \text{ are constants}).$$

When $c_1 = 1, c_2 = 0$.

$$\vec{\eta}_1 = \begin{bmatrix} 0\\1\\0 \end{bmatrix}$$

is a solution of Eq.(4).

When
$$c_1 = 0, c_2 = 1$$
,
 $\bar{\eta}_2 = \begin{bmatrix} 0\\0\\1 \end{bmatrix}$

is a solution of Eq.(4).

We draw all the solutions of Eq. (4) starting at the origin of the space rectangular coordinate system, then all the ends of the vectors form a plane O'A'B'. Moreover, the plane O'A'B' happen to be the image of Eq. (4) in the space rectangular coordinate system, and the plane O'A'B' parallel to the plane OAB. All the vectors which start at the origin O and end at the point on the plane O'A'B' can not constitute a vector space. See Fig.4.

V. CONCLUSIONS

In this paper, we illustrate the structures of the solutions of homogeneous linear equations and the solutions of nonhomogeneous linear equations respectively by simple examples which can be solved. We point out that the solutions of a solvable homogeneous linear equations constitute a vector space. On the other hand, the solutions of a solvable nonhomogeneous linear equations can not constitute a vector space. The image analysis of this paper makes the abstract theory of algebra has intuitive expressions.

REFERENCES

- Peking University department of mathematics, Higher algebra(M), Higher education press, Beijing, second edition, 1987 (chinese).
- [2] Herui Zhang, Bingxin Hao, Advanced algebra(M), Higher education press, Beijing, 4th edition, 1999 (chinese).

Auxiliary Laplace Parameter Method For Solving Fractional Equations

Chunfeng Liu, Hua Zhang, Liting Wang

College of Science, North China University of Science and Technology, Tangshan, 063000, China

Abstract— In this paper, the Auxiliary Laplace Parameter Method(ALPM) is extended to solve the nonlinear fractional equations. The method is coupled with homotopy method, Laplace transform, Adomian Polynomial. Some numerical examples are considered, the results illustrate that the an*alytical technique can solve fractional equations*.

Keywords— Fractional equations; Homotopy method ; Laplace transform; Adomian polynomial

I. INTRODUCTION

In recent years, the fractional differential equation has caused more and more attention, So many methods have been proposed for solving the fractional equations. Such as Adomian decomposition method[1-3], Variational iteration method[4-6],variable separation method[7], finite element method[8], differential transform method [9-10].Laplace transform method[11].the ALPM was presented by Khan Y et al[12] to solve the differential—difference equations. In this paper, the method is extended to solve nonlinear fractional equations, some numerical example been shown to demonstrate the feasibility of the method.

II. ANALYSIS OF THE ALGORITHM

In this section, we analysis of the algorithm, considering the following fractional equation

$$\begin{cases}
D_t^{\alpha} u + R(u) + N(u) = f \\
u^{(k)}(0) = u^{(k)}
\end{cases}$$
(1)

Where the $D_t^{\alpha} u$ is fractional operator, R(u), N(u) is the Linear and nonlinear part of the equation respectively. Applying Laplace transform on both side of the equation, then

$$s^{\alpha}L(u) - \sum_{k=0}^{[\alpha]} u^{(k)}(0)s^{\alpha-k-1} + L[R(u)] + L[N(u)]$$
(2)
= $L[f]$
 $L(u) - \sum_{k=0}^{[\alpha]} u^{(k)}(0)s^{-k-1}$
 $+ \frac{L[R(u)] + L[N(u)] - L[f]}{s^{\alpha}} = 0$ (3)

The nonlinear part of the equation can be replaced by Adomian polynomials, then

$$N(u) = \sum_{n=0}^{\infty} A_n , \qquad (4)$$

where

$$A_n = \frac{1}{n!} \left[\frac{d^n}{d\lambda^n} \left[f(\sum_{i=0}^{\infty} \lambda^i u_i) \right] \right]_{\lambda=0}, n = 0, 1, \dots (5)$$

We establish Eq.(1) homotopy format H(v, p) =

$$(1-p)[L(v) - L(u_0)] + phL[R(v) + N(v)-f]^{(6)}$$

Where p, n is auxiliary parameter, so we can get the following formula

$$L[v - u_0] + \frac{h}{s^{\alpha}} L[R + N - f] = 0 \quad (7)$$

Applying Laplace inverse transform on both side of formula (7), then

$$v_n = u_0 - h L^{-1} [\frac{L[R(v) + N(v) - f]}{s^{\alpha}}]$$
(8)

According to the formula (8), we get

$$v_{n+1} = -hL^{-1}\left[\frac{L[R_n(v) + N_n(v) - f_n]}{s^{\alpha}}\right]$$
(9)

So we get the approximate solution of Eq. (1) $u = \lim v = v + v + v + v + \cdots$

$$u = \lim_{n \to \infty} v = v_0 + v_1 + v_2 + v_3 + \cdots$$

III. NUMERICAL ILLUSTRATIONS

In this section, we give some examples to validate the effectiveness of the method.

Example 1 Considering the following fractional Riccati equation

$$\begin{cases} D_t^{\alpha} u = 2u(t) - u^2(t) + 1, 0 < \alpha \le 1\\ u(0) = 0 \end{cases}$$
(10)

Applying Laplace transform on both side of the Eq.(10), then

$$L[u_n(t)] = \frac{u(0)}{s^{\alpha}} + \frac{1}{s^{\alpha}} L[2u(t) - u^2(t) + 1] \quad (11)$$

Establishing Eq.(10) homotopy format, then $H(y) = I[y - y_{-}]$

$$H(v) = L[v - u_0] - \frac{h}{s^{\alpha}} L[2v(t) - v^2(t) + 1] = 0$$
(12)

Applying Laplace inverse transform on both side of Eq.(10), then

$$v_{n} = u_{0} + hL^{-1}\left[\frac{L[2v(t) - v^{2}(t) + 1]}{s^{\alpha}}\right] \quad (13)$$

So
$$\begin{cases} v_{0} = \frac{u(0)}{s} = 0\\ v_{n+1} = hL^{-1}\left[\frac{L[2v_{n}(t) - A_{n} + 1]}{s^{\alpha}}\right] \end{cases}$$

The nonlinear part V^2 as Adomian polynomial, then $\int A_0 = v_0^2$

$$\begin{cases}
A_1 = 2v_0v_1 \\
A_2 = 2v_0v_2 + v_1^2 \\
A_3 = 2v_0v_3 + 2v_1v_2 \\
\dots
\end{cases}$$

So that

$$v_{1} = \frac{ht^{\alpha}}{\Gamma(1+\alpha)}$$
$$v_{2} = \frac{2ht^{2\alpha}}{\Gamma(1+2\alpha)}$$
$$v_{3} = \frac{ht^{3\alpha}(4\Gamma^{2}(1+\alpha) - \Gamma(1+2\alpha))}{\Gamma^{2}(1+\alpha)\Gamma(1+3\alpha)}$$

So, we get the approximate solution of Eq.(11)

$$u = \frac{ht^{\alpha}}{\Gamma(1+\alpha)} + \frac{2ht^{2\alpha}}{\Gamma(1+2\alpha)} + \frac{ht^{3\alpha}(4\Gamma^{2}(1+\alpha) - \Gamma(1+2\alpha))}{\Gamma^{2}(1+\alpha)\Gamma(1+3\alpha)} + \cdots$$

For $\alpha = 1$, h=1 we can the approximate solution of Eq.(11)(see table 1) Table1 Comparison the solution of Eq.(10)by different methods

TableT	omparison the soluti	on of Eq.(10) by and	lefent methous
t	Ref[13]	ALPM	Eaxct
0.1	0.110311	0.110313	0.110295
0.2	0.241995	0.242000	0.241977
0.3	0.395123	0.395126	0.395105
0.4	0.567829	0.567829	0.567812
0.5	0.756029	0.756032	0.756014
0.6	0.953576	0.955550	0.953566
0.7	1.152955	1.529600	1.152949
0.8	1.346365	1.346369	1.346364
0.9	1.526909	1.526911	1.526911
1.0	1.689494	1.689497	1.689498

Example 2

$$\begin{cases} D_t^{\alpha} u + e^u = 0, 0 < \alpha \le 1\\ u(0) = 0 \end{cases}$$
(14)

Applying Laplace transform to both side of the Eq.(14), then

 $s^{\alpha}L(u) + L[e^{u}] = 0$ (15) Establishing Eq.(14) homotopy format, then

$$H(v) = [L(v) - L(u_0)] + \frac{h}{s^{\alpha}} L[e^v]$$
(16)

Applying Laplace inverse transform on both side of Eq.(16), then

 $v_n = \frac{u_0}{s} - hL^{-1}\left[\frac{L[e^v]}{s^\alpha}\right]$

Then

$$\begin{cases} v_{n+1} = -hL^{-1}\left[\frac{L[A_n]}{s^{\alpha}}\right]\\ v_0 = 0 \end{cases}$$

The nonlinear part e^{v_n} as Adomian polynomial, then

$$\begin{cases} A_{0} = e^{v_{0}} \\ A_{1} = v_{1}e^{v_{0}} \\ A_{2} = (v_{2} + \frac{1}{2}v_{1}^{2})e^{v_{0}} \\ A_{3} = (v_{3} + v_{1}v_{2} + \frac{1}{6}v_{1}^{3})e^{v_{0}} \\ \dots \\ v_{1} = \frac{-ht^{\alpha}}{\Gamma(1+\alpha)} \\ v_{2} = \frac{ht^{2\alpha}}{\Gamma(1+2\alpha)} \\ v_{3} = \frac{-h\Gamma(2\alpha+1)t^{3\alpha}}{\Gamma^{2}(1+\alpha)\Gamma(1+3\alpha)} \\ v_{4} = ht^{4\alpha}(\frac{2\Gamma^{2}(\alpha+1) + \Gamma(2\alpha+1)}{2\Gamma^{2}(1+\alpha)\Gamma(1+3\alpha)}) \\ v_{5} = -\frac{2h\Gamma(2\alpha+1)\Gamma(4+\alpha)t^{5\alpha}}{\Gamma(1+\alpha)^{3}\Gamma(1+3\alpha)\Gamma(1+5\alpha)} \\ + \frac{h\Gamma(6\alpha+1)t^{7\alpha}}{\Gamma(1+\alpha)^{4}\Gamma(1+7\alpha)}(\frac{\Gamma(2\alpha+1)^{2}}{\Gamma(1+3\alpha)^{2}} \\ + \frac{4\Gamma(2\alpha+1)\Gamma(4\alpha+1)}{\Gamma(3\alpha+1)\Gamma(5\alpha+1)}) \end{cases}$$

So, the Approximate solution of Eq. (14) is

$$\begin{split} u &= v_0 + v_1 + v_2 + v_3 + v_4 + v_5 \cdots \\ &= \frac{-ht^{\alpha}}{\Gamma(1+\alpha)} + \frac{ht^{2\alpha}}{\Gamma(1+2\alpha)} \\ &- \frac{h\Gamma(2\alpha+1)t^{3\alpha}}{\Gamma^2(1+\alpha)\Gamma(1+3\alpha)} + ht^{4\alpha} (\frac{2\Gamma^2(\alpha+1) + \Gamma(2\alpha+1)}{2\Gamma^2(1+\alpha)\Gamma(1+3\alpha)}) - \\ &\frac{2h\Gamma(2\alpha+1)\Gamma(4+\alpha)t^{5\alpha}}{\Gamma(1+\alpha)^3\Gamma(1+3\alpha)\Gamma(1+5\alpha)} \\ &+ \frac{h\Gamma(6\alpha+1)t^{7\alpha}}{\Gamma(1+\alpha)^4\Gamma(1+7\alpha)} (\frac{\Gamma(2\alpha+1)^2}{\Gamma(1+3\alpha)^2} \\ &+ \frac{4\Gamma(2\alpha+1)\Gamma(4\alpha+1)}{\Gamma(3\alpha+1)\Gamma(5\alpha+1)}) + \cdots \end{split}$$

For
$$\alpha = 0.9$$
, $h = 1$, so we get
 $u = -1.0398t^{0.9} + 0.5965t^{1.8} - 0.4346t^{2.7} + 0.4666t^{3}$

and its approximate solution in table.2 Table 2 Comparison the solution of Eq. (10) by different methods

t	ALPM	GDTM	Ref[14]
0.01	-0.016331	-0.016331	-0.016331
0.02	-0.030238	-0.030238	-0.030241
0.03	-0.04237	-0.04237	-0.043245
0.04	-0.055621	-0.055621	-0.055639
0.05	-0.067531	-0.067531	-0.067564
0.06	-0.079047	-0.079047	-0.079100
0.07	-0.090225	-0.090225	-0.090303
0.08	-0.101102	-0.101102	-0.101213
0.09	-0.111710	-0.111710	-0.111860
0.1	-0.122072	-0.122072	-0.122267

IV. CONCLUSIONS

In this paper, we extend the Auxiliary Laplace Parameter method to fractional equations. And the results of numerical examples are near to the exact solution. So this method can be an alternative way to solve fractional equations.

ACKNOWLEDGMENTS

This work was supported by the National Natural Science Foundation of China (no. 61170317,11126213), and the National Natural Science Foundation of Hebei Province (no. E2013209215).

REFERENCES

[15]

JOURNAL OF SIMULATION, VOL.3, NO.5, OCTOBER 2015

- Duan J S, Chaolu T, Rach R, et al. The Adomian decomposition method with convergence acceleration techniques for nonlinear fractional differential equations[J]. Computers & Mathematics with Applications, 2013, 66(5): 728–736.
- [2] Huihai Wang, Kehui Sun, Shaobo He. Characteristic Analysis and DSP Realization of Fractional—Order Simplified Lorenz System Based on Adomian Decomposition Method[J]. International Journal of Bifurcation & Chaos, 2015.
- [3] Birajdar G. Numerical Solution of Fractional Partial Differential Equations by Discrete Adomian Decomposition Method[J]. Advances in Applied Mathematics & Mechanics, 2014, 6(1):107–119.
- [4] W. Su, D. Baleanu, and X. a.Yang, "Damped wave equation and dissipative wave equation in fractal strings within the local fractional variational iteration method," Fixed Point Theory and Applications, vol. 2013, article 89, 2013.
- [5] X.—J.Yang and D. Baleanu, "Fractal heat conduction problem solved by local fractional variation iteration method," Thermal Science, vol. 17, no. 2, pp. 625–628, 2013.
- [6] D. Baleanu, J. A. T. Machado, C. Cattani, M. C. Baleanu, and X. Yang, "Local fractional variational iteration and decomposition methods for wave equation on Cantor sets within local fractional operators," Abstract and Applied Analysis, vol. 2014, Article ID 535048, 6 pages, 2014.
- [7] Daftardar—Gejji V, Bhalekar S. Boundary value problems for multi—term fractional differential equations[J]. Journal of Mathematical Analysis & Applications, 2008, 345(2):754—765.
- [8] Esen A, Tasbozan O. Numerical Solution of Time Fractional Burgers Equation by Cubic B—spline Finite Elements[J]. Mediterranean Journal of Mathematics, 2015.
- [9] Matteo A D, Pirrotta A. Generalized Differential Transform Method for Nonlinear Boundary Value Problem of Fractional Order [J]. Communications in Nonlinear Science and Numerical Simulation, 2015.
- [10] Abuteen E, Momani S, Alawneh A. Solving the fractional nonlinear Bloch system using the multi—step generalized differential transform method[J]. Computers & Mathematics with Applications, 2014, 68(12): 2124— 2132.
- [11] Sharma K K. Fractional Laplace transform[J]. Signal Image & Video Processing, 2010, 4(3):377–379.
- [12] Khan Y, H. Vázquez—Leal, Faraz N. An auxiliary parameter method using Adomian polynomials and Laplace transformation for nonlinear differential equations[J]. Applied Mathematical Modelling, 2013, 37(5):2702–2708.
- [13] Yuanlu LI. Solving a nonlinear fractional differential equation using Chebyshev wavelets[J]. Communications in Nonlinear Science\s&\snumerical Simulation, 2010, 15(9):2284–2292.
- [14] Jang B. Efficient analytic method for solving nonlinear fractional differential equations[J]. Applied Mathematical Modelling, 2014, 38(5-6):1775-1787.

Strategic Management of Aden—soft Company

Aiman Matar*

School of management science and Engineering, Dalian University of Technology

Abstract—The purpose of this study is to make a contribution to the literature on efficiency and productivity of the Aden soft company as a high tech company and SMS news service provider. The study seeks to elucidate how the efficiency of Aden soft company can be assessed according to the employee's number of the whole company, and its effect ion in the company. The study will further expound on describing the impact of the total number of employee's under one department and it's also proving that the employee's number is the main reason of holding back the performance of the company. The High tech industry is a highly centralized and fast growing market, and the ability to manipulate and utilize the resources effectively in order to maximize the output may promote efficiency and productivity gains. However, the key lies in dividing the one core company into two major core and individual departments, which usually bears a great strategic management implication that enhances the development of Aden soft company.

Index Terms—Forecasting analysis; Regression analysis; SWOT analysis; Aden—soft Hi—tech Company

I. INTRODUCTION

The structure in high—tech companies differs from that of conventional enterprises due to the influence of the traditional strategic management. Most of the traditional management methods are not suitable for high—tech enterprises because they require generating some new and advanced ways of management. With the advancement of technology, the high—tech companies have drawn attentions of enterprise managers and researchers to work out the best approach necessary for the application of strategic management.

Adequate human resource is important in the effective implementation of strategic management practices in business Companies. The financial performance of business companies is contingent on how the Company applies appropriate strategic management approaches and take advantage of its qualified human resource. However, a large number of Companies have not been able to implement the strategic management approach effectively for various reasons including human resource constraint, and this inability is reflected in the poor financial performance of such Companies. Based on this understanding, this study examines the relationship between the human resource (the employees) of Aden—soft Company and its performance. It uses SWOT analysis, regression and forecasting analysis to investigate the hypothesized relationship and to compare the performance of Aden—soft and that of a major competitor (Blue Horizon).

II. EXTERNAL ENVIRONMENT ANALYSIS

Based on its work with multiple customers in the high-tech manufacturing sector, the high-tech industry believes that these companies will need to assess and improve their business capabilities to address described. Ongoing, the challenges effective collaboration among globally dispersed employees, and with external organizations, must become a routine way of working in all functions, from product development and supply-chain management to marketing, sales, and service management. Improved capabilities will be required to ensure that accurate business information is provided in a secure, timely, and personalized way to any decision maker who needs it-anywhere.

a) Domestic Industrial Factors

The important part of an external audit is identifying rival firms and determining their strengths, weaknesses, capabilities, opportunities, threats, objectives, and strategies. Collecting and evaluating information on competitors is essential for successful strategy formulation. For example, STAY WITH US company and Blue horizon hi—tech company are located generally across the street from each other and battle each other every day on price and customer service.

b) Regression Analysis Steps and Preliminary Results

Comparison of results for the two software companies which are Aden—soft and Blue Horizon. Blue horizon is taken as a successful model that implemented strategic management.

c) Statistical models for the analysis of Aden—soft Company

In order to test the relationship between independent variables and each indicator of performance (dependent variable) and achieve the study objectives, the following statistical models or equations were formulated.

$$ASSG = \beta_0 + \beta_1 TOTE \ 1014 + \beta_2 SMSE1014 + \beta_3 ITE1014 + u \tag{3.4}$$

 $\beta 1$, $\beta 2$ $\beta 3$: are the coefficients of the independent variables

Where:

β0: Is constant (y—intercept)

 μ : is the stochastic error term or disturbance term

```
REV: Revenue growth in each quarter of the year from 2010 - 2014
```

PROF: Profitability in each quarter of the year from 2010 - 2014

SGRW: Sales growth in each quarter of the year from 2010 - 2014

ASSG: Value of assets in each quarter of the year from 2010 - 2014

TOTE1014: Total number of employees in each quarter (2010—2014)

SMSE1014: Total number Employees in the SMS service section (2010-2014)

ITE1014: Total number employees in the IT services section (2010–2014)

Model 3.1 predicts the relationship between independent variables (TOTE1014, SMSE1014,

ITE1014) and revenue growth (REV), which is an indicator of performance. Model 3.2 shows the relationship between independent variables (TOTE1014, SMSE1014, ITE1014) and profitability (PROF) of Aden—soft Hi Tech Company. Besides, model 3.3 estimates the relationship between number of employees at Aden—soft Hi Tech Company and growth in sales performance (SGRW). Lastly, model 3.4 predicts the relationship between growth in company's assets (ASSG) and independent variables (TOTE1014, SMSE1014, ITE1014). The coefficients of the models given above were estimated through the Ordinary Least Square (OLS) methods hence, and they are known as least—squares (OLS) estimators.

After inserting the obtained coefficients mentioned above, the models appear as follows:

REV = 2.32 + 0.52 TOTE1014 + 0.03 SMSE1014 + 0.46 ITE1014	(3.5)
PROF = 45.00 + 0.26 TOTE1014 + 0.08 SMSE1014 + 0.68 ITE1014	(3.6)
	$(2, \pi)$

SGRW = 70.07 - 2.12 TOTE1014 - 0.68 SMSE1014 + 2.79 ITE1014(3.7)

```
ASSG = 3.36 - 0.27 \text{ TOTE1014} + 3.21 \text{ SMSE1014} + 0.96 \text{ ITE1014} (3.8)
```

III. REGRESSION MODEL RESULTS AND COMPARISON

This section presents the results of regression analysis according to the objectives of the study. The first objective relates in independent variables to revenue growth while the second objectives draw the relationship between independent variables and profitability as the measure of company's performance. In addition, the third objective relates independent variables with sales growth, and the last objective examines the relationship between independent variables and asset growth of the company.

IV. THE COMPRESSION BETWEEN NUMBER OF EMPLOYEES AND REVENUE GROWTH

As stated in objective one, the number of employees in two different sections and the total number of employees at Aden—soft Company were expected to predict the revenue of the company. This result was examined by OLS regression analysis—model (3.1). Results of the regression analysis shows that this model independent variables explained 100 percent of the variance in revenue growth (R2 = 100, p<0.001). The coefficients of the independent variables are presented in Table 1 below:

Table1. Regression	on results for the	e relationship	between	number o	of employ	yees and revenue	
Un	standardized	c	Standardiz	zad	t	Sig (p	

Variables	Un—standardized		Standardized	ι—	Sig.(p		
variables		coefficient	СС	pefficient	statistic va	lue)	
		В	Std. Error	Beta			
	Constant	0.282	2.315	_	0.122	0.905	
	TOTE	0.859	0.028	0.524	30.520	0.000	
	SMSE	1.183	0.129	0.031	9.202	0.000	
	ITE	1.227	0.047	0.462	26.105	0.000	

As shown in the table all the independent variables were significant predictors of revenue growth. The total number of employees (TOTE) predicts the revenue significantly higher ($\beta = 0.524$, p<0.001) than the other two predictors (SMSE: $\beta = 0.031$, p<0.001 and ITE: $\beta = 0.426$, p<0.001).

Objective two of the study examines the relationship between the total number of employees, employees at SMS section, employees at IT section and the sales growth of Aden—soft Company. Model (3.3) was developed to predict the relationship between the number of employees and sales growth. The result indicates that the predictor variables explained 45.1 percent of the variance in sales growth (R2=0.451, p=0.058). However, although the model explains nearly 50 percent of the relationship between predictor and criterion variable, but it was not significant. Table 4.3 below shows the coefficient of the independent variables for this relationship.

Tab 4.3 Regression results for the relationship between number of employees and sales growthUnstandardized coefficientStandardizedt—Sig.(p

Variables	Unstandard	ized coefficient	Standardized	t—	Sig.(p
		cc	pefficient	statistic	value)
	В	Std. Error	Beta		
Constant	300.854	70.071		4.294	0.001

TOTE	—1.327	0.852	—2.121	1 559	0.145
SMSE	—9.979	3.890	0.679		0.025
ITE	2.837	1.422	2.797	2.565 1.995	0.069

As shown the table 4.3 above, the number of employees in the SMS department is the only predictor that significantly affects sales growth of Aden—soft Company ($\beta = -0.679$, p<0.05). The other two predictors (total number of employees and employees at the IT department) do not affect the sales growth. The coefficients of these predictors were $\beta = -2.121$, p=0.145 for the total number of employees and β =1.995, p=0.069 for employees in the IT department.

The study used profitability as a measure of performance. As such, the number of employees at two different sections and total number of employees were related to the profitability of Aden—soft Company. Model (3.1) was developed and used to statistically predict the relationship between these variables. The results shows that the independent variables (total number of employees, number of employees at SMS sections and number of employees at IT section) predicted 96.6 percent of the variance in profitability of Aden—soft Company (R2 = 0.966, p<0.05). Moreover, the model for this relationship was significant at probability level 0.05. The coefficient of each independent variable is presented in table 2 below.

Table2. Re	gression results I	for the relationsh	ip between number	of employees	and promability	/
Variables	Unstandardi	zed coefficient	Standardized	t—	Sig.(p	
		co	efficient	statistic	value)	
	В	Std. Error	Beta			
Constant	-12.110	45.006			0.792	
Constant				0.269		
TOTE	0.425	0.547	0.263	0.776	0.453	
SMSE	3.004	2.499	0.079	1.202	0.252	
ITE	1.775	0.914	0.677	1.944	0.046	

Table2. Regression results for the relationship between number of employees and profitability

According to the table above, number of employees in the department of IT is the only significant predictor of profitability at Aden—soft Company ($\beta = 0.667$, p<0.05). The number of employees at SMS department and total number of employees they are not predicting profitability significantly although they are related positively with profitability. The coefficients of the total number of employees and that of number of employees at SMS department were $\beta = 0.079$ (p=0.252) and $\beta = 0.263$ (p= 0.453) respectively.

V. THE COMPRESSION BETWEEN NUMBER OF EMPLOYEES AND ASSET GROWTH

In addition to revenue, sales and profitability, this study also used asset growth as a proxy measure of performance. Objective four was formulated for examining the relationship between asset growth and number of employees at two departments and the total number of employees. Statistical model (3.4) was developed and used to examine statistically the relationship between these variables. The regression results indicate that the 83.3 percent of the variance in asset growth was explained by the predictor variables (total number of employees, number of employees at SMS department and number of employees at IT department (R2 = 0.833, p<0.05). The relationship between each predictor variable and the dependent variable (Asset growth) is shown in Table 3 below.

Variables	Unstandardi	zed coefficient	Standardized	t—	Sig.(p
		coefficient		statist	value)
_	В	Std. Error	Beta		
Constant	0.887	3.357		0.264	0.796
TOTE	0.015	0.041	0.269	0 363	0.723
SMSE	0.416	0.186	0.321	2.234	0.045
ITE	0.086	0.068	0.958	1.259	0.232

Table3. regression results for the relationship between number of employees and asset growth

The results of Table 4.5 indicate that the number of employees in SMS department significantly determine the asset growth of Aden—soft Company ($\beta = 0.321$, p<0.05). The total number of employees ($\beta = -0.269$, p=0.723) is negatively but also insignificantly related to the asset growth. On the other hand, the number of

employees in the IT department is positively related to asset growth ($\beta = 0.958$), but at insignificant level (p=0.232).

Collectively, these results indicate that the four dimensions of performance (revenue growth, sales growth, profitability and asset growth) are affected differently by the three independent variables (number of employees in SMS and IT departments and total number of employees). In general the independent variables provide a sufficient overview about the performance of Aden—soft Company.

SWOT Analysis Results

The company has strength in the following aspects; it is the most valuable brand in the country, diversified income, and skilled workforce. According to SWOT analysis the company has some weakness; high employee turnover, high cost structure and weak brand portfolio.

Opportunities of the company rely on the market growth for the main firm's product, new technology that will cut costs and growing number of people purchasing online. Threats are the intense competition, government policies and political instability in the country.

The descriptive statistics indicates that all the series have been found to have a positive mean and standard deviation. The smallest mean value is recorded for sales growth while the highest mean value is for IT employees whom stood at 78.8750. The smallest standard deviation is recorded for IT employees indicating that the data points are less spread out over a wider range of values with smaller risk, while the highest value is recorded for the highest growth which indicates that the data points are spread out over a wider range of values thus high risk involved.

VI. CONCLUSION

Those results show clearly how the performance of Aden—soft Company is not that follows, and therefore the enhancement of the performance of Aden—soft Company is needed to make the company perform in the way it should.

The first strategy is to divide this company in two major departments and make each department have its own manager and budget .in this way the company would be more efficient because it will perform as it is two individual companies which will enhance the performance and the input of the company.

For the Soft wear department the main action that should be taken is encouraging the employees and makes them contribute more to the company instead of increasing the number of employees and without getting the expected contribution.

The strategic this study comes with is enabling the Performance to improve efficiency in its processes to submit claims and process payer and patient payments to increase cash flow and reduce operational costs.

Those results show clearly how the performance of Aden—soft Company is not that follows, and therefore the enhancement of the performance of Aden—soft Company is needed to make the company perform in the way it should.

The first strategy is to divide this company in two major departments and make each department have its own manager and budget .in this way the company would be more efficient because it will perform as it is two individual companies which will enhance the performance and the input of the company.

For the Software department the main action that should be taken is encouraging the employees and makes them contribute more to the company instead of increasing the number of employees and without getting the expected contribution.

REFERENCES

[1] Covin J G, Slevin D P. Strategic management of small firms in hostile and benign environments[J]. Strategic management journal, 1989, 10(1): 75–87.

[2] BurgeSmani R A, Wheelwright S C. Strategic management of technology and innovation[J]. READING, 2004, 1(1).

[3] Ketchen D J, Shook C L. The application of cluster analysis in strategic management research: an analysis and critique[J]. Strategic management journal, 1996, 17(6): 441–458

[4] Simonds J, Goldstein D, Walker B, et al. The Relationship Between Psychological Factors and Blood Glucose Regulation in Insulki—dependent Diabetic Adolescents[J]. Diabetes Care, 1981, 4(6): 610—615.

[5] Michael E. Porter. 1998. Clusters and New Economics of Competition[J]. Harvard Business Review, 11.

[6] Bromwich M. The case for strategic management accounting: the role of accounting information for strategy in competitive markets[J]. Accounting, Organizations and Society, 1990, 15(1): 27–46.

[7] Shank J K. Strategic cost management: new wine, or just new bottles[J]. Journal of Management Accounting Research, 1989, 1(1): 47–65.

[8] Ittner C D, Larcker D F. Quality strategy, strategic control systems, and organizational performance[J]. Accounting, Organizations and Society, 1997, 22(3): 293—314.

Cloud Computing Industry Faces Challenges

DAI Lu, Li Jianhua

1 School of computer, Dongguan university of technology, Dongguan, China, 523808

ABSTRACT— The study is mainly based on the knowledge and technologies in the fields of cloud computing, electrical engineering and intelligent computing. As a challenging novel subject, it carries out study on the resource allocation under cloud computing environment by integrating immune algorithm and energy consumption design and optimization technology.

Index Terms— cloud computing; challenging novel subject; resource allocation

I. INTRODUCTION

By generalizing above analyses, it can see that it has important academic theoretical value and practical application value that resource allocation algorithms and energy consumption optimization under cloud computing environment is systematically and intensively studied. With information technology is widely applied in all fields recently, the demand to large scale low cost computing capability is becoming more and more urgent. Meanwhile, the continuous growth of network bandwidth makes accessing of resources in remote computers is increasingly matured. The cloud computing was just arising under this background. As further development of distributed computing, grid computing and utility computing, cloud computing is an emerging mode of computing which takes network as carrier and dynamically allocate resources according to users' requirements on the basis of virtualization technology [1]. With computing technology is developing towards generalization, large scale data centers have to be built for satisfying the society's increasing requirement to cloud computing, however its operation has to be maintained with a great deal of energy[2]. Then it becomes an urgent issue that how to increase resource utilization rate and reduce energy consumption under the premises of ensuring high performance of cloud computing system and providing generalized service.

Resource allocation is a key technology of cloud computing. At present, the most of studies on resource allocation mainly focus on improving the overall performance by balancing the load of data center, but they didn't give full consideration to how to reduce energy consumption. The better solution for energy saving in the process of seeking resource allocation can not only save electric energy, but also reduce heat production of server so as to cut heat dissipation cost, improve system stability and extend service of hardware [3,4]. The increase of resource utilization rate both saves energy and reduces emission of CO2 such that it contributes to reduction of greenhouse effect, be significant to protection of the whole ecological environment and conforms to present idea of "Green IT" [5,6]. Now it urgently needs to develop studies on optimization of energy consumption of cloud computing resource allocation and its practical application, achieve innovative results with independent intellectual property on studies of optimization of energy consumption and prototype systems as well as lay the foundation for participating in international and corresponding domestic standards. Therefore, it has very important theoretical significance that resource allocation strategy and methods for optimizing energy consumption under the environment of cloud computing are studied.

With respect to optimization of energy consumption of resource allocation under the environment of cloud computing, this project plans to propose a kind of efficient algorithm for resource allocation, establish resource allocation under the environment of cloud computing into an optimization model with multiple purposes and solve this model with immune algorithm. As a kind of bionic intelligent algorithm inspired by information processing methods of biological immune system, the immune algorithm (IA) simulates biological evolution and inheritance processes following bio system's principle of "struggle for existence and survival of the fittest" and it has become a rising hotspot of study in computer science. While preserving several features of biological immune system such as good diversity, strong robustness and implicit parallelism, IA has own features and advantages over other inspired optimization algorithms. With self - adaptability and distributive nature and being very suitable for transplanting to cloud computing platform, IA produces offspring on the basis of the optimal individual of parent and substitutes the group convergence with the convergence of the optimal individual.

It can be seen from above analysis that this project not only introduces the latest results of IA into cloud computing, but also organically integrates resource allocation and optimization of energy consumption and provides new tools and methods for studies in the field of cloud computing. Comparing with existing analysis models and measures, the solutions proposed by this project have distinct features and development prospect.

ACKNOWLOGEMENT

This paper was supported by the science innovative and development of Guangdong Province (NO.3XZ151004)

REFERENCE

[1] Kliazovich D, Bouvry P, Khan SU. DENS: Data center energy-efficient network-aware scheduling. Cluster *Computing*, 2013,16(1): 65 75. [doi: 10.1007/s10586—011—0177—4].

- [2] Lee YC, Zomaya AY. Energy efficient utilization of resources in cloud computing systems. The Journal of Supercomputing, 2012,60(2):268 280. [doi: 10.1007/s11227-010-0421-3].
- [3] Song J, Li TT, Yan ZX, Na J, Zhu ZL. Energy—Efficiency model and measuring approach for cloud computing. Ruan Jian Xue Bao/Journal of Software, 2012,23(2):200 214 (in Chinese with English abstract). http://www.jos.org.cn/1000—9825/4144.htm [doi: 10.3724/SP.J.1001.2012.04144].
- [4] Contreras G, Martonosi M. Power prediction for Intel XScale[®] processors using performance monitoring unit events. In: Proc. Of the 2005 14th Int'l Symp. on Low

Power Electronics and Design (ISLPED 2005). IEEE, 2005. 221 226. [doi: 10.1109/LPE.2005.195518].

- [5] Singh K, Bhadauria M, McKee SA. Real time power estimation and thread scheduling via performance counters. ACM SIGARCH Computer Architecture News, 2011,37(2):46 55. [doi: 10.1145/1577129.1577137].
- [6] Noy F.N., McGuinness D.L., 2010.Ontology Development 101: A Guide to Creating Your First Ontology. Stanford Knowledge Systems Laboratory Technical Report KSL— 01—05 and Stanford Medical Informatics Technical Report SMI—2001—0880, March.
- [7] Fonseca, F. Egenhofer M., Agouris, P., Camara G. 2010. Using Ontologies for Intergrated Geographic Information Systems. Transactions in GIS, —(6):3 in print