

CONTENTS

THE DESIGN OF THE AUTOMOBILE RIBBED BELTS FATIGUE TESTER.....	
.....XU YING, ZHAO WEIHONG, DONG KUN	251
OPTIMIZATION ALGORITHM ANALYSIS OF SPORTS PERFORMANCE INFLUENCE FACTORS BASED ON RADAR IDENTIFICATION CHART.....	
.....TINGRAN ZHANG, JIONG LUO	254
APPLICATION OF AN ADAPTIVE NETWORK-BASED FUZZY INFERENCE SYSTEM USING GENETIC ALGORITHM FOR SHORT TERM LOAD FORECASTING.....	
.....ZHANG HONGHUI, GENG WENBO	258
FUZZY PROXIMAL SUPPORT VECTOR MACHINE FOR THE IMBALANCED AND BALANCED DATASETS.....	
.....CHUANDONG QIN	261
APPLYING DATA MINING TECHNOLOGY TO SOLVE THE PROBLEM OF FAMILY MIGRATION: A CASE STUDY.....	
.....WANG TIANYI	265
INTEGRATING DATA MINING IN CAMPING ALONG THE BIG LONG RIVER.....	
.....KE ZHU	269
COMPARATIVE ANALYSIS OF DIFFERENT TYPES OF HEAT PUMP IN RECYCLING OF WASTE HEAT IN THERMAL POWER PLANT.....	
.....KUNSHAN YANG, WANG WEI	272
CUTTING PROCESS SIMULATION IN MACHINING OPERATION BASED ON CAD SIMULATION SOFTWARE.....	
.....XIAOZHIWANG ,ZHIGANG LIU*,DONGYANG,SUNXINJIE	276
A STUDY ON GREEN SUPPLIERS SELECTING FOR BIOTECHNOLOGY INDUSTRY ON THE BASIS OF ANALYTIC HIERARCHY PROCESS.....	
.....XUELING NIE	279
SECQUENT NUMBERS' INPUT AND EDITION IN AUTOCAD DRAWING.....	
.....XING TIAN, LIU JIANING	286
DEVELOPMENT OF WEARABLE MEDICAL DEVICES.....	
.....LIU XUE-LIN, WANG HAI-TAO, BAI JIE-FANG	290
INFLUENCE OF EDDY CURRENT RETARDER AND THE MAIN BRAKE TO THE BRAKING SYSTEM	
.....LIU WENGUANG, HE REN, LU WEI	293
STATISTICAL DATA QUALITY ASSESSMENT GRID BASED ON BAYES METHODS.....	
.....HONGWEN. YAN, YAMEI. ZHOU	296
RESEARCH OF WIRELESS SENSOR NETWORK BASED ON IPV6.....	
.....RUIHUA SHI	301
RESEARCH ON COLLEGE STUDENTS MORAL DEGENERATION BASED ON NETWORK.....	
.....PAN SHUNZHAO	305
AN INVESTIGATION OF PUBLIC-PRIVATE KEY PAIRS.....	
.....HONGFEI SONG, YING CHE, XINGYU LIAO	309
CALL FOR PAPERS.....	312

The Design of the Automobile Ribbed Belts Fatigue Tester

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Abstract—To simulate the car engine ribbed belts with fatigue wear, according to the actual work of operation situation and distributed location in automobile engine ribbed belts, the automobile ribbed belts fatigue tester is designed. Considering the influence in the automobile ribbed belts fatigue life of the stress changes, the environment temperature changes and the driving factors, tester is designed, and key components of the tester is simulated by finite element analysis software in order to make wedge belt to the device as far as possible to meet the engine's actual situation, make it reflect the actual operation situation of the ribbed belts, meet the automobile ribbed belts fatigue tests, and provide reference for the ribbed belts with the quality inspection methods.

Index Terms—Ribbed belts; Fatigue tester; Fatigue life

I. INTRODUCTION

Belt drive with its simple structure, stable transmission, low cost, no lubrication and buffer vibration absorbing, replaces the other form of transmission on many situations, and is widely used in various fields of production and living. Ribbed belts drive with large transmission ratio, high space utilization and higher transmission efficiency is used to drive car accessories by engine manufacturers[1]. The main factors affecting the service life of the belt are its own characteristics, transmission system, external environment factors. This paper based on the car with ribbed belts in the actual working condition has carried on research and design in ribbed belts fatigue tester[2-4].

II. The design of GENERAL planning

Based on the actual working condition of the car engine, the design on the automobile ribbed belts fatigue tester includes power input parts, transmission parts, tension and high temperature control part.

A. The selection of power source

Power system is an important part of a machine. Only selected the suitable power plant, machine can have a stable working condition and the power of tester could be fully explored. So the first thing is choosing a suitable power plant[5,6]. Common power source includes gasoline engine, diesel engine and motor, etc. Because of the big cost and polluting gases of the gasoline engine and diesel engine, it does not take on the fatigue tester in the both as a source of power[7]. Considering that the

motor has the advantages of a lower initial cost, low running cost, less maintenance requirements and the characteristics of wide power range, it is chosen as power source[8]. Considering the large power consumption, long working hours and variable requirements in test process. The power source of choice is frequency conversion electric machine at last. Adding to the use of frequency converter can meet the needs of the automobile ribbed belts fatigue tester.

B. Determine the size of accessory gear train layout and pulleys

The layout of Engine accessory gear train is restricted by the size of the layout. The limited space increased the difficulty of the gear train layout. The special issue to consider is the location of accessories and pulley diameter. The actual situation of layout in the engine gear train as shown in figure 1, the design of the automobile ribbed belts fatigue tester is based on it. To simulate the engine wear condition in the actual case, the actual engine working condition has been calculated. The engine load is replaced by the water pump wheel load which the water pump in transmission shaft produces, so as to simulate wedge with real wear effect, and achieve the goal of fatigue experiment.

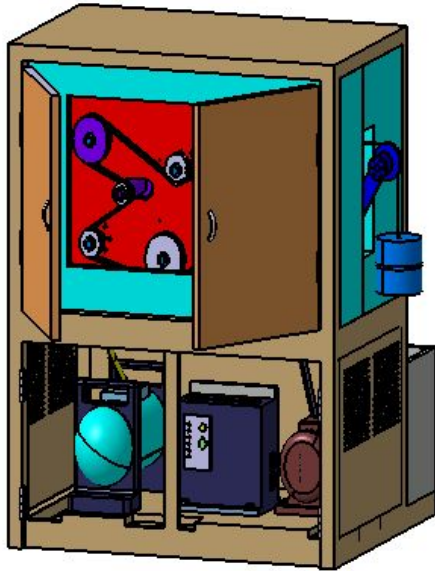
C. The pre-tightening force uploading device

Tension of belt is the necessary to guarantee the normal work of the gear train. The lack of pre-pull will produce skid and decrease the belt transmission power. Skid also cause overheating, desquamate phenomenon, and early wear. If tension is too large, it will lead to higher lateral load, the increase in extrusion pressure and support load and causing premature fatigue failure and permanent deformation. In addition, it will also affect the bearing life. Although the ribbed belt has strong tensile layer and low elongation, it still should strictly be controlled in the belt tension. Considering the economic weight loading method can be used for tension.

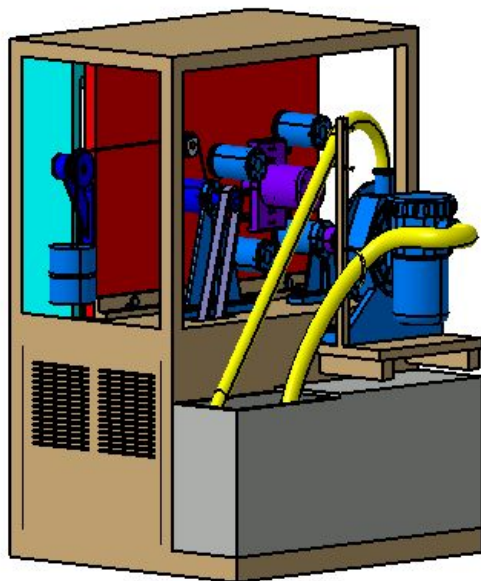
D. High temperature control

Because of large amounts of heat generated in the friction effect during the process of transmission, the ribbed belt has been in high temperature environment. In addition, the automobile engine start-stop makes its under high and low temperature changing circumstances. To simulate the condition of the ribbed belt wear in transmission, the machine bottom added high temperature control equipment. Ribbed belt is always in

a closed environment in testing process. Through the high and low temperature control device to control the temperature inside the machine, it simulate working conditions with ribbed belt in changing environmental temperature.



(a)The layout of gear train, power source and high temperature control



(b)The layout of pretightening force uploading device and loading
Figure 1. The schematic plot of Vribbed belts fatigue tester

According to the above design principles, the automobile ribbed belts fatigue tester is designed as shown in figure 1. In this design, considering the operation process of engine power, rotational speed and engine load fluctuations, vibration, the choosing machine power as input source should realize the adjustable speed. Considering the layout of the gear train, the diameter of pulley, the tension system, angle, the section and number of wedge, etc., it shall be based on the actual location of gear train layout to design the automobile ribbed belts

fatigue tester, so that it can reflect the fatigue test of real environment.

III. FINITE ELEMENT ANALYSIS OF KEY COMPONENTS IN FATIGUE TESTER

For the analysis of the transmission reliability of fatigue tester, we do force analysis on the drive shaft. On the basis of real size of transmission shaft, three-dimensional model is constructed by Inventor, the model as shown in figure 2.



Figure 2. The three-dimensional model of drive shaft

At work, the lower left side is the power input terminal of the drive shaft, and the upper right is power output. The input power is a torque. It is the size of 23000N.mm. Applying the torque to the input shaft end of the shaft, it takes static finite element analysis on the stress distribution and deformation of , and it get the stress distribution chart as shown in figure 3 and the strain distribution of cloud as shown in figure 4.

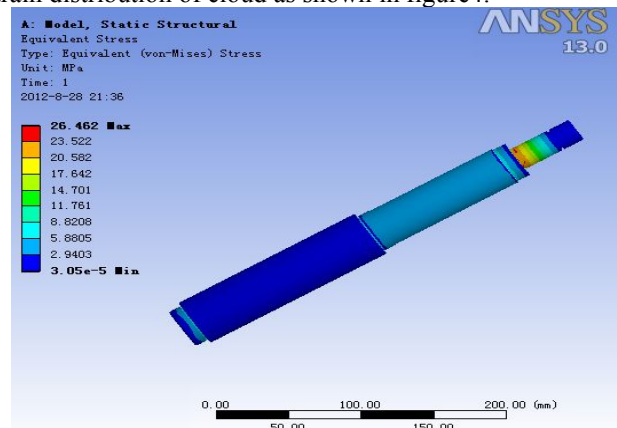


Figure 3. The stresses distribution of drive shaft

The place where Maximum stress appear is the place that the transmission shaft torque is, and the maximum stress is 26.642Mpa. Selection of transmission shaft material is 45 # steel. The material of the elastic modulus is 2×10^5 Mpa. Allowable stress is 60Mpa, the fracture limit is greater than 28.4Mpa. We can see from the load axial strain contours. The maximum strain of the load axis appears at the end of the shaft. Its size is 0.20844 mm and this impact of the deformation amount of automotive ribbed belt's fatigue testing machine is so small that it can be neglected, so the load axis design is reasonable and reliable. Thus it meets the demand of strength and stiffness. In the same conditions, it get strain distribution cloud of drive shaft as shown in figure 4.

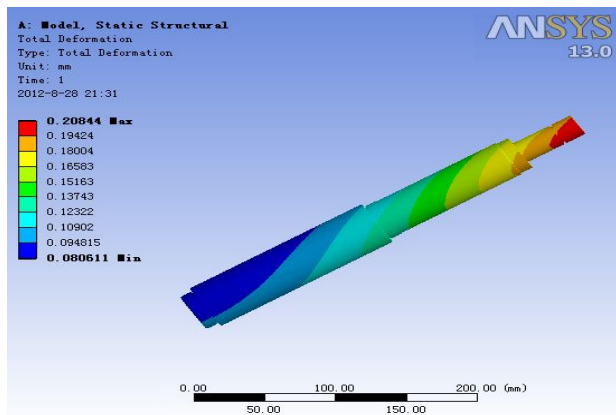


Figure 4. The strain distribution of drive shaft

As can be seen from the transmission shaft strain the shaft of the biggest variable should appear the end of it, the size of 0.01505 mm. the deformation has little effect on the automobile ribbed belts fatigue tester. It is negligible, so the shaft design is reasonable and reliable.

IV. HELPFUL HINTS

According to the structure characteristics of automobile engine ribbed belt transmission and its working environment, the automobile ribbed belts fatigue tester is designed. We can see from the analysis of stress and strain in key components that the equipment meet the requirement of the strength and stiffness, and it can be used for automobile ribbed belts fatigue test. The design is realistic .And equipment can realize more real simulation testing on the ribbed belts fatigue life. It has certain theoretical significance and practical reference guide.

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Optimization Algorithm Analysis of Sports Performance Influence Factors based on Radar Identification Chart

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Abstract—Since the advent of group training theory based on simple classification, it develops rapidly in the sports industry and becomes a core link between the special training and development strategy, and it has been widely used in the field of sports training decision and personnel training. This paper firstly describes the basic concept and classification of event-group training, based on this it uses correlation to do empirical analysis on affecting athletic result with modern pentathlon as an example, further combined with quantitative analysis to construct the sports optimization training model of event group training theory, which provides a theoretical basis and practical guidance for sports training and athlete personnel training to a certain extent.

Index Terms—Group training, sports performance, determinants, quantitative analysis, correlation, empirical analysis

I. INTRODUCTION

Group training is an extension of general training, but also as a development of specific training theories, it connects the general training with the special training theory. The thought of event group has opened up a new path for the study of sports training theory, also overthrew some fallacies which spread already a long time, therefore it becomes the important thought of creation in Chinese sports training theory. From the proposed and the establishment the event group training theory has attracts more attention in the sports sector, with support from all parties, and it has obtained the unceasing development. When studying the grouping theory in the field teaching contents of He Xinwu and Tian Kun, they adopted the method of group classification, clever fusion of competitive mode and teaching mode, making the track and field teaching content organization reasonable, full and effective, so the track and field teaching projects have been closely linked, and enriched the teaching content of track and field. While eliminating the teaching in the presence of obstacles, which greatly improves the quality of teaching, and achieved satisfactory teaching effect. In event group training theory status of Hu Yuli, based on the method of mathematical statistics and literature review, he describes the event group training theory application condition, and then expounds the rules between event group training theory and relevant training. The ideas and

methods not only enrich the sports training, but also provide a favorable theoretical basis for the diversity of the teaching method [1,2]. Cheng Yongmin and Xu Weimin's competitive ability, structure and classification of event group training theory - traditional deficiencies and improvement, comprehensive describes the core of the science of sports training is the competitive ability. Through analyzing the concept of competitive ability in China, it is found the association between exercise normative and substructures. He defines definition of the three layer structure division concept of competitive ability, puts forward supplement theory of the event group classification, which repairs and improves loophole existed in traditional training theory.

II. THE BASIC CONCEPT EVENT GROUP TRAINING THEORY

A. The Connotation of Event Group Training Theory

As a general rules and disciplines of sports training, based on "training" of Dr. Harley, through hard decades of research and continuous exploration, sports training is mixed with the specific training theory, and it has formed a set of more efficient, scientific training theory, which is named "the event group training theory", as shown in Table 1.

Since 1964, Dr. Harley put forward the relevant theory of training, Russia and other countries have done sports training practice research on general training theory and special training, and they failed to find serious flaws and shortcomings existing in the system. Before 1983, due to the narrow field of vision, the special training has universal limitation, so the theory research and training about sports remain stagnant during this period. In 1983, Chinese famous scholar Professor Tian Maijiu found that the athletic project classification system violates the objective laws and has serious logical problems [3]. Through a lot of investigation and analysis, he put forward the classification of the movement project according to athlete athletics ability. Under the leadership of Professor Tian Maijiu, in 1984 he and his colleagues put forward one brand-new concept of classification training. After nearly 20 years of painstaking research, finally the event group training theory is widely spread in the training field, and obtained the approve of most experts and scholars. Professor Tian and his team public the concept of group, namely category polymerization of the movement project, which

deeply explains the basic rules of group training and further improve the event group training theory. It laid a solid theoretical foundation for the study and development of sports training in the future.

TABLE I.
THE EVENT GROUP TRAINING THEORY

Time	Nationality	Main characters	Main achievements
1964	Germany	Dr. Harley	"Training" published
1983	China	Tian Maijiu	Firstly put forward the classification of movement project according to athlete athletics ability as the dominant factor
1984			Proposed the establishment of "classification training" concept
1987			Entitled "idea and name of group training theory"
1990			Published "the establishment and application of event group training theory "
1998			Published the monograph "the event group training theory"
2000			Published the teaching material "sports training"

B. Classification of Sport Event Group

Athletics is the smallest unit of the competitive strength in competitive sports, but it is also the carrier of various athletic competition with each other, so the analysis of the project is the primary task of the analysis of the athletic events [4]. Classification of sports project is various, mainly according to the sports form, nature, structure, equipment and venues. The classification is an important theoretical basis for improving the efficiency and effect of the athletes.

Compared with all Olympic Games level classification, Professor Tian Maijiu analyze it from the essential attribute of project, summing up the past research experience and theoretical conclusion, and puts forward event group classification method according to the competitive ability, action structure and evaluation of sports performance.

TABLE II.
ATHLETICS PROJECT CLASSIFICATION ACCORDING TO THE EVENT GROUP CLASSIFICATION

Main class	Subcomponent	The main project
Physical oriented	Fast strength	Jumping, throwing, weightlifting
		Short distance running (100, 200, 400 m)
	Speed type	A short tour (50, 100 m)
		The short distance speed skating (500 meters)
		Short distance velodrome cycling (200, 1000 m)
Endurance	The long distance run, walking, skating, triathlon,	

		military pentathlon	
		The long distance swimming, cross-country skiing	
Skill oriented	Performance	Accuracy	Shooting, archery, crossbow
		Difficulty and beauty	Gymnastics, artistic gymnastics, skills, diving, figure skating, synchronized swimming, skating, martial arts (routine), freestyle skiing, water skiing, trampoline
	Combat	Net	Table tennis, badminton, tennis, volleyball
		Same field	Football, handball, ice hockey, water polo, hockey, basketball
		Combat	Wrestling, judo, boxing, fencing, taekwondo, Wushu (Sanda)

In the face of many kinds and different properties of athletics project classification problem, it needs to construct a more scientific and complete training theory system. According to the mutual connection between each sport, a profound understanding of the nature of each item, based on the project properties and the athletes comprehensive requirements, and more objective classification is done [5]. In 2003, professor Tian Maijiu describes the innovative concept of multiple criteria and multiple dimensions for group combination, and sets up movement characteristics and performance evaluation system based on an athletic ability.

III. THE EMPIRICAL ANALYSIS OF AFFECTING SPORTS ACHIEVEMENT FACTOR

In order to better analyze the influence factors based on group theory, this paper uses military pentathlon in 2012 London Olympic Games as an example to do empirical analysis. This paper takes the male and female athletes final race results of military pentathlon as the basis. First of all the results are normalized, and the specific analysis of the table is as shown in table 3.

TABLE III.
THE MILITARY PENTATHLON FINALISTS RESULTS IN LONDON 2012 OLYMPIC GAMES

Project	10 m air pistol	Fencing	200 m crawl	Horsemanship	Cross-country race
Male	19.5%	16.8%	25.0%	20.2%	18.9%
Female	18.6%	15.6%	24.1%	20.1%	18.7%

As shown in Table 3, in the military pentathlon, each competitive individual of male and female accounts for the whole competition is the same [6, 7]. The largest proportion of all is the 200 meter crawl, and the smallest proportion is fencing, which explains that the movement competition results show uneven structure. Based on group theory it is apparent that the 200 meters crawl will become the leading, so in the training it needs to strengthen the dominant project training.

This paper uses correlation to analyze the individual performance and total performance, and uses index of correlation coefficient to reflect the single and total score [8]. Using the male's military pentathlon individual achievements in London 2012 Olympic Games as the reference sequence: $Y_i = \{Y_i(k) | i = 1; k = 1, 2, \dots, 11\}$; using female's 10 meter air pistol, fencing, 200 meter crawl, equestrian and cross-country running as compared sequence: $X_j = \{X_j(k) | j = 1; k = 1, 2, \dots, 11\}$.

After initialization, the following sequence is obtained:

$$Y'_i(k) = \left\{ \frac{Y_i(k)}{Y_i(k)} \mid i = 1; k = 1, 2, \dots, 11 \right\}. \quad (1)$$

$$X'_j(k) = \left\{ \frac{X_j(k)}{X_j(k)} \mid j = 1; k = 1, 2, \dots, 11 \right\}. \quad (2)$$

Combined with the data in Table 1, the formula (1) and (2) are through correlation coefficient coupling of comparison sequence and reference sequence, so we can get

$$\xi_{ij}(k) = \frac{\Delta \min + \delta \Delta \max}{\Delta_{ij}(k) + \delta \Delta \max}. \quad (3)$$

In formula(3), $\Delta \min = \min_j \min_k |Y'_i(k) - X'_j(k)|$, $\Delta \max = \max_j \max_k |Y'_i(k) - X'_j(k)|$, $\Delta_{ij}(k) = |Y'_i(k) - X'_j(k)|$, and δ is the correlation coefficient, which mainly

upgrades related significant upgrade of single factor and total score ($0 \leq \delta \leq 1$). General value is 0.5, and it is used to analyze the correlation γ_{ij} between military pentathlon single project achievement influence factor x_j of j and total score y_i .

$$\gamma_{ij} = \left(\frac{1}{n} \right) \sum_{k=1}^n \xi_{ij}(k). \quad (4)$$

Through formula (4), the standard regression coefficient statistics of individual performance and total performance is as shown in table 4.

TABLE IV.
THE LONDON 2012 OLYMPIC GAMES MILITARY PENTATHLON
STANDARD REGRESSION COEFFICIENT STATISTICS

Project	10 m air pistol	Fencing	200 m crawl	Horsemanship	Cross-country race
Male	0.28	-	-	0.69	0.49
Female	-	0.34	0.27	0.62	0.38

As shown in Table 4, there was no statistical significance in only two item of male; project and only one in female's project, the other has a moderate correlation with sports achievement [9]. Combined with restriction factor structure diagram proposed by Tian Maijiu in the book of the sports training process, the rating scale of military pentathlon group achievement influence factors is as shown in table 5.

According to table 5, it can build radar recognition diagram of sports performance influence factor characteristics, as shown in Figure 1.

TABLE V.
THE LONDON 2012 OLYMPIC GAMES MILITARY PENTATHLON STANDARD REGRESSION COEFFICIENT STATISTICS

Project	Pistol shooting		Fencing		Swimming		Equestrian		Cross-country running		Military pentathlon	
	Average	Grade	Average	Grade	Average	Grade	Average	Grade	Average	Grade	Average	Grade
Body shape	1.3	1	1.9	2	1.8	2	1.7	2	2.3	3	2.9	3
Physical function	1.1	1	2.9	3	2.2	3	2.8	3	1.9	2	1.9	2
Movement quality	1.3	2	0.9	1	1.2	2	1.9	2	3.3	4	2.9	3
Motor skills	1.0	1	1.7	2	1.4	2	1.2	2	1.4	2	2.2	3
Tactical ability	1.2	1	2.3	3	2.3	3	2.8	3	2.2	3	2.9	3
Mental ability	1.3	3	1.9	2	3.0	3	0.9	1	1.6	2	0.9	1
Sports intelligence	1.0	1	2.3	3	1.1	2	2.4	3	1.5	2	2.9	3

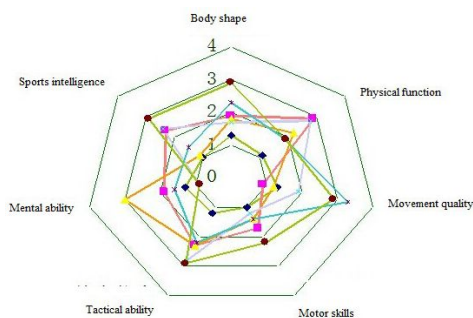


Figure 1. Radar recognition graph of Sports performance influence factor characteristics

From Figure 1, it is not difficult to see that, among the various influencing factors the basic does not exist the phenomenon of coincide, that is to say there is no correlation between the different influencing factors, no significant difference. So the movement achievements decision factors based on event group training theory are the random [10, 11]. In the special environment of sports competitions, sports scores is the competitive strength of athletic performance, it is also a comprehensive performance of athletes in the special environment of competition, which is a reflection of overall in more influence factors, and influence factors are random.

IV. MOTION SYSTEM OPTIMIZATION MODEL BASED ON EVENT GROUP TRAINING THEORY

Because the kinesiology is in the dynamic development, it can extract numerous kinds of division theoretical basis from the numerous classification standards, therefore in the process of sports training, using the event group training theory, according to their own needs of sports training, establishing the group training system of integrated personalized and theory. V is input of sports training funds; n is athlete training period; s is the residual investment value of retired athletes; C_p is the sports achievements; C_d is the annual athletic performance; i is uncertainty of sports performance influence factor; A is certainty of sports achievement factor. Combined with the certainty and the uncertainty of athletic performance, the whole training system for the event group training theory is as below:

$$A = (V - S) \left[\frac{i(1+i)^n}{(1+i)^n - 1} \right] + S_i \cdot \quad (5)$$

Group theory is a classification system in accordance with the decisive factors of the athletic ability division group, according to the theoretical basis of the theory of interpretation, can carry out the sports scientific training, improve and development of athletes in many aspects of competitive ability, lays the theoretical foundation for the common point to explore many types of sports and the law of development, then the criterion model is:

$$\min \left[(V - S) \frac{i(1+i)^n}{(1+i)^n - 1} + S_i + C_p + C_d \right]_j \cdot \quad (6)$$

The whole movement score is C_p , usual sports result is C_m , competitive sports scores is C_n , training performance is C_w , usual total score is C_b .

$$C_p = C_m + C_u + C_w + C_b \cdot \quad (7)$$

Putting the formula (7) into formula (6), it can get the event group training theory motion system optimization model.

$$\min \left[(V - S) \frac{i(1+i)^n}{(1+i)^n - 1} + S_i + C_m + C_u + C_w + C_b + C_d \right] \cdot \quad (8)$$

Through formula (8) it shows the movement system of group training theory, sport performance group based on the theory of competition is in the environment according to certain judgment standard for athletes competitive ability comprehensive evaluation system [12,13]. According to different rules and the way of evaluation, achievements of the movement have its own characteristics in different sports, present a pluralistic feature, in general the movement achievement is mainly composed of a combination of individual performance and a number of achievements.

V. CONCLUSION

Research on group training theory provides scientific and effective basis for the formulation of Chinese competitive sports strategy and promotes the reasonable flow of sports talents. Lacking the innovation theory application and not mature operation mechanism management still needs to be solved. The influence factors based on of sport performance based on event group training theory has important significance for the feature of the whole sports and sports performance improvement.

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Application of an Adaptive Network-based Fuzzy Inference System Using Genetic Algorithm for Short Term Load Forecasting

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Abstract—This paper discusses a method to forecast short term electricity load using genetic algorithm (GA) optimized Adaptive Network-based Fuzzy Inference System (ANFIS). The structure and parameters of the adaptive fuzzy neural network are synchronously optimized using an improved genetic algorithm. A fitness function is applied to guide the search process which makes the searching more efficient. The speed of convergence is significantly accelerated without causing any instability. After well trained, the fuzzy neural network is used to analyze relevant factors influencing load prediction. The results show that the proposed genetic algorithm optimization of adaptive fuzzy neural network has a higher forecasting accuracy and requires a shorter training time than the artificial neural network (ANN) which makes it attractive and promising in practical applications.

Index Terms - prediction model; electricity; genetic algorithm; fuzzy neural network;

I. INTRODUCTION

Short term forecasting of electricity load is of great importance in management of modern electricity grid system. It is therefore necessary to develop methods that can accurately forecast electricity load. Neural network is used in load forecasting but training of the network is rather complicated. The forecasting accuracy strongly depends on training of the network, therefore it is usually associated with problems such as long training time and local optimization, etc. Application of fuzzy inference system requires experiences and relevant knowledge of the professional personnel, making the forecasting difficult to control and thus limiting its applications when there is a lack of experiences of the personnel. Well integration of adaptive neural network into fuzzy inference system can comprehensively utilize the strong characteristics of both methods and overcome the above mentioned disadvantages. Genetic algorithm works directly on parameter sequences using a number of operators abstracted by natural selection. As population evolution is used in the operation, GA enables searching in multi-dimensions in the space of object function and implicit parallel computing, etc, therefore all feasible solutions will be examined simultaneously, which accelerates the searching towards the globally optimal solution. Due to its many advantages, GA is widely applied in the field of optimization. Application of the

genetic algorithm in optimization of ANFIS is considered natural and effective.

II. ADAPTIVE NETWORK-BASED FUZZY INFERENCE SYSTEM

Learning of the fuzzy neural network includes both modification of the network weightings and adjustment of the relevant parameters in the fuzzy neuron model, such as the size of the universe of fuzzy sets, algorithms for fuzzification and reverse-fuzzification and function of degree of membership etc. In network learning, the δ rule is used as the learning rule while the weightings and the model parameters are adjusted using the gradient method.

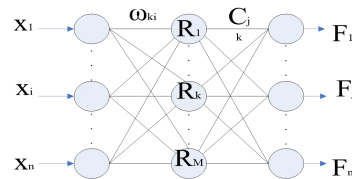


Figure 1. The feed forward fuzzy neural network with three layers

For the neural network in Fig. 1, the generalized probability integral of FN model is used in the ruling fuzzy neuron while the generalized probability summarization of FN model is used in the output layer. The following data sample is given.

$$\{F_j^a, F_j^a\}, (j=1 \dots m, \alpha=1 \dots S), \tag{1}$$

where the subscript indicates the sequence of the network output variable; the superscript α indicates the

sample sequence; F_j^a is the sample output; F_j^a is the measured output. The fuzzy neural network can be learned by solving the following optimization:

$$\min_{\omega, C, p, q} E = \frac{1}{2} \sum_{\alpha=1}^S \sum_{j=1}^m (F_j^a - F_j^a)^2 \tag{2}$$

where ω indicates weighting from the input to the ruling layer; C indicates the weights from the ruling to the output layer; q indicates the adjustable variables in the generalized probability summarization of FN; p indicates the adjustable variables in the generalized probability integral of FN; t indicates the number of iterations. According to the gradient method, the weighting of fuzzy neural network and the FN model parameter are defined as follows:

(1)the weighting from the input to the ruling layer

$$\omega_{ki}(t+1) = \omega_{ki}(t) - \eta \frac{\partial E}{\partial \omega_{ki}} \tag{3}$$

where $i = 1 \sim n, k = 1 \sim M, \eta > 0$ is learning ratio. The

gradient function $\frac{\partial E}{\partial \omega_{ki}}$ is defined as:

$$\frac{\partial E}{\partial \omega_{ki}} = - \sum_{\alpha=1}^s \left[\sum_{j=1}^m (F_j^\alpha - F_j^\alpha) q_j (1 - F_j^\alpha) \right] \frac{p_k R_k^\alpha}{1 - R_k^\alpha} \ln(X_i^\alpha) \tag{4}$$

(2)the FN model parameter in the ruling layer

$$p_k(t+1) = p_k(t) - \eta_p \frac{\partial E}{\partial p_k} \tag{5}$$

where $k = 1 \sim M, \eta_p > 0$ is the learning ratio. The gradient is defined in the following equation:

$$\frac{\partial E}{\partial \omega_{ki}} = - \sum_{\alpha=1}^s \left[\sum_{j=1}^m (F_j^\alpha - F_j^\alpha) q_j (1 - F_j^\alpha) \right] \frac{R_k^\alpha}{(1 - R_k^\alpha) p_k} \ln(R_k^\alpha) \tag{6}$$

(3)the weighting from the ruling to the output layer

$$C_{jk}(t+1) = C_{jk}(t) - \eta' \frac{\partial E}{\partial C_{jk}} \tag{7}$$

$$\frac{\partial E}{\partial C_{jk}} = \sum_{\alpha=1}^s (F_j^\alpha - F_j^\alpha) (1 - F_j^\alpha) q_j \ln(1 - R_k^\alpha) \tag{8}$$

where $j = 1 \sim m; k = 1 \sim M; \eta' > 0$.

(4)the FN model in the output layer

$$q_j(t+1) = q_j(t) - \eta_q \frac{\partial E}{\partial q_j} \tag{9}$$

$$\frac{\partial E}{\partial q_j} = \frac{1}{q_j} \sum_{\alpha=1}^s (F_j^\alpha - F_j^\alpha) (1 - F_j^\alpha) \ln(1 - F_j^\alpha) \tag{10}$$

where $j = 1 \sim m; \eta_q > 0$.

And ordinary neural network, fuzzy operators which are connected with each other by fuzzy neural network itself also represents a kind of information distributed storage structure, and wherein the stored information and fuzzy logic system information display rules are equivalent. Because of the internal storage information equivalence, a fuzzy neural network model can be converted into one easy to understand and explain the fuzzy rule model. Fuzzy neural network after learning, the weights and FN model parameters will be updated.

III. ADJUSTMENT OF THE PARAMETERS OF ANFIS USING GA

Genetic algorithm is effective in solving complex cases. First put forward by JohnHoland, this algorithm is based on Darwin's theory of biological evolution to inspire and create, is based on the evolution of the

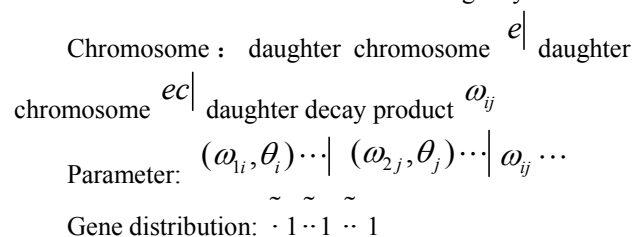
survival of the fittest, natural selection, survival of the fittest and species genetic thought search algorithm. Its outstanding characteristic is that it contains and the biological heredity and evolution very similar steps: selection, reproduction, cross, recombinant and variation etc.. Copy quality individual copy, increases the average fitness of. Cross was selected according to the cross and determine the crossover probability, the pair of individual genes, in part exchange, create new individual. Variation by setting the mutation rate in the population, individual loci, with its opposite gene replacement, get new individual, through variation can also restore the specific loss of information. It is a random search technique, its operation object is the parameter coding, instead of the parameters themselves, and not subject to function constraints (such as continuity, differentiable, unipolar value) constraints, so it can solve the problem of traditional optimization method to solve the multi parameter and multi model optimization problem. In GA, searching is started in each of the data sequence, which minimizes the possibility of being stuck in a local optimization. As each data sequence is treated individually, the GA is strongly adaptable and is suitable for cases with many unknowns and/or with strong non-linearity and for cases with difficulties to create a model. As random operation and probability decision making are used to guide the searching process, the best optimal solution can be obtained by evolution of the population. The input variables for control of ANFIS are residual e and changes of residual ec . Each variable is quantified by three membership functions. The parameters in the input layer is represented by the weightings (ω_{1i}, ω_{2j}) and the deviations (θ_i, θ_j), which gives in total 12 parameters to be adjusted. In addition there are 15 weighting parameters connecting the implicit layer and the output layer. In total, there are 27 parameters to be adjusted in GA.

Before the GA can be used in searching for optimization, the parameters have to be coded. Each parameter is coded into character strings (gene sequences). The resulting chromosome length is 360 bytes. The linear equation is defined as:

$$g_q = G_q + (G_{qmax} - G_{qmin}) \cdot A_q / (2^8 - 1) \tag{11}$$

where g_q is the real value of the qth parameter; A_q is

the gene sequence with N bytes; G_{qmax} and G_{qmin} are respectively the upper and lower limits which the character string can express. The code of the parameter in the chromosome is ordered in the following way:



The searching is initiated on the population with chromosomes distributed all over the target space. The initial population consists of $P^n = 200$ individuals. The improved fitness function f is used to guide the searching process towards the best optimal solution. J is the target function as defined in Equation 12.

$$f = \frac{1}{(1 + J)^2}, J = \frac{1}{2} (y_d - \hat{y})^2 \tag{12}$$

where variation probability = $\exp(0.05 \cdot N / M) - 1$. N is the current generation while M is the total number of generations.

Dynamic cross rate and variation rate are used in the genetic algorithm. In the start phase, the cross rate is relatively high. All the potential individuals are selected and collected so that the searching space is squeezed with a logarithmic order as the evolution goes on. Initially being zero, the variation rate significantly increases as it moves closer to the best optimal. The cross operation is based on two point method. The selection, cross and variation process are described as follows:

With adaption value f_k , chromosome k is selected with a probability p_k : $p_k = f_k / \sum_{k=1}^{pn} f_k$ (13)

The expected value of chromosome k : $s_k = p_k \cdot pn$ (14)

The integral probability of chromosome k : $q_k = \sum_{j=1}^k p_j, k = 1, 2, \dots, pn$ (15)

IV. A FORECASTING EXAMPLE

The daily electricity load data of Zhoukou City in November is used to train the neural network. i indicates the week number of the day in question while j indicates time. The load of the day in question and two days before are used as sample for learning. The sample is defined as:

$$[x(i-2, j-1), x(i-2, j), x(i-1, j-1), x(i-1, j), t(i,$$

There are four input variables and one output variable. The ANFIS optimized by the genetic algorithm is used to estimate the number of clusters and the center locations of the clusters. The structure of the network is then identified. The network is trained using the hybrid method. Given the four influencing factors of the week as inputs, the trained network can predict the forecasting as an output. The daily load of Zhoukou City in December 6 (Tuesday) is forecasted on a 24 h basis using the adaptive fuzzy inference system. The neural network consists of three layers with 8 neurons in the implicit layer. The structure and the size of the sample are described above. Fig. 2 shows a comparison between the forecasted and the measured electricity load.

It can be seen in Fig. 2 that the GA optimized ANFIS has a higher prediction accuracy than the artificial neural network (ANN). The training time for ANFIS and ANN

are $t_{ANN} : 236.78$ S and $t_{ANFIS} : 3.62$ S respectively. The time required for training of ANN using back-propagation algorithm can be significantly reduced if the GA optimized ANFIS is used. The load predicted by ANFIS has a better agreement with the measured value than that that predicted by ANN.

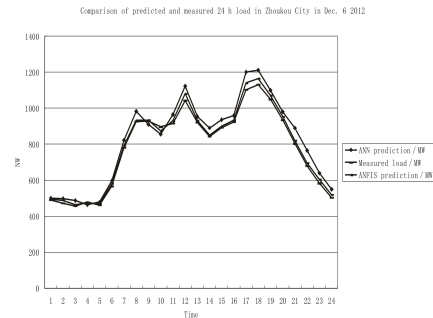


Figure 2. Comparison of predicted and measured 24 h load in Zhoukou City in Dec. 6 2012

V. CONCLUSION

A genetic algorithm optimized adaptive fuzzy inference system is proposed by integrating artificial neural network with fuzzy inference system. The structure of ANFIS is identified using the fuzzy inference system while the network is trained by genetic algorithm and back-propagation algorithm respectively. The proposed method is applied in short term forecasting of load of a city in a typical winter day. The result show that compared to the artificial neural network method, the ANFIS has a better prediction accuracy and a shorter training time which makes the proposed method attractive and promising in future applications.

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Fuzzy Proximal Support Vector Machine for the Imbalanced and Balanced Datasets

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Abstract—Introducing two fuzzy membership functions for the different features datasets and gaining the fuzzy membership, we propose the Fuzzy Proximal Support Vector Machine (FPSVM) for the imbalance datasets. This kind of FPSVM based on the PSVM can deal with the overfitting phenomenon among the imbalance classification problem. specially, reducing the influence of the outliers and noise in imbalanced datasets. Different fuzzy memberships may have different effects on the separating hyperplane. Points close to the proximal hyperplane have more effects than those away from the plane. Experiment results on six benchmark datasets show the classification accuracy of this algorithm is improved. Compared with other Fuzzy Support Vector Machines (FSVM) and PSVM, each method has its own preponderance and shortcomings for the different datasets, but this algorithm have the more selection for the classification of the imbalanced datasets.

IndexTerms—proximal support vector machine; fuzzy membership; fuzzy proximal support vector machine; Linear decaying; exponential decaying.

I. INTRODUCTION

Your Support Vector Machine (SVM) [1-3] is a widely used machine learning technique, which has been applied to many real-world classification problems in various domains. Based on the theory of SVMs, many scholars did the further research in data mining fields. J.A.K. Suykens (1999) proposed Least Squares Support Vector Machine (LSSVM) classifiers with an equation instead of the inequality of Lagrange Support Vector Machine (LSVM) [4]. After two years, Fung and Mangasarian (2001) proposed the Proximal Support Vector Machine (PSVM) [5], which may be thought of a kind of regularized LSSVM. PSVM requires the solution of a single set of linear equations and which can be considerably faster than the traditional SVMs. The solution of this linear system requires the dimension of the inversion of a matrix is smaller than in the case of SVMs, which yields a computational advantage. And Fuzzy Support Vector Machine (FSVM) is a variant of the SVM learning algorithm, which was originally proposed in [6]. In order to handle outliers and noises in imbalance datasets, FSVM technique assigns different fuzzy membership values (weights) for different training examples to reflect their importance and then incorporates these membership values into SVM learning algorithm to reduce the effect of outliers and noise. There are many ways to define the membership of a training example [7]-[8].

In this paper, according to the features of the imbalance dataset, we define a suitable membership function and proposed the FPSVM based on the PSVM algorithm. The memberships are closely related to the features of the dataset and reflect the contribution rate of any example point for the optimal proximal hyperplane. The proposed method enhances the PSVM algorithm in reducing the effect of outliers and noises in dataset. Experimental results show the FPSVM is superior to the PSVM and gains the more selection for the different imbalance datasets.

II. FUZZY MEMBERSHIPS

When training the SVM with all kinds of datasets, you will find the different example point give the different contribution rates to the hyperplane of classifier. So does the PSVM, the examples closer to the proximal hyperplane are treated as more informative and assigned higher membership values, while the examples far away from the proximal hyperplanes are treated as less informative and assigned lower membership values. To the PSVM, the proximal hyperplanes cross the center of the cluster. The distance of each point to the proximal hyperplane and the optimization hyperplane can be expressed respectively as follows:

$$d_i^p = \frac{\omega \cdot \varphi(x_i) + b \pm 1}{\sqrt{\|\omega\|}} \tag{1}$$

$$d_i^o = \frac{\omega \cdot \varphi(x_i) + b}{\sqrt{\|\omega\|}} \tag{2}$$

The distance of the proximal hyperplane to the optimization hyperplane is $d = \frac{1}{\sqrt{\|\omega\|}}$, where $\|\omega\|$ is the 2-

norm, d_i^p is the distance to the proximal hyperplane and d_i^o is the distance to the optimization hyperplane.

$(\omega \cdot b)$ can be gained from (10)-(11) and $\omega \cdot \varphi(x_i)$ can also be worked out with the kernel function: $K(A, A^T) = \varphi(A) \cdot \varphi(A^T)$

For the PSVM, we only need to compute the membership of the point between the two proximal hyperplane. So the membership should be subject to the following conditions:

$$s_i = \begin{cases} s_i, & \text{if } d_i^o \leq d \\ 0, & \text{if } d_i^o > d \end{cases} \tag{3}$$

Under the above conditions, we only need to compute nearly half of the points in two cases: Linear-decaying membership function and exponential-decaying membership function

$$s_i = 1 - \frac{d_i^p}{\max(d_i^p + \Delta)} \quad (4)$$

$$s_i = 1 - \frac{2}{1 + \exp(\beta d_i^p)}, \beta \in [0, 1] \quad (5)$$

Matrix $S = \text{diag}(s_1, s_2, \dots, s_m)$ is a diagonal matrix about the dataset with nearly half of the zeroes. Obviously, the small positive value Δ is used to avoid the case where becomes zero and the constant β determines the steepness of the decay. Some outliers or noise which is far away from the proximal hyperplane will be given a very smaller value.

III FUZZY PROXIMAL SUPPORT VECTOR MACHINE

Given the dataset:

$T = \{(x_{1M}, y_1), (x_2, y_2), \dots, (x_m, y_m)\}, x_i \in R^m, y_i \in \{-1, 1\}, i = 1, 2, \dots, n$. Based on the LSSVM classifiers of [4], the PSVM of Glenn Fung was aimed to build a decision function in the feature space $F: x_i \rightarrow \varphi(x_i)$ which can be express as follows:

$$\begin{cases} \min_{(\omega, b, \xi) \in R^{n+1+m}} \frac{1}{2}(\omega^T \omega + b^2) + \frac{C}{2} \|\xi\|^2 \\ \text{subject to } D(\varphi(A)\omega + eb) = e - \xi \end{cases} \quad (6)$$

Where A is the dataset and ξ is the slack variable. For simplicity, let $\varphi(A)$ be the map in a feature space, and $K = K(A, A^T) = \varphi(A) \cdot \varphi(A^T)$. Figure 2 describe its geometric explanation in R^2 , the planes $\omega \cdot \varphi(x_i) + b = \pm 1$ around the points “ \circ ” and “ Δ ” are pushed apart.

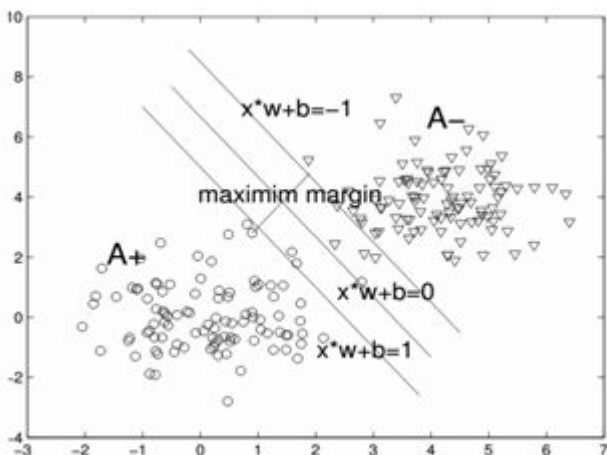


Figure1. FFSVM, modle

IV. THE LINEAR FUZZY PROXIMAL SUPPORT VECTOR MACHINE

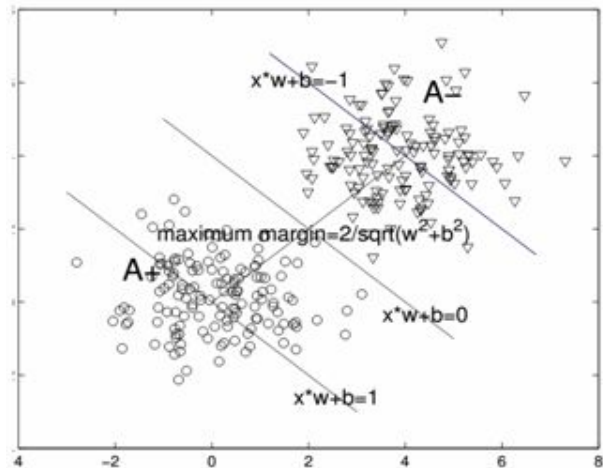


Figure2. PSVM model

After gained the fuzzy membership, we propose the FPSVM as follows:

$$\begin{cases} \min_{(\omega, b, \xi) \in R^{n+1+m}} \frac{1}{2}(\omega^T \omega + b^2) + \frac{C}{2} \|S\xi\|^2 \\ \text{subject to } D(A\omega + eb) = e - \xi \end{cases} \quad (7)$$

Here $S = \text{diag}(s_1, s_2, \dots, s_m)$ is the diagonal matrix. There are almost half of zeroes in the diagonal matrix S . The diagonal elements correspond to its membership values, which are associated with a lower bound $\sigma \leq s \leq 1$, where $\sigma > 0$ denotes the lower bound for the i th sample. To solve the model (7), we construct the following Lagrange function.

$$L(\omega, b, \xi, u) = \frac{1}{2}(\omega^T \omega + b^2) + \frac{C}{2} \|S\xi\|^2 - u^T D(A\omega + eb) - e + \xi. \quad (8)$$

Using KKT optimality conditions for (9), we can get the explicit formulation:

$$u = [HH^T + S^{-2}C^{-1}]^{-1} e \quad (9)$$

By letting $H = D[A - e]$, we implement the Sherman-Morrison-Woodbury formula [12] to (8) and obtain

$$u = CS^2 - [CS^2 H(I + H^T S^2 H)^{-1} H^T CS^2] e \quad (10)$$

This expression includes an inversion of $(n+1) \times (n+1)$ matrix, which should be much simpler than the inversion of $m \times m$ matrix in the case of $n \ll m$. The way computing (11) is the same to the linear PSVM. So the decision function for the linear fuzzy PSVM can also gains the same decision function:

$$f(x) = \text{sgn}(K(x^T, A^T)Du + b).$$

V THE NONLINEAR FUZZY PROXIMAL SUPPORT VECTOR MACHINE

Similar to the nonlinear PSVM algorithm, FPSVM algorithm can also be used in the nonlinear case. The equality constraint of (8) can be replaced by the following equality:

$$D(\varphi(A)^T \omega + eb) = e - \xi. \quad (11)$$

The nonlinear optimization problem for FPSVM is represented as follows:

$$\begin{cases} \min_{(\omega, b, \xi) \in \mathbb{R}^{n+1+m}} \frac{1}{2}(\omega^T \omega + b^2) + \frac{C}{2} \|S\xi\|^2 \\ \text{subject to } D(\varphi(A)^T \omega + eb) = e - \xi \end{cases} \quad (12)$$

Using KKT optimality conditions, we obtain an explicit expression

$$u = [GG^T + S^{-2}C^{-1}]^{-1}Se \quad (13)$$

Where G is defined as $G = D[K, -e]$. The nonlinear separating hyperplane corresponding to $\omega = \varphi(A)Du$

can be express $x^T \varphi(A)Du + b = 0$. Replacing $x^T \varphi(A)$ by the kernel function $K(x^T, A^T)$ we obtain the separating surface:

$$K(x^T, A^T)Du + b = (K(x^T, A^T)K(A^T, A^T) + e^T)Du = 0 \quad (14)$$

The corresponding nonlinear classifier is

$$f(x) = \text{sgn}(K(x^T, A^T)Du + b).$$

Note that the above matrix G and H is similar. Unlike the situation with linear kernels, the SMW (Shermarr-Morrisorr-Woodbury) formula is useless, because the kernel matrix is a square matrix. The inversion in (13) cannot be converted to an inversion of $n \times n$ matrix as the linear case. So the solution of the nonlinear fuzzy PSVM need to apply the way of the nonlinear PSVM which adopt the reduce kernel technology. The computational complexity of the nonlinear FPSVM is the same as PSVM.

VI. ALGORITHMS FOR FPSVM

6.1 Training algorithm for linear Proximal SVM

- (i) Define H , compute u by(13) for some positive C .and gain (ω, b) from PSVM.
- (ii) Compute the distance of each point to the optimization hyperplane from(1)or(2)and gain the membership $S = \text{diag}(s_1, s_2, \dots, s_m)$ from(3)-(5).
- (iii) Recomputed u from (10) using the upper S, H and u .
- (iv) Determine (ω, b) from FPSVM and gain the linear classifier.
- (v) Classify a new x_i by using the linear classifier.

6.2 Training algorithms for Nonlinear Proximal SVM

We generate the nonlinear classifier as follows:

- (i) Choose a kernel function $K(A^T, \bar{A}^T)$, where $\bar{A}^T_{\bar{m} \times m}$ is the submatrix of A and \bar{m} is as small as 1% of m , typically the Gaussian kernel.
- (ii) Define $G = D[K, -e]$ where $K = K(A^T, \bar{A}^T)$ and e is an $m \times 1$ vector. Compute u by (13).
- (iii) Compute the distance of each point to the hyperplane by (1) or (2) and gain the Membership $S = \text{diag}(s_1, s_2, \dots, s_m)$ by (3)-(5).
- (iv) Recomputed u by (13) using the upper S, H and u .
- (v) Determine (ω, b) from FPSVM and gain the nonlinear classifier.
- (vi) Classify a new x_i by using the nonlinear classifier.

VII. EXPERIMENTS AND COMPARISONS

We consider five benchmark real-world datasets from the UCI machine learning repository [13] to validate the proposed FPSVM method. In the test, each dataset is scaled into $[-1, +1]$ interval. and a five-fold cross-validation method is used. The results of the LSVM, PSVM and SSVM algorithm can be gain from [14] and [15].FSVMs is gained from [8] and [13].all of the results will be compared with the FPSVM in the following table.

Table I: Comparison of training accuracy, testing accuracy and running time (s) about PSVM, SSVM, LSVM and FPSVM using a linear kernel

$$k(x_i, x_j) = (x_i, x_j)$$

Dataset (m×n)P/N	PSVM	SSVM	LSVM	FPSVM	
				Lear	Exp
WPBC (198×32) 151/47	70.8%	70.8%	70.8%	72.5%	71.2%
	68.0%	68.5%	68.5%	71.8%	69.6%
	0.02	0.17	0.53	0.30	0.48
Ionosphere (351×34) 225/126	90.0%	94.3%	94.4%	95.6%	94.2%
	87.0%	88.7%	88.7%	94.2%	93.4%
	0.17	1.23	1.40	0.42	0.56
WDBC (569×32) 357/212	77.0%	78.2%	78.2%	79.5%	79.2%
	77.0%	77.6%	77.6%	79.0%	78.6%
	0.02	0.78	2.18	1.06	1.56
BUPA Liver (345×6) 145/200	70.8%	70.8%	70.1%	71.3%	71.2%
	70.0%	70.0%	69.6%	70.8%	70.8%
	1.75	1.05	0.34	1.98	2.40
Mushroom (8124×22) 4208/3916	81.0%	81.7%	81.7%	84.6%	82.8%
	81.0%	81.5%	81.5%	83.7%	81.6%
	1015	11.73	61.62	2836	3617

Table I shows the FPSVMs algorithm have the stronger processing ability. They gain the more precise results but the execution time increase much more than other SVMs, Because datasets have the different features. The linear decaying membership function is fit for the Ionosphere and Mushroom and the Exponential-decaying membership function is fit for the BUPA Liver and WPBC. Both of the two membership functions are effective for classifier.

Table II. Comparison of training accuracy, testing accuracy and running time (s) about LSVM, SSVM, PSVM and FPSVM using Gaussian kernel.

Dataset (m×n)P/N	LSVM	SSVM	PSVM	FSVM	FPSVM	
					Line	Exp
Ionosphere (351×34) 225/126	97.0%	97.0%	96.5%	93.5%	96.7%	97.8%
	95.8%	95.8%	95.2%	93.4%	96.1%	97.0%
	14.57	25.25	4.60	2.89	6.80	7.68
BUPA Liver (345×6) 145/200	75.8%	75.8%	75.7%	78.9%	76.3%	76.3%
	73.7%	73.7%	73.6%	78.8%	75.9%	76.1%
	20.89	30.80	4.80	25.98	5.64	6.84
Tic-Tac (956×9) 625/333	98.2%	98.0%	98.0%	97.8%	97.6%	98.8%
	94.7%	98.4%	98.4%	97.0%	97.4%	98.0%
	350.64	395.30	74.95	86.30	188	216
Mushroom (812×22) 4208/3916	87.6%	89.0%	88.0%	87.6%	89.2%	88.2%
	87.8%	88.8%	88.0%	87.2%	88.7%	87.4%
	503.74	307.66	35.50	214	89.6	146

Table 2 tells us: The correctness of the five methods is very similar but the execution time of the FPSVM is larger than that of the PSVM and smaller than the other SVMS. It also shows the FPSVM is better than FSVM in some dataset, such as WPBC, Ionosphere, except for BUPA Liver. Those show the fuzzy membership function has the selectivity for different datasets. Some datasets are suit for our FPSVM algorithm; some datasets are suit for the FSVM. But most of FSVM can gain the better effect for the datasets with some noise or outliers especially.

VIII. CONCLUSIONS

In this paper, we propose a FPSVM method with two types of fuzzy membership function for different datasets based on the PSVM algorithm. In this method, we assign a fuzzy-membership value for training examples according to the distance to the proximal hyperplane of the PSVM and validate the proposed method with several real-world datasets in two ways. From the overall results obtained, we can conclude that the proposed FPSVM method could result in significantly better classification results than PSVM, LSSVM and SSVM. But it spends more time than PSVM. Compared with the FSVM algorithms, FPSVM algorithm also has obvious superiority in selecting the fuzzy membership function. Those show us the FPSVM with different fuzzy membership function has a strong ability to handle the datasets with noise or outliers. As future work, it would be interesting to investigate the effectiveness of using the FPSVM method in the imbalance-learning or the twin support vector machine learning.

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Applying Data Mining Technology to Solve the Problem of Family Migration: A Case Study

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Abstract—In order to examine what changes when families move forth and back, a summary about emigration is first presented. There is a brief description of the findings on the immigrant families on researches conducted in that country. Further, sections on the existing data on the return migrants from relevant literature on the theme are presented. Finally, we present the themes that emerged from the qualitative study on the return migration of families followed by a discussion section.

Index Terms— Data Mining, Family Migration, Immigrants Data

I. INTRODUCTION

Over recent years, there has been a considerable growth of the size of data over the World. The data mining technology has become thoroughly entirely integrated in the too many field now. The technology plays an important role in almost every aspect of human life such as industry, commerce, security domain. Learning analysis has appeared 5 years or more, but it has not given us too much surprise, what is the major challenge of the field learning analysis? In order to examine what changes when families move forth and back, a summary about emigration to the United States is first presented. Following that section, there is a brief description of the findings on the immigrant families on researches conducted in that country. Further, sections on the existing data on the return migrants from relevant literature on the theme are presented. Finally, we present the themes that emerged from the qualitative study on the return migration of families followed by a discussion section.

A. Emigration

Emigration started in the mid-eighties, a country that previously had a reputation for receiving immigrants from other parts of the world. The United States, Japan and countries in Europe constitute the main hosts of this relatively recent emigrant population. The majority of these s are in the United States, primarily in New York, Boston, and Miami. [1] There are no official data on how many s live in the United States, since the official immigration data does not account for undocumented immigrants.

B. Who are the Immigrants to the United States

At the beginning of this exodus the emigrating population was predominantly composed of males, at a

ratio of three or four men to each woman, but at the end of the 1980s and beginning of the 1990s more women and families started to arrive. The majority of the migrants to Boston is from the state of Minas Gerais in south central Brazil. The typical immigrant in Boston is the one from the town of Governador Valadares and its surroundings. [2] Historically, the United States connection with this city dates from World War II when American airplanes took off regularly from Governador Valadares carrying mica, then an essential material for making radios. The connection was maintained even after the war, since the city became a semiprecious stone trading center for many American businessmen. During the 1960s, unemployment went up after the loggers cut down the tropical forest around the region. Then, young men started making a ten hour bus trip to Rio de Janeiro which would later be substituted by the journey to the U.S. The first emigrants during the 60s wished to stay temporarily in the U.S. to save enough money to return and open their own business and/or were eager for a new adventure. Others worked under seasonal programs offered by the American government, and today these pioneers on this journey own gas station, buildings and land in Governador Valadares. But their number at that time was not significant.

Social scientists address the connection between the two cities as having created a "culture of out migration" in Valadares, a term applied to communities that have an established pattern of international migration on a long time. The prospect of going to the United States or knowing someone who has gone became part of their history and daily life. Many receive remittances from relatives in the States or administer their investment on the local real estate market and other commercial enterprises with the dollars sent from abroad. Further, other aspects make the connection to the U.S. evident to a passerby, such as: tourist agencies that focus on travels to the U.S., exchange houses, local newspapers with columns that address issues pertaining to immigration, and so on. Thus, not only the townspeople are exposed to a diversity of information about emigration, but also the remittances provided by relatives and friends enable the move.

As social scientists explain, international migration can be understood by two main approaches: the push-pull model, a more traditional view, that proposes the imbalance in labor supply and labor demand in migrant-sending and migrant-receiving countries as the cause for international migration; and the structural model that

proposes macroeconomic trade and investment flows between the countries as the catalysts for international migration.[3] While proponents of the push-pull model emphasize individualistic responses, structuralisms emphasize the global scenario. Both approaches are not mutually exclusive, but useful when considering different levels of analysis. Brazil, as one of the new industrializing nations, has entered the cycle of transnational migration in the industrialized world.

The search for a better future for the next generation constitutes another motivational factor linked to economics. s no longer see the possibility of providing good quality education for their children in their own country. A good education is equivalent to having one's children in private schools which presents higher costs each year.

In terms of pull factors, Massachusetts originally attracted immigrants with stories of its economic boom during the mid 1980s. But besides economics, other factors seemed to attract this population. According to the Immigration and Naturalization Service in Boston, many s came to Massachusetts because of its large Portuguese-speaking population of immigrants from Portugal and the Portuguese islands such as Cape Verde and the Acores. Further, social networks and the already established community in Boston are essential factors in the continuous arrival of newcomers.

II. LITERATURE REVIEW

A. Changes in the U.S.

Immigration has major psychological implications. It does not involve simply the dislocation from one place to another. It can also involve the loss of all that the country of origin represents: native language, common cultural habits, rules and norms, social support of extended or near family, friends, acquaintances, well-known environment, and so on. Thus, immigration is an uprooting experience accompanied by an acculturation process. The disruption of a previous gender role pattern constitutes one of the great challenges families face with their move to the North American sociocultural environment. A closer look at the families' gender roles and their acculturation process revealed that changes in attitudes towards women, division of labor were related to the couples' acculturation process which in turn affected their satisfaction in their marital relationship. Fifty couples (50 wives and 50 husbands) who had at least one child, had lived an average of twelve years together, and had lived an average of seven years in the U.S. were interviewed. In most couples both husbands and wives were employed. Most of the wives worked as domestic housecleaners for American families, as did some of their husbands. The analysis indicated that husbands' gender roles were significantly related to their level of acculturation. With more acculturation, men became more liberal in their attitudes toward women and men's roles, and more involved with childcare.

Further, wives' satisfaction with their marital relationship increased as a function of their husbands'

acculturation and gender role attitudes, as well as their husband's involvement in taking care of their children. Husbands' marital satisfaction was not related to any of these factors, although evidence showed that husbands involved in feminine household tasks, such as doing the dishes, were more satisfied in their marital relationship. Moreover, interviews revealed frequent comments on differences between and U.S. society in gender roles and women's rights that placed pressure on immigrant marriages to change.

She got a job. Within two months after she went to work they separated".

Some studies have considered that the achievement of economic parity for many immigrant women has not led to more egalitarian households but to the disruption of their marriages as Margolis mentioned in her work citing Pessar and Grams muck. In my study, the disruption is credited to women's economic achievements but my findings indicate that changes towards more egalitarian relationships do occur within some marriages and marital satisfaction rises when men get more involved in feminine tasks.

Different from Hondagneu Sotelo's, who argues that gender role changes are a

consequence of the migration process, and not caused by any influence of the novel culture, with which her respondents had restricted contact, in my study most of the sample was involved in housecleaning of American family homes, which provided a contact with the inside life of family organization. In that sense, the North American families became a comparative scenario to their own family lives. Even if the personal contact was for a short period of time on the American employers' perspective, to the s it constituted in a very significant encounter, which helped them to understand how people from the U.S. arrange their lives in that country. Further, as the results of my research in the U.S. indicate, s demonstrate a tendency towards an acculturation pattern in which aspects of both cultures are valued, which might account for their openness towards the novel culture, while at the same time maintaining their own cultural characteristics.

B. What we know about Return Migration

The only study found about return migration from the U.S. to Brazil was by Margolis. Her research focused on s who had lived in New York and went back to Rio de Janeiro. She contended that the great difficulty in finding the return migrants was due to the fact that this population does not describe herself as immigrant, because of their plans to return to the homeland. However, the desire to return is typical of the migration phenomenon. The other phenomenon Margolis found was the yo-yo migration that is, after going back to Brazil "for good", many end up emigrating back to the U.S. after a few years in the homeland. In fact, in my previous research (2002) with 50 couples residing in Boston, of the 50 women interviewed, 7 had returned to Brazil, where they lived from 10 months to five years and then re-emigrated to the U.S. Of the 50 men interviewed, 9 went back to the U.S. after living from one to ten years in

Brazil. As mentioned by the interviewees on that occasion, the re-emigration was many times related to an enterprise that had not been successful in the home country or to difficulties in readapting to the homeland.

Gmelch wrote a thorough literature review on return migration. In spite of being more than two decades old, it is still extremely informative, since no other literature review in this line of research was found. For this reason, I will describe the major findings of his study. The author focused on international migration, in which migrants crossed country and cultural borders. He defines a brief typology of the returned migrants and addresses the motives for the return. The author asks why migrants return to a less developed country and give up a comparative high standard of living in one of the more industrialized nations of the world. Such enquiry seems to be quite frequent not only from academics and acquaintances from the more developed country, who look down on the migrant's homeland, but also from people of the country of origin, who look up to the industrialized world. Some of the studies reviewed indicate economic recession in the host country as the main motive, although the majority of the studies suggest that the wish to be reunited with kin and old friends is the strongest motive to return to the country of origin. The cultural and social advantages are stronger than the economic ones. Many studies reviewed ask if the return is linked to success or defeat in immigration, but there is no data indicating one or the other. Further, the adaptation and readjustment is addressed. The author shows that while some suggest that the psychological costs associated with the return would be lesser than those associated with the first emigration to a new place, the data shows a very different scenario. Some scholars even talk of a reverse cultural shock.

Another issue raised is whether the return migration influences in the promotion of new ideas or in sustaining the status quo. There are no conclusive data besides the indication of innovations on material culture and house design.

C. Back home what happens

Participants for this study were ten families returned from the U.S.. Two of the families were acquaintances of families the researcher met in the U.S., others were contacted with the help of local informants. An open-ended questionnaire was elaborated and used by the researcher as a guide. The questionnaire consisted of 24 questions assessing matters such as demographic characteristics, emigration and remigration history, job history, physical, organic or psychological problems, expectations for the return, decision to return, extended family relations, previous and present household division. The interviews were conducted with each spouse separately and lasted from one to two hours.

The present study reflected the use of grounded theory techniques. Couples were interviewed and the interviews were further transcribed in full. In this process, the data was broken down, compared and categorized enabling an analysis of the data.

The average marriage time of the group is 12.7 years, the ranging from 6 to 20 years of marital life. The men's average age is 38.3, ranging from 29 to 47 years, and the women's average age is a little lower, 36.4, the youngest being 31 and eldest 46 years old. In average, women had been in Brazil longer (4.18 years) than the men (3.98 years) since their return. Women's education is higher than the men, three women have a College degree in contrast to only one man, and five women are high school graduates versus three of the men.

D. Gender Role Issues

That theme emerged mostly in response to the question on how the couple organized their household duties in both countries. Sixty per cent of the sample had a more egalitarian division of laboring the U.S. and 40% sustained a more "traditional" relationship. Thus, whereas most men and women shared the responsibilities such as cooking, washing dishes, doing laundry and taking care of the children others sustained a division of tasks based on stereotypical standards. However, even the couples that maintained an uneven division of household and childcare tasks, the men had a greater participation in the U.S., when compared to their present life in Brazil.

For the more traditional couples, it did not matter if the husbands had spent some time sharing quarters with other men and had divided the house duties, when the wife arrived in the U.S., they resumed their sexist division. This finding contrasts to Hondagneu Sotello's who argues that living quarter arrangements determined changes in gender roles among Mexican families.

But in spite of the "traditional" arrangements, he did help his wife in some duties. However, as they returned to Brazil, he ceased to participate in the household tasks to avoid the comments of other men who might see him trespassing the local cultural gender role spheres. Both wife and husband demonstrate a sexist ideology towards gender roles, the wife believes that because the husband is unemployed he should help her with household work, but the social pressure to conform to the rigid cultural standards is clearly illustrated.

For half of the families that did have a fair division of labor in the U.S. (30% of the sample), where sometimes the husband had an even greater role in household organization and childcare responsibilities because the wife had greater work commitments, there was a reversal of such arrangement as they returned to Brazil. For the other half (30%) the roles continue to be perceived as equal.

The quality of the marital relationship is in general perceived by women to be better in the host country. Such consideration involves not only a greater participation of the men in the household duties but also in the way women felt they were treated by their husbands, as mentioned above by Mara. Gender role changes in the U.S. are described by women as an achievement. Marcia, exemplifies the 30% families who had an equalitarian arrangement in the U.S.

Marital dissolution among s in the U.S. is viewed as a consequence of women's greater independence and the greatest problem faced there by most families. When

asked if they would recommend to a family to return to Brazil, they consider that the greater family problem occurs in the U.S. and not in Brazil. Her statement implies that once in Brazil women conform to their traditional role and become or are silenced, as Marcia's statements show above. Cultural pressure from family, institutions put r pressure on these women to enact their maternal and submissive role. Their present depressive mood, however, tell us that they are experiencing an internal psychological conflict related to the ambiguity felt towards their return to the home country and the "traditional" role. On one hand, they value being near family and kin taking many times the responsibility of keeping family unit. On the other hand, they miss their independence and autonomy which enhanced their self-worth and self-esteem.

But some men are aware of the culture's treatment of women, how women's image is used to attract clients and sell goods. Adilson, who owns a pizzeria, comments on the general trend in commercial establishments' and the strange habit of using women as a way to increase the clientele. His perception contrasts with the posters of women wearing bikinis or in erotic positions I saw on the grocery store and liquor distributor owned by two other families of the sample.

Thus, the cultural differences on how gender is portrayed, what is expected of men and women, and their roles in the family, permeate the lives of these families in their return to the country of origin. The contrast between their arrangements in the U.S. and Brazil, the cultural norms of each country in regard to women and men's roles, pose new issues, demanding negotiations of their gender roles in some cases, or subtle impositions in others. It is a process which most families undergo, as illustrated by the case of Mara who talks to her husband about their gender role changes in both countries. She talked to her husband, who had become rude to her in front of others. Also Marcia, who during the interview realizes the reversal of their roles from egalitarian towards an uneven one, these were the major issues that emerged in relation to the couples' gender arrangements and changes in both countries.

III. DISCUSSION

The present paper explored gender role issues in the adjustment of families to the U.S., as it emerged in the studies conducted there, and whether the changes observed were sustained or not when families returned to

Brazil. The study indicates that return to the homeland constitutes an extremely stressful experience to all family members. Previous arrangements on gender roles learned abroad are many times discontinued in favor of a more traditional relationship. Women, in spite of a lower social status, felt higher self-esteem and more joy in life in the U. S. When describing their present life, they expressed a depressive tone of voice and sadness. Such phenomenon has important psychological implications. Professionals dealing with that population need to be aware of the reverse role status women go through when coming back to their own country. The social pressure to conform to a dependent and subservient position in relation to the husband affects their self-esteem and well-being on the long run. Men also need to become aware of the jeopardy this new arrangement can bring to the family. As my previous research demonstrated, about 30% of the families that had a more egalitarian division of labor both wives and husbands were more satisfied in their relationships. So, all members gain when genuine change is possible. In the present study it becomes clear that although most families did have a fair share of the household responsibilities and childcare in the U.S., in half of these cases the men conformed to those changes for practical and external reasons and not because of any sex role ideology change. But the other half constitute an example of how gender role changes can cross frontiers and sustain a family life in which both spouses feel respected and valued as individuals.

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Integrating Data Mining in Camping Along the Big Long River

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Abstract—This paper establish a model to schedule trips down the Big Long River. The goal is to develop the best schedule and determine the carrying capacity of the river. We propose scheduling groups down river in order to maximize the campsite utilization. In order to ensure each group enjoys a wilderness experience, this paper simplifies the model by the hypothesis that the travel groups behind could never catch up with the groups which are in front of them. This article calculate the camp utilization ratio in a six-month season (the utilization of the campsite), and regard it as the objective function. Eventually, this paper determines the schedule to launch an optimal mix of trips, of varying duration and propulsion that will utilize the campsites in the best way possible.

Index Terms—optimization algorithm, carrying capacity, campsite

I. INTRODUCTION

A. Problem statement

Visitors to the Big Long River can enjoy scenic views and exciting white water rapids. The rise in popularity of river rafting calls for a solution to allow more trips to travel down the river [1]. River trips all start at First Launch and exit the river at Final Exit, 225 miles downstream. Passengers take either oar-powered rubber rafts or motorized boats to spend 6 to 18 nights camping on the river, start to finish. No two groups can occupy the same site at the same time. Minimal contact with other groups of boats on the river should also be considered to ensure each group enjoys a wilderness experience in the optimal solution.

B. Model Overview

We propose scheduling groups down the Big Long River in order to maximize the campsite utilization.

- We calculate the camp utilization ratio during six months (the utilization of the campsite), and regard it as the objective function. Obviously, when the camp utilization increases, there will be more travel groups can travel the river.
- To simplify the model preliminarily, we set out essential limits in the process of calculating the utilization ratio of the campsite.

C. Constraints

The problem specifies the following constraints:

- Six months mentioned in the problem equals to 180 days.
- About each group travels the same miles every day, but different groups can travel different miles in a

day. Each group can only stay one night at the same campsite. Both oar-powered rubber rafts and motorized boats sail on a uniform velocity (oar-powered rubber rafts on 4 mph and motorized boats on 8 mph).

- We can prescribe the proportion of oar-powered rubber rafts to motorized boats.
- The travel groups behind could never catch up with the groups which are in front of them.
- Groups can travel only between 8 a.m. and 6 p.m., a maximum of 10 hours of travel per day.

D. Case study

Shechter and Lucus developed the wilderness use simulation model (WUSM) to simulate hikers' use of trail segments, cross-country travel routes and camping sites in order to estimate the numbers of encounters and potential conflicts among groups [2]. The WUSM model lacked many details of the actual river trip situation, but having fixed trip itineraries with only launch date and trip length as variables.

A computer program called the Grand Canyon River Trip Simulator (GCRTSim) has been developed for use by managers at the Grand Canyon National Park. GCRTSim consists of a database and a simulator, as well as extensive analysis tools. The database will eventually contain approximately 500 trip diaries collected in 1998 and 1999 that report stops for activities and camping along the 226 mile Colorado River corridor within the purview of the National Park Service [3]. The simulator provides users with the opportunity to set up prospective launch schedules for rafting trips and to simulate rafting seasons using these launch calendars. Both the trip diary database and the results of the simulations can be analyzed using extensive graphing tools [4]. The analysis can provide insight into use levels that could impact both the recreational experiences and the treasured resources along the Colorado River corridor.

II. METHOD

A. Assumptions

- We can prescribe the proportion of oar-powered rubber rafts to motorized boats.
- Campsites are distributed fairly uniformly throughout the river corridor.
- Groups can travel only between 8 a.m. and 6 p.m., a maximum of 10 hours of travel per day.
- Each group travels the same miles every day, but different group can travel different miles in a day.

- Both oar-powered rubber rafts and motorized boats sail on a uniform velocity (oar- powered rubber rafts on 4 mph and motorized boats on 8 mph).
- Each group can only move downstream and stay one night at the same campsite.
- The travel groups behind could never catch up with the groups which are in front of them.
- Weather and river conditions could not influence daily travel velocity and distance.
- We assume that the six months mentioned in the problem equals to 180 days.

B. Definitions and Notation

TABLE I. DEFINITIONS AND NOTATION

Symbol	meaning
X	the total number of groups launched by managers in 6 months
Y	the total number of campsites
N_i	the days group i traveling on the river
V_i	the velocity of group i
T_i	the date of group i start
$L_{i,j}$	the sequence number of campsite where group i stays at the date j
t_i	the time group i traveling each day on the river
S_i	the course group i traveling each day on the river
m_i	the number of campsites group i pass by but not stay each day
n_k	the number of campsite No. k be occupied
\hat{O}_k	the utilization of campsite No. k
$M_{i,i+1}$	the distance between group i and the group in front

C. Methods

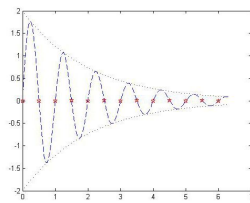


Figure 1. The grand canyon

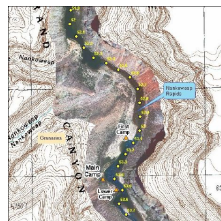


Figure 2. The campsite map of the grand canyon

The Grand Canyon is an ideal case study for our model, since it shares many characteristics with the Big Long River. The Canyon’s primary river rafting stretch is 226 miles, it has 235 campsites, and it is open approximately six months of the year. It allows tourists to travel by motorized boat or by oar-powered river raft for a maximum of 12 or 18 days.

The Figure 2 apparently shows that the distance of two neighboring campsites is around 1mile so we can assume that the total number of campsites is fewer than 224.

D. Objective functions

The manager wants to know ways in which to develop the best schedule and determine the carrying capacity of the river. For the sake of determining how to schedule an

optimal mix of trips, of varying duration (measured in nights on the river) and propulsion (motor or oar) that will utilize the campsites in the best way possible, we simplify the model by some essential constraints.

We obtain from the problem statement that the travel duration of each group is limited in 6 to 18 nights and each group can only move downstream and stay one night at the same campsite. So we have

$$18 \leq Y \leq 224; 6 \leq N_i \leq 18$$

Where Y is the total number of campsites N_i is the day’s group i traveling on the river.

The velocity of each group is

$$V_i = 4\text{mph OR } V_i = 8\text{mph}$$

X groups travel down the Big Long River each year during a six month period (the rest of the year it is too cold for river trips).So

$$1 \leq T_i \leq 180$$

Where T_i is the date of group i start its trip?

We construct a matrix, with the elements of the matrix describing the sequence number of campsite where group i stays at the date j ,so

$$1 \leq i \leq X; 1 \leq j \leq N_i$$

We know

$$t_i = \frac{225}{(N_i+1)*V_i} \tag{1}$$

$$S_i = V_i * t_i = \frac{225}{N_i+1} \tag{2}$$

$$S_i = \frac{225 - L_{i,1} * \frac{225}{Y+1}}{N_i} \tag{3}$$

$$S_i = L_{i,j} - L_{i,j-1} \tag{4}$$

Where t_i is the time group i traveling each day on the river and S_i is the course group i traveling each day on the river.

The distance of two neighboring groups is

$$M_{i,i+1} = \{(T_{i+1} - T_i) * t_{i+1} * V_{i+1} - (T_i - T_{i-1}) * t_i * V_i\} * \frac{Y+1}{225} \tag{5}$$

Since we assume that the travel groups behind could never catch up with the groups which are in front of them, we get

$$m_i = S_i * \frac{Y+1}{225} - 1 \tag{6}$$

$$n_{i+1} \leq M_{i,i+1} + n_i \tag{7}$$

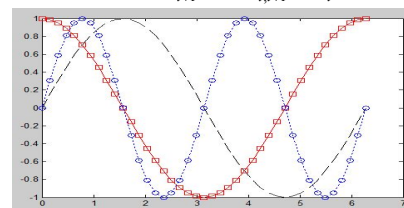


Figure 3. Model preferences

Where m_i is the number of campsites group i pass by but not stay each day, n_k is the number of campsite No. k be occupied.

The utilization of campsite No. k is

$$\begin{aligned} \hat{d}_k &= \frac{n_k}{180} \\ 1 \leq k \leq Y \end{aligned} \tag{8}$$

and

$$\sum_{k=1}^Y n_k = \sum_{i=1}^X \frac{N_i}{180 * Y} \tag{9}$$

We define the final objective function

$$f = \max \sum_{i=1}^X \frac{N_i}{Y} \tag{10}$$

III. CONCLUSION

In our optimization algorithm model, we make some reasonable assumptions to decrease the number of unknown variables. Then we transform the complex problems into solvable mathematical model of non-linear programming.

We assume that each team travels the same miles every day, and we do not allow different groups to meet at the travel course. Therefore, we weaken the condition that all groups on the river meet less as soon as possible and only consider the maximal carrying capacity of the river.

We take advantage of the method of optimization algorithms and find the objective function, and then we adopt Lingo to solve the problem.

In our optimization algorithm model, we assume that each team travels the same miles every day and we do not allow different teams to meet at the travel course on the river. While our models attempt to get a reasonable and convincing result, there also exist limitations.

While using the Lingo to solve this problem which contains a large number of variables, it has some limitations in dealing with large scale optimization.

All the process do not consider the impact of weather factors, but the weather does affect the actual schedule.

In our optimization algorithm model we presume that each team travels the same miles every day and cannot meet any other teams. In fact, this situation does not exist in real life. If we abandon this assumption and reestablish restraint conditions and objective function, we will get the solution more in line with the actual situation.

In the process of solving the questions raised in the above issue, we have some important discoveries. We have established a optimization algorithm model chinch successfully solved the maximum carrying capacity of the Big Long River within a half year and the schedule of travel arrangements for travelers who come here. Now, we write this memo to tell Managers our important findings.

The results of our optimization algorithm model are particularly detail. As long as we input the parameters necessary, results can be got. The results include the launched number of the two types of boats every day,

their start time, their duration time (from 6 to 18 days) on the river and even the serial number of campsite each group lives every night. By controlling the way of launch we guarantee that the boats launched late can never catch up with the boats in front. In this way, our model ensures that every trip can enjoy a wilderness experience, with minimal contact with other groups of boats on the river as well as the maximal carrying capacity of the river.

By improving the algorithm, an important discovery has been found. We found how the number of campsites on the river corridor affects the number of boats Managers can send downstream. If the campsite number is less, namely, the parameter Y we input is less, the maximal carrying capacity of the river decreases accordingly. Conversely, if the number of campsites increases, the maximal carrying capacity of the river becomes larger accordingly.

When this model is applied to the Colorado River, if we find the number of boats Managers can send downstream small, our algorithm can tell us how many more groups could be added to the river each day. Conversely, if we are experiencing river congestion, we can determine how many groups should be reduced on the river, as well how many groups waiting to begin their travel should be reduced? If we have the data of future waitlists, our algorithm can output schedules in advance, allowing Managers to schedule the precise campsite location of any group.

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Comparative Analysis of Different Types of Heat Pump in Recycling of waste heat in thermal power plant

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Abstract—Different heat pumps and combination modes is calculated detailedly and compared to explore the best installed package in a gassteam combined cycle power plant. And the article has analyzed static investment income ratio of the project using different types of heat pumps. So that, it provides calculation method for another waste heat utilization scheme, and provides installed solution reference.

Index Terms— gassteam combined cycle power plant, low temperature waste heat, heat pump, energy saving

I. INTRODUCTION

Heat pump technology utilize the phase change process of refrigerating fluid itself to absorb heat from the low temperature matter to the high one to fulfill the transfer progress of heat. There are two chief applications of heat pump technology in China at present: 1) refrigeration and heating in architecture; 2) Recycling the low grade waste heat and offer higher grade heat energy.

The methods of different thermal power plants utilizing heat pump in recycling low temperature waste heat is various, there are multiple effects of boundary parameters should be taken into consideration. This study use a fuel gassteam combined cycle power plant as example. Compared with the calculation of different types of heat pump and their compound mode to find the optimal install scheme.

A. Classification and Application of Heat Pumps

There are different types and classifications of heat pump, the types that could apply to the waste heat recovery by low temperature circulating water in thermal power plant are electric compression heat pump, direct

combustion heat pump, lithium bromide absorption heat pump, steam compression heat pump, etc. [1][2]

B. Electric Compression Heat Pump

In order to centralized heating, electric compression heat pump utilize electric energy as power to recycle the low temperature circulating water waste heat in thermal power plant, the COP of it could reach 5 or so. Because of the low single-machine capacity (no more than 10MW) and high price (key assembly units of compressor rely on import), electric compression heat pump are rarely used in waste heat recovery of thermal power plant in order to central heating engineering. But the electric compressional mode cold water (heat pump) which can offer cold and hot water have more application. As Table.1 shows.

C. Direct Combustion Heat Pump

Direct combustion absorption heat pump use natural gas as drive heat source, enhancing the heat from the low temperature heat source to moderate or high temperature so that improve the quality and utilization efficiency of energy. COP of it is between 1.7 and 2.4. For the high price of natural gas, it's not reasonable in economy that use direct combustion heat pump to low temperature exhaust heat recovery in thermal power plant. Accordingly, use direct combustion heat pump as heating equipment in large-scale of thermal power plant is rarely to see at present. However, in the major industry with abundant natural gas resource or small area that need to heat, the direct combustion heat pump has its place. As Table.2 shows.

TABLE.I SOME APPLICATIONS OF ELECTRIC COMPRESSIONAL MODE COLD WATER (HEAT PUMP)

Customer	Type	amount	refrigerating capacity(kW)
Post Office of Funing in Qinhuang Island	RHSCW180M	3	600
Zibo Guo An Trade Development Limited Company	RHSCW060M	1	200
Dslian Ji Tian Construction Materials	RHSCW240M	4	800
Beijing Kai Yuan Management Limited Company	RHSCW180M	3	600
Hanzhong Shanxi Electric Bureau	RHSCW180M	3	600
People's Bank of China in Shenyang	RHSCW300M	25	5000
Qilu Landification Qihua Industry and Trade Group controlling corporation	RHSCW180M	3	600
Post Office of Funing in Qinhuang Island	RHSCW300M	10	2000
VALQUA(Shanghai)	RHSCW120M	2	400

TABLE.II SOME APPLICATIONS OF DIRECT COMBUSTION HEAT PUMP

Customer	Type	Amount	heating capacity(MW)
Xinghua Village Shanxi Wine Industry	RDP080	1	3.6
Xinghua Village Shanxi Wine Industry	RDP058	1	3
Sinopec Shijiazhuang Chemical Fibre Factory	RHP028DM	1	2.8
Sinopec Victory Oil Field	RHP020D	1	2
Sinopec Shijiazhuang Chemical Fibre Factory	RHP028DM	1	2.8

D. Lithium bromide absorption heat pump

Lithium bromide absorption heat pump (heat gain pump) is usually called AHP (absorption heat pump) for short. It use steam and waste hot water as its heat source, enhance the heat from low temperature to moderate or high temperature so that increase the quality and utilization efficiency of energy. According to different working conditions, the COP of it usually range from about 1.60 to 1.85. The temperature of hot water which supplied by absorption heat pump often under 98 °C, the higher hot water temperature rise is, the smaller COP value is. The heat source could be the steam with 0.2~0.8MPa, and the fuel oil or fuel gas as well. The condition which the temperature of low temperature exhaust heat could be taken advantage of is that the temperature is higher than 15 °C. In general condition, the higher hot water temperature is, the higher hot water temperature which supplied by heat pump is. The unit capacity of steam absorption heat pump can reach above 50MW, and the range of it is wide. Because of the developed technology, the application of it often used in the field of low temperature exhaust heat. As Table.3 shows.

E. Steam compression heat pump

The theory of steam compression heat pump is basically the same as it of the electric compression heat pump, the only difference between them is that steam compression heat pump drive heat pump compressor by power turbine to recycle low temperature circulating water. The core device of steam compression heat pump is need to be imported, and the unit costs of large-scale whole set of steam compression heat pump is so high that the application of it in China is rare. A waste heat recovery heating engineering in Shangdong and Shenyang municipal sewage waste heat recovery for central heating use a set of steam drive of multistage centrifugal heat pump system with heating capacity of 50MW.

TABLE III. SOME APPLICATIONS OF ABSORPTION HEAT PUMP

num ber	Thermal power plant	The condition of recovery of waste heat	Commis siong date
1	Chi Feng in Inner Mongolia thermal power plant	Recovery part of waste heat from one unit of 35MW	2008.6
2	The third thermal power plant in Yangquan	Recovery 35MW condensing heat from two unit	2010.4
3	The first thermal power plant in Datong	Recovery 135MW refrigerator waste heat from one unit	2010.3
4	The second thermal power plant in Datong	Recovery 600MW refrigerator waste heat from one unit	2010.3
5	Jing Neng thermoelctricity	Recovery 200MW condenser recycling of waste heat from one unit	2010.3
6	Wei Lake thermal power plant	Recovery 125MW steam heat from one unit	2010.3
7	Kiamusze thermal power plant	Recovery 300MW steam heat from one unit	2011.12
8	Dong Hua thermal power plant	Recovery 300MW steam heat from one unit	2012.12
9	The second Hua Dian(Beijing)thermal power plant	Recovery 254MW fuel gas-steam condensing heat from one unit	2012.12
10	The first thermal power plant in Harbin	Recovery 300MW steam heat from one unit	2013.12
11	Shuangya mMountain thermal power plant	Recovery 200MW steam heat from one unit	2013.12
12	The second thermal power plant in Changchun	Recovery 220MW steam heat from one unit	2013.12

II. FORMULATION OF SCHEME TYPE

For the better result of comparing the application condition of different types of heat pump, this study used a gassteam combined cycle power plant as the example to calculate for comparison and selection. This plant started to construct first-stage project of recycling of waste water, put two absorption heat pump with 60.9MW into operation and both run well. For the sake of enhancing the heating capacity and efficiency of energy use, they use one heat pump to recycle the waste heat of circulating water from another. The return water temperature is advisable to be 55 °C, the temperature of circulating water to in and out condenser is 32 °C/36 °C.

The low tension steam is exhausted in the first-stage project, so there is no suitable steam source for absorption heat pump in the second-stage project. However, there are various kinds of energy for thermal power plant, such as natural gas, electricity and high pressure steam. Therefore, different kinds of heat pump and match pattern could be used to recycle low temperature waste heat. The scheme is shown in Table.4.

TABLE IV. SCHEME TYPES

Project	Scheme1	Scheme2	Scheme3	Scheme4	Scheme5	Scheme6	Scheme7
Power source	Natural gas	Electricity	Low tension steam	steam	steam	steam	steam
Scheme pattern	Direct combustion	Electric compression	Absorption	Decrease temperature and pressure + absorption	Small turbine+ absorption	Pressure verifier+ absorption	Steam compression + absorption
Primary device	Direct combustion heat pump	Electric compression heat pump	Absorption heat pump	Temperature and pressure decrease device and absorption heat pump	Small turbine and absorption heat pump	Pressure verifier and absorption heat pump	Steam compression and absorption heat pump

III. ANALYSIS FOR DIFFERENT CALCULATION SCHEME

The main calculating data is shown in Table.

TABLE.V MAIN DATA STATISTICS

Project	First-stage	Scheme 1	Scheme 2	Scheme 3	Scheme 4	Scheme 5	Scheme 6	Scheme7
Steam extraction pressure (MPa.a)	0.58	/	/	0.38	7.15	7.15	7.15	7.15
Steam exhaust flow (t/h)	138	138	138	138	138	138	138	138
Circulation water flow(t/h)	10500	10500	10500	10500	10500	10500	10500	10500
Unit back pressure(MPa.a)	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007
The temperature of heat-supply water into the heat pump(°C)	55	64.5	55	55	55	55	55	55
The temperature of heat-supply water out the heat pump(°C)	74.4	84.9	76.4	80.5	80.5	80.5	80.5	75.6/ 79.8
The heat-supply water flow(t/h)	5400	5000	2500	4000	4000	4000	4000	2200/ 1200
Driving source to provide heat(MW)	71.6	69.8	13.5	69.8	69.8	69.8	69.8	31+7.5
Waste heat recovery quantity(MW)	48.8	48.8	48.8	48.8	48.8	48.8	48.8	48.8
Heat pump COP	1.72	1.7	4.6	1.7	1.7	1.7	1.7	4.6/1.7
Heat pump heating quantity(MW)	121.8	118.6	62.3	118.6	118.6	118.6	118.6	52.9+ 34.6
Heat pump single-machine capacity(MW)	60.9	59.3	12.45	39.5	59.3	59.3	59.3	26.4/ 17.3
Number of heat pump	2	2	5	3	2	2	2	2+2
Temperature before heat-supply water into the heater(°C)	67.04	80.8	74.8	80.8	80.8	80.8	80.8	77.5
Temperature of heat-supply water out the heater(°C)	87.15	95.4	95.4	95	95.4	95	95.4	95.4
Total heating load in heating supply system(MW)	317.8	375.9	375.9	372.6	375.9	371.6	375.9	375.9

TABLE.VI ECONOMIC DATA STATISTICS

Project	First-stage	Scheme 1	Scheme 2	Scheme 3	Scheme 4	Scheme 5	Scheme 6	Scheme 7
Saving of associated natural gas(Nm ³)	1111	-340	1115	946	787	946	901	933
The effect of increasing backpressure on generating electricity(MW)	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
The effect of generating capacity(MW)	6.02	-2.2	14.1	6.3	18.2	5.67	12.7	10.4
Total operating cost(104 yuan)	832	-221	1444	649	1859	574	1298	1070
Total revenue(104 yuan)	1699	-555	1098	15078	-66	1583	757	1087
Total investment(104 yuan)	5100	6800	5650	5700	5000	6700	5000	7000
Ratio of return on investment(year)	3.0	Loss	5.1	3.8	Loss	4.2	6.6	6.6

note: 1、 the hour used in first-stage is 2160 and in second-stage is 1600;

2、 The price of electricity is 0.64yuan/kwh, price of natural gas is 2.28yuan/kWh, calorific value of natural gas is 35MJ/Nm³;

3、 The combined influence of generating capacity is the change of steam extraction, the unit back pressure, etc effects on the unit power in generating electricity;

4、 Total operating cost comprise of fuel, decrease of generating electricity quantity, increase of auxiliary power and operating and maintenance fees.

The consumption of fuel and own demand in different scheme has different effects on generating electricity, install number and equipment cost by combined cycle units. This lead to different pay back period. The specific economy analysis is shown in Table.6.

A. Analysis of direct combustion heat pump

(1)Direct combustion heat pump need extra natural gas consumption and increase the operating cost, the worst economic condition make company at a loss. Besides, the exhaust gas temperature is about 90 °C, that make the waste heat cannot used efficiently.

(2)The waste heat from direct combustion heat pump is about 66MW and larger than recycling heat, that is equivalent as operating water heater in advance. The steam exhaust and waste heat from circulating water are both increased so that the balance of system cannot be guaranteed.

B. Analysis of compression heat pump

(1)Compression heat pump need vast electric energy, enhance the station service power consumption rate, but increase the operating cost.

(2)The unit capacity of compression heat pump is small, and the floor space and noise when it's running

(80~95db) is large. The cost to maintenance of equipment is also large.

C. Analysis of convention heat pump

(1)The steam source of heat pump in scheme 3 need extract from outside through low tension steam port. That requires an intractable transform of turbine which need communicate with turbine manufacture to determine the modification scheme.

(2)The steam source of heat pump in scheme 4 comes from high tension main steam, it requires to punch in the high tension main steam pipe to extract steam. The transformation is not too difficult relatively. But it will effect on generating capacity of turbine and decrease the temperature and pressure directly may make a waste in the high quality main steam. The benefit is tiny and make company at a loss.

(3)The scheme 5 is based in scheme 4 to make the high quality main steam gradient utilization and decrease the loss of generating electric energy because of equipping generating set before main steam enter into the heat pump. However, this scheme need many accessory

equipment and the equipment layout need to be taken into consideration.

(4)The scheme 6 is based in scheme 4 to decrease the extraction flow of main steam by through equip pressure matcher, mixture parts of heating steam extraction and attemperation water. This scheme can decrease the consumption of main steam and the loss of generating electric energy compared with scheme 4.

D. Analysis of compression and convention combined heat pump

The scheme 7 is based in scheme 4 add a compression heat pump so that it could make the main steam gradient utilization. But the cost of steam compression heat pump is so high that need a long payback time, and the noise from compressor is large that require further entrench.

E. Recommended scheme

Take the difficulty of transformation, operating maintenance, pay back period, demonstration effect and noise control and environmental protection into consideration, the recommended scheme is shown in Table.7.

TABLE.VII RECOMMENDED SCHEME

project	Number	Gross assets	Payback period (year)	Technical difficulties	transformation difficulties	characteristic
recommended scheme1	3	moderate(5700)	The shortest (3.8)	smallest (absorption)	moderate (transform turbine)	Appropriate extraction steam condition
recommended scheme2	7	The most(7000)	Long (6.4)	Small Steam compression+absorption	small	Steam cascade utilization is novelty
recommended scheme3	2	moderate(5650)	moderate (5.1)	Small (electric compression)	small	COP value is big
Not recommend	5	large(6700)	Short (4.2)	big (add pulcino)	big	Small loss in generating electricity and difficult in layout
Not recommend	6	small(5000)	Long (6.6)	small	small	Low profits and long payback period
Not recommend	4	small(5000)	At a loss	small	small	Low profits
Not recommend	1	small(6800)	At a loss	big	small	Low profits

IV. CONCLUSION

(1) Because of the limitation of the temperature of heat pump supply water and the heat supply water flow, the transformation cost increased and the utilization time decreased in the second phase. It

results in the invest recovery ratio of some scheme in the second phase are bigger and the economy is lower than that in the first phase.

(2) The compression and convention combined heat pump could make the main steam gradient utilization, but has huge effects on generating capacity and need large investment. However, the combination of the two is so novel that make it has demonstration effect.

(3) Take the difficulty of transformation, operating maintenance, pay back period, demonstration effect and noise control and environmental protection into consideration, the first recommended scheme is scheme 3 (convention heat pump +steam ports extraction), the

second recommended scheme is scheme 7 (convention absorption heat pump +steam compression heat pump) and the third recommended scheme is scheme 3 (electric compression heat pump).

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Cutting Process Simulation in Machining Operation Based on CAD Simulation Software

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Abstract—This paper simulated the blade machining cutting process using the finite element method and CAD simulation software. The first part introduced the two blade processing technologies: electrochemical machining and mechanical cutting. It also introduced the advantages and disadvantages of the two processing techniques. The second part describes the three-dimensional cutting force model. It established the mathematical model of cutting force of the blade during the cutting process through finite element mathematical theory and got the answer of matrix equation according to the limited micro-unit principle. The third part combined with the mathematical model of second part and used professional finite element analysis software CAD to simulate the cutting process of the blade. It established CAD blades and 3D model of tool and divided the grid through mesh function. Finally, we got stress curve graph by calculation module CAD. From the curve, we can see that the maximum stress of tools reached 1450Mp. From the detection of a force point of different cutting speeds, we can conclude that when cutting speed is lower, cutting force is smaller

Index Terms— finite element method, cutting process, CAD system, blade machining, numerical simulation, machining accuracy, cutting force

I. INTRODUCTION

There are two commonly-used methods of blade machining. One is the electrochemical machining. Another is the direct mechanical cutting [1-3]. The detail introduction of the two processing technique is described as follows:

(1) Electrochemical machining

The principle of the electrochemical machining is putting the material which needs to process into the positive or negative pool of electrochemical decomposition pool. There are metal solutions including the material which need to process in electrolyses. Then, it deposits and machines part through the electrochemical reaction in the anode or the cathode. The blade is a complex mechanical structure model. We can produce blade machining mold using the electrochemical machining. CNC control technology can be applied in the production process to ensure precision of mold. Finally, we can process the casting mold using the model of precision casting. However, the process of electrochemical machining is complex. It is difficult to control. And the processing cycle is long it waste a lot of human and material resources [4,5].

(2) Mechanical cutting

With the development of CNC technology, mechanical cutting machining is the most commonly used processing method of machining. The blade is a complex mechanical structure model. Its precision is difficult to ensure due to the presence of the cutting forces and the temperature. The blade machining process must use CNC machining technology. It can establish the locus graph of tool through CAD system [6,7]. It can cut the parts. After the adjustment of the parameters of the tool to ensure that the affect of cutting forces and temperature on machining accuracy is the minimum.

The two processing methods can be summarized as the processing flow chart which is shown in Figure 1.

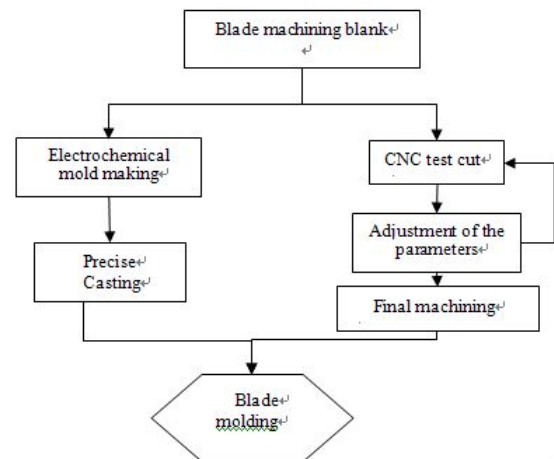


Figure 1. Blade processing flow chart

II. CAD FINITE ELEMENT NUMERICAL SIMULATION IN CUTTING PROCESS OF BLADES

In the cutting process, CAD finite element simulation includes pre-processing and calculation process. Pretreatment process includes 3D modeling, parameter setting and the effect of cutting. The calculation process comprises the calculation of cutting force and the display of the effect of the calculation.

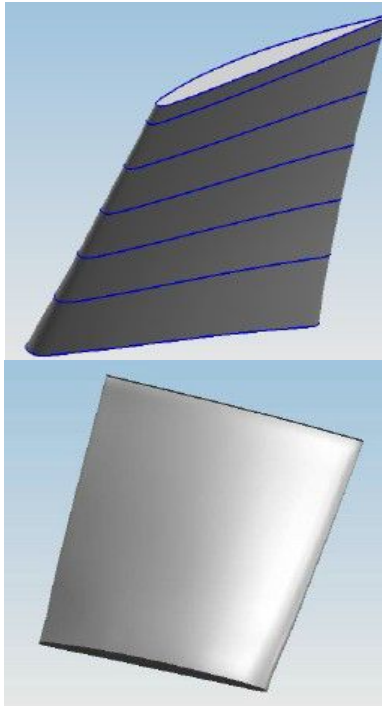


Figure 2. CAD finite element modeling

In Figure 2, it is blade model established in the CAD. The root and the corner of blade have been parameter optimized. The optimized blade is more in line with the curve and surface effect of real blade.

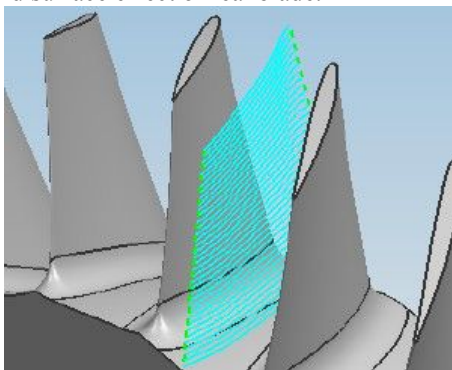


Figure 3. The locus of knife

In Figure 3, it is the locus of knife. The locus is spiral. We can optimize cutting parameters after the trial for tool so that the frictional force of tool is smaller. We can reduce the cutting temperature and speed up cutting speed of tool.

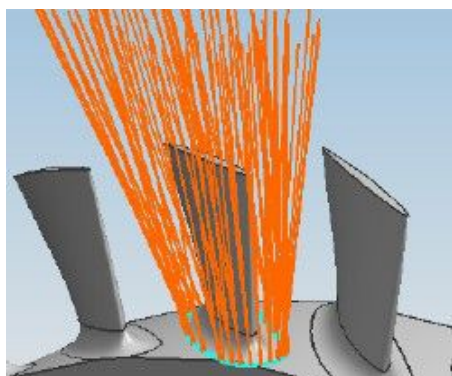


Figure 4. The cleared root locus of blade cutter

In Figure 4, it is cleared root process of blade's root in the process of blade cutting process. Tool resects the root through directional coupling.

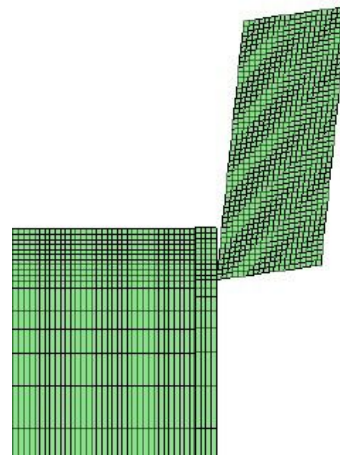


Figure 5. The local grid of tools and blades

In Figure 5, it is the grid schematic diagram of tools and blades. We can divide the finite element mesh using mesh function which be modeled by UG. After meshing, it can be substituted into the tool parameters for the calculation of finite element.

Table I. Cutting condition table

<i>Condition</i>	<i>Value</i>
Rotational velocity(r/min)	89
Feed rate(mm/r)	0. 3
Cutting thickness(mm)	1.1
Cooling	Coolant

In table 1, it is tool parameter table. Cutting speed is 89 r/min. The cutting thickness is 0.3mm. We can substitute cutting parameters into the second part of the familiar model. We can get the neprogram of tool's attrition using the CAD calculation module which is shown in Figure 6.

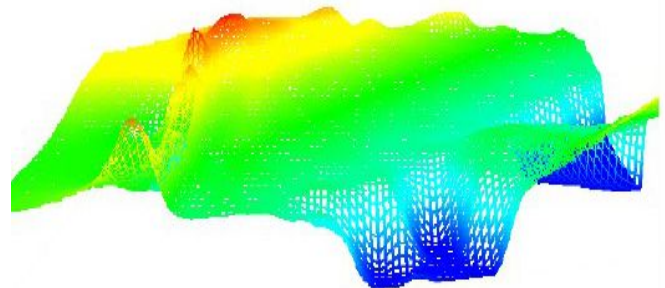


Figure 6. Fraying diagram of tool

As is shown in Figure 6, under the effect of the cutting force, tool has been abraded. Tool is no longer as smooth as the initial. The fraying of the anterior and posterior segment of tool is more serious.

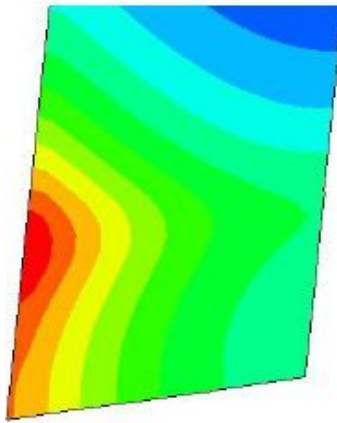


Figure 7. The stress nephogram of tools

As is shown in Figure 7, the stress of tools mainly concentrated in the top of the props under the effect of the cutting force. The stress of the end of tool is smaller.

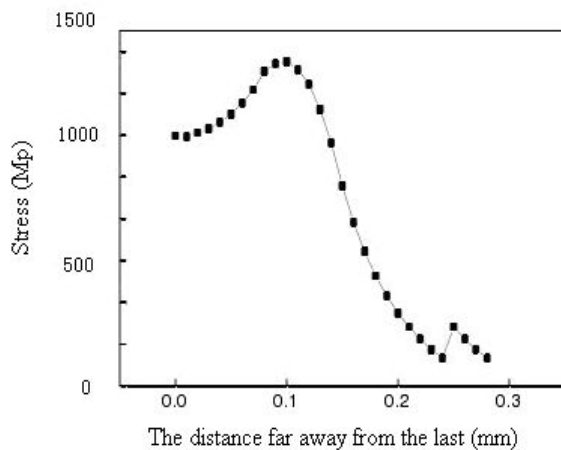


Figure 8. stress curves of tool

As is shown in Figure 8, when The Cutting speed is 89m / s and cutting thickness is 0.3mm, the stress of tools mainly concentrated in the top of the prop. The stress of the tools decreases from the top to the end, and the maximum stress reached to 1450Mpa.

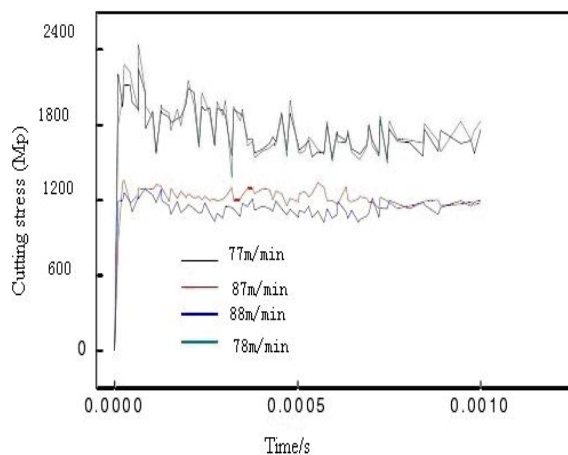


Figure 9. The cutting stress changes of different cutting speeds

As is shown in Figure 9, at different cutting speeds, the cutting thickness is 0.3mm. We can monitor the cutting force of a position of the tool. From the Figure, we can

see that when cutting speed is larger, the cutting force is smaller. Simulation results are consistent with the actual cutting experiments.

III. CONCLUSION

The blade is a complex mechanical structure model which has two processing methods. One is making mold blade using the electrochemical methods and forming the blade molding using precision casting methods. But the cycle of this processing method is long and the process is complex and difficult to control. The second method is cutting the blade directly. The cutting force and the friction between tools and blanks can affect the machining accuracy of the machining. We should timely adjust the cutting parameters and cooling model to improve processing accuracy. This paper simulates the blade machining cutting process using the finite element method and CAD simulation software. The first part introduces the two blade processing technologies: electrochemical machining and mechanical cutting. It also introduces the advantages and disadvantages of the two processing techniques. The second part establishes finite element mathematical model of tools in three axial according to limited micro-element method. The third part combines with the mathematical model of second part and software CAD to simulate the attrition of tool and the situation of force. Finally, we get the stress curve graph.

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A study on Green Suppliers Selecting for Biotechnology Industry on the basis of Analytic Hierarchy Process

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Abstract—The objectives of the research were twofold: (1) to establish collaborative evaluation criteria of green suppliers utilizing AHP; and (2) to construct evaluation processes according to the aforementioned set of criteria. In order to fulfil the two goals, an investigation to the selection process for green suppliers in the biotechnology industry via utilization of the analytic hierarchy process (AHP) was made. The findings of this research suggest that the major concerns in terms of green supplier selection for biotechnology companies are currently cGMP certification, established environmental policies, and product acknowledgement. Also, an evaluation form consisting of green criteria and weights is constructed to facilitate the selection process.

Index Terms—green supply chain, green supplier selection, analytic hierarchy process, biotechnology industry

I. INTRODUCTION

In recent years, the hi-tech industry has been greatly supported by governments, and a great deal of talent and funds have been absorbed into several relative fields. John Naisbitt (1990) pointed out in *Megatrends 2000* that the biotechnology revolution was one of ten trends that influenced peoples' lives in the 1990s. The biotechnology industry is a kind of sunrise industry, as it requires relatively low energy consumption and high knowledge intension, and offers high added value. According to a forecasting report of the Industrial Economics and Knowledge Center at the Industrial Technology and Research Institute (ITRI), the global biotech market grows at 18% per annum on average. Thus, the Taiwanese government included it in the "Two-Trillion-Twin-Stars" project as a national key developing industry in 2002, and has invested NT\$150 billion since then to boost the Taiwanese biotechnology industry (MOEA, 2006). In the next five years, the biotechnology industry turnover is expected to grow at 25% per annum on average, driving a NT\$150 billion investment. Further, over 500 biotechnology companies will have been founded during this ten-year period (MOEA, 2006). However, the issue of environmental protection gradually becomes important for biotechnology companies, in terms of new product R&D and manufacturing processes, especially the impacts of water and air pollution (Shief, 2006).

Supporting enterprises with technology needed for green supply chains is one way to raise industry

competence. With the looming of a green industry revolution, enterprises must be environmental-friendly, and must collaborate with both upstream and downstream supply chain partners. Green supply chain management (GSCM) was first proposed in 1970s. However, scholars and entrepreneurs plunge into its study until 1990s. The concept of GSCM can be simply defined as: an enterprise that collaborates with suppliers to improve products or manufacturing processes so as to raise environmental performances of suppliers and customers (MOEA, 2006).

Since 1999, many theoretical studies and practical cases on green supply chain management in Europe and the US have appeared. One key reason that green supply chain management has become a worldwide phenomenon is that consumers, investors and governments have all become more concerned about environmental protection work. Amongst globalization trends, all large-scale manufacturers have integrated upstream and downstream supply chains one after the other in order to achieve cost-saving in an efficient way. Relationships between supplier and manufacturer are no longer traditionally hostile battles, but have evolved into partner relationships (Lin, 2002). Cooperation with fewer suppliers can ensure a high quality yet low cost supply source; therefore, supplier selection has become more important. In terms of the green supply chain issue, green information and communication systems, environment quality management systems, green product design management, and green supply chain audits are all linked to each other. Therefore, some European Union (EU) countries have begun to focus on cross-link relationships regarding supply chains, and have transformed everlasting environmental protection demands to activate legislation aimed at encouraging involvement of all interested parties (including final consumers) through a market guided system to extend producer responsibility.

The choice of an appropriate cooperative partner is at the heart of supply chain management, and material or product/service providers are the most closely associated with an enterprise. If we can find a supplier that complies with industry characteristics and meets supply chain requirements, then supply chain competence can be enhanced; on the contrary, adding improper suppliers to the supply chain disables the collaborative operation of the whole supply chain, which either causes delays in terms of delivery and production planning, or causes credit and financial losses. Therefore, evaluation of

appropriate suppliers is a basic step in terms of supply chain management. In the existing literature, the supplier evaluation for biotech industry was seldom discussed. In practice, efficient supplier evaluation operations are difficult to perform in the biotechnology industry and a set of evaluation systems need to be built that consider the concept of environmental protection. In this study, we derive green supplier evaluation criteria and develop an evaluation model for biotechnology industry to overcome abovementioned difficulties.

II. LITERATURE REVIEW

A. Green Supply Chain Management

Supply chain management refers to utilizing, from the upfront supplier to the end consumer, a series of efficient operations to integrate product-related material planning and control, based on the interests of all members in the channel including suppliers, manufacturers, warehouses and retailers. By increasing customer service levels with management skills, existing resources can be fully used and whole system costs can be minimized (Chen & Chen, 2001). The objective of supply chain management is to integrate markets, distribution networks, manufacturing processes and purchasing events in all nodes of the whole supply chain, to realize high level yet low cost customer service, and thereby enlarge competitive advantages. Supply chains expand the original logistic system by not only extending conventional vertical integrated logistics, but also by surpassing logistics through taking full account of the whole logistic process and various environmental factors affecting the process (Juang et al., 2006).

Webb (1994) pointed out that product manufacturing had to use environmental criteria to choose appropriate raw materials, and had to pay attention to recycling and the green purchasing concept as well. Beamon (1999) suggested that environmental factor must be introduced to the supply chain model to put forward wider supply chain design methods. The green supply chain generally refers to supplier product and environmentally related management, or to incorporating environmental protection principles into supplier management systems, the purpose of which is to enhance market competence by implanting more environmental protection concepts. In practice, some companies propose environment-specific purchasing schemes, as well as performance or evaluation processes, to make all or most suppliers follow, while other companies list types of environmentally hazardous substances, and require that no substance on the list exist within materials or components.

Kuo et al. (2004) indicated that, in the whole process of supply chain management, the combination of the process, the products, the packaging, and the distribution have to take environmental problems into account, not only by reducing the social burden on the environment, but also by meeting environmental laws, and lowering green trading barriers. Lai (2004) suggested that building green supply chains has become a major challenge, but

that the trend of providing green products can allow us to advance towards a sustainable society. Further, component or material suppliers must consider environmental protection related system besides existing management system; in other words, they must propel green supply chain management methods.

B. Green Supply Chain Supplier Management

In traditional buyer and supplier relationships, each party protects itself, and rarely considers using close cooperation to achieve higher profits. As a result, both buyers and suppliers compete for price advantages in transactions, in order to have the lowest production cost. Their associations are mostly in terms of short-term contracts. Such a price-driven philosophy leads to limited communication between buyers and sellers during transactions, and only rare instances of sharing technical information (Spekman, 1998). In fact, often bilateral hostile relationships are the result due to less trust among manufacturers. Stuart & McCutcheon (1995) discussed building buyer-and-supplier relationships in one conceptually empirical investigation. Newman (1989) and Rubin & Cater (1990) pointed out that, in contrast to short-term contracts, bilateral relationships between buyers and suppliers allow both parties to move closer under a long-term strategic coalition. Blenkhorn & Noori (1991) and McCutcheon et al. (1997) suggested that good cooperation between buyers and suppliers leads to more rapid information exchange, which in turn generates greater environmental adaptivity and flexibility for organizations. All of the above literature stresses successful buyer-and-supplier relationships, and key factors pertaining to collaborative trading relationships.

Choosing appropriate collaborative partners is the most important step for supply chain management, while materials or service providers are the most closely associated with the enterprise. Finding suppliers that comply with industry

III. RESEARCH METHODOLOGY

This study mainly adopted AHP to analyze the importance of various green supplier evaluation criteria. Thus, related criteria were initially acquired from the related literature, and confirmed by expert interviews. We interviewed biotechnology managers to obtain the reference model for biotechnology manufacturers when evaluating green suppliers. A preliminary questionnaire was made after collecting and processing the literature, followed by discussion with biotechnology manufacturing professionals. The processes included asking experts to rate and score the criteria. Criterion unanimously regarded as important were included, while less important ones were omitted.

AHP is a multi-attribute evaluation method developed in 1971 by Prof. Thomas L. Saaty of Pittsburg University, and it is primarily used to solve decision problems in uncertain situations and with multiple evaluation criteria. Combined with expert discussion, the AHP hierarchy structure can be generated from confirmed criteria. To avoid excessive industry discrepancies between the

experts, all experts chosen for this study were senior executives of purchasing or environment engineering departments within the industry. This study included five such experts, who were all senior executives of listed or over-the-counter pharmaceutical firms with years of industry experience, and who all had unique viewpoints on subject of this study. Eisenhardt (1989) pointed out that, when conducting a case study, the case number should normally be between four and ten, as fewer cases hamper theory construction, and more cases become hard to analyze due to the relatively large amount of data. Therefore, this study included senior executives of five firms as interview subjects.

The above procedure can be shown as follows: (1) obtain criteria from literature, and filter them by expert interview to form AHP hierarchy structure; (2) design AHP questionnaire and assess comparative values; (3) compute weight of each criterion, and construct evaluation form as well as operational process.

IV. RESULTS AND DISCUSSION

A Extract Green Evaluation

After the literature analysis, 24 criteria were induced and tabulated as shown in Table I.1. However, to investigate the essential green criteria that significantly

TABLE I. Profile of Interviewed Manufacturers

company.	Founding Year	Capital RMB billion)	Major Products	Listed or OTC	Subject Tittle
A	1952	2.9	Human medicine, orthopedic appliance, animal medicine	Yes	General Manager
B	1967	1.5	Western medicine, Chinese traditional medicine, material medicine, animal medicine, biochemical supplement	Yes	Assistant Manager
C	1715	670	Prescription medicine, health product, oral cleaning, prepared medicine	Yes	Regional Manager
D	1988	1.1	Western medicine, Chinese traditional medicine, health food	Yes	Regional Director
E	1993	0.831	Various Western medicines, Western medicine material, antibiotics, serum, vaccine, medical equipment	No	General Manager

B Build Criterion Hierarchy

Using multiple criteria, AHP is a simple evaluation method to determine precedence. This study used AHP to confirm the five categories and 14 criteria (cGMP certification, environmental protection policy and objectives, executive support, environmental protection partner, product acknowledgement, usage of

affect the evaluation of pharmaceutical product suppliers, in-depth interviews were also performed. Pharmaceutical products are mainly for human and animal use, and there is high demand for product quality and dose accuracy. In circumstances related to the rising environmental protection pressure, supplier selection must be especially cautious. We chose to focus on the pharmaceutical industry. The basic data for the chosen manufacturers is shown in Table II. As for the in-depth interviews, subjects were senior executives serving in this industry, or purchasing supervisors of companies in this industry.

The most significant problems the companies faced are the lack of standard evaluation processes and green criteria to rank suppliers. The green supplier evaluation processes are not performed systematically. The interview material also uncovered many key factors and concerns for developing such a procedure. We thus asked the experts to rate the criteria shown in Table I. The rating scale ranged from 5 points (very important) to 1 point (not important). If the average score for a criterion was higher than 4, then it was adopted. In total, 14 criteria were selected for further analysis. We divided the 14 criteria into five categories, namely: environmental management system, general management ability, environmental protection ability, environment improvement cost, and environmental protection related documentation.

environmental-friendly materials, ability to decrease pollution, procurement of environmental-friendly materials, acquiring new environmental-friendly technology, product redesign, employee training cost, management of departmental documents, bill of waste management, environment log). The hierarchy structure was built and is shown in Figure 1.

TABLE II. CRITERIA SUMMARY

No.	Criterion	Description
1	Environmental protection policy and objective	Formulate environmental protection related policies or plan "product environment quality assurance" and regulation restricted product environment quality objectives
2	Environmental protection certification	Introduce or acquire environment management system certification (e.g.: ISO 14001, ROHS)
3	Information transmission and exchange	Summarize customer environment quality requirements and circulate to business departments, design and technical departments and manufacturing departments
4	Education and training	Draft environment related education and training courses with plans and implementations
5	Environmental protection partner	Formulate and execute environmental protection related criteria along with supply chain members
6	Executive support	Company management support implementation of environmental protection strategy
7	Recycle and reuse	Product R&D consider reusability (material alternatives, decomposable, dividable), and check hazardous substances, if any, for recycling
8	Remanufacturing	Design of recyclable containers, reconstruction, remanufacture
9	Green package	Product package design (e.g., reusable package, high recovery package) complying with recycle requirements

10	Material alterability	Improve material labeling, reduce material types, use similar and compatible materials
11	Green technical capability	Develop alternative materials, products, equipment and methods that alleviate life cycle shocks
12	Usage of environmental-friendly material	Whether or not supplier members use process banned substances in processing and has efficient control of chemical substance data
13	Ability of decreasing pollution	Whether or not product contains waste/toxic chemicals
14	Recycled product treatment capability	Whether or not company is capable of treating recycled products
15	Product acknowledgement	Whether or not customers trust and acknowledge product after purchase
16	Environmental protection mark	Whether or not product design and package have honor of environmental protection mark
17	Customer satisfaction	Whether or not environment management substances are summarized as per customer requirement
18	Procurement of environmental-friendly material	Supplier purchase of material must comply with environmental friendly requirements
19	Acquiring new environmental-friendly technology	Supplier manufacturing process must use new environmental-friendly technology
20	Product redesign cost	List product redesign cost
21	Employee training cost	List staff training cost
22	Management of departmental document	As per "product environment quality assurance system", outline documents and data to be managed by various departments
23	Bill of waste management	Manage various kinds of bills (e.g., chemical bill, laboratory and office supply bill)
24	Environment log	Publish environment log (regular report, edition journals of discharge, energy consumption, accident, impairment)

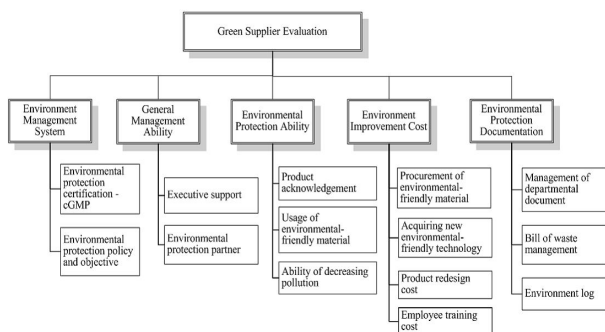


Figure 1. Criterion Hierarchy of AHP

C Calculate the Weight of Each Criterion

This step was divided into four stages: performing interviews based on the questionnaire; establishing a pairwise comparison matrix; computing criterion weights; and calculating consistency.

This study completed the AHP expert questionnaire on the basis of the above criteria. In total, ten experts were interviewed and eight questionnaires were valid, i.e. consistency index, $CI < 0.1$, and consistency ration, $CR < 0.1$. If the number of effective questionnaires had amounted to three, it would have indicated compliance with the AHP hypothesis (Lin, 2005). The experts interviewed were primarily senior pharmacy executives with decisive power, and they were also knowledgeable regarding environment protection issues. Thus, they were able to express precise and insightful opinions.

The comparison matrix was then established. Once the pairwise comparison matrix was established, the precedence of each criterion could be calculated. After normalization process, the normalized pairwise comparison matrix can be obtained, as shown in Table III. The criterion score was calculated by averaging the normalized values in each row; these were in turn used to compute consistency measures and a consistency index, and finally the consistency ratio.

TABLE III. NORMALIZED PAIRWISE MATRIX FOR MAIN CRITERION

	Environment Management System	General Management Ability	Environmental Protection Ability	Environment Improvement Cost	Environmental Protection Documentation	Criterion Score	Consistency Measure
Environment Management System	0.121951	0.078647	0.122804	0.241371	0.1851852	0.149992	9.519056
General Management Ability	0.121951	0.393236	0.1228049	0.241371	0.2592593	0.227725	11.830840
Environmental Protection Ability	0.609756	0.393236	0.6140243	0.241371	0.2592593	0.423529	20.230784
Environment Improvement Cost	0.121951	0.078647	0.1228049	0.241371	0.2592593	0.164807	14.056875
Environmental Protection Documentation	0.024390	0.056233	0.0175611	0.034516	0.0370370	0.033947	0.755350

D Summarize the AHP Questionnaire

We processed the questionnaires into the pairwise comparison matrix one by one, and calculated precedence according to the above steps. Every column in Table IV represents the weight of each criterion rated by each expert (e.g., the first expert rated environment management systems with a weight of 0.557); every row represents a criterion of each hierarchy in the AHP structure.

AHP uses a consistency ratio to check the pairwise comparison consistency, and if this ratio exceeds 0.1, it indicates inconsistent judgment. In this case, the decision

maker had to correct the original values of the pairwise comparison matrix. It was also necessary to check the CI and CR values – if the consistency ratio was less than 0.1, then the pairwise comparison consistency was deemed to be a reasonable level, e.g., for the first expert, $CI = 0.085 < 0.1$, $CR = 0.076 < 0.1$.

TABLE IV WEIGHTS OF CRITERION CATEGORIES AND CR VALUES

.NO.	Environment Management	General Management Ability	Environmental Protection	Environment Improvement	Environmental Protection	CI	CR

	System		Ability	Cost	Docume ntation		
1	0.557	0.147	0.154	0.090	0.049	0.085	0.076
2	0.567	0.161	0.154	0.075	0.041	0.083	0.074
3	0.386	0.166	0.343	0.051	0.051	0.070	0.060
4	0.388	0.159	0.338	0.071	0.042	0.097	0.086
5	0.149	0.423	0.164	0.227	0.033	0.090	0.080
6	0.276	0.155	0.155	0.184	0.227	0.090	0.080
7	0.348	0.177	0.177	0.222	0.073	0.040	0.040
8	0.557	0.130	0.130	0.130	0.051	0.010	0.010
Total	3.228	1.518	1.665	1.050	0.567	-	-
Average	0.403	0.189	0.208	0.131	0.070	-	-
Rank	1	3	2	4	5	-	-

E Compute the Average Weights

A total of ten experts attended this questionnaire investigation. Two questionnaires with high inconsistency were omitted; hence there were eight effective questionnaires in total. Every hierarchy in each questionnaire has its own weight and consistency ratio. To integrate the questionnaire weights as given by these experts, this study calculated the weight of every criterion in all questionnaires using a weighted average. For instance, the weights of the environment management system criteria as rated by expert 1 thru expert 8 were 0.557, 0.567, 0.386, 0.388, 0.149, 0.276, 0.348, and 0.557 respectively. These eight weights add up to 3.228, and the average is 0.403. Calculation results of all weights in all categories by all experts are shown in Table 5. It was found that the criterion precedence order was “environment management systems”, “environmental protection ability”, “general management ability”, “ environmental improvement costs”, and “environmental protection documentation.”

TABLE V
GREEN SUPPLIER EVALUATION FORM

Main Criterion (Weight)	Sub Criterion(Weight)	Rank	Overall Weight (a)	Score(b)	Weighted Score (a*b)	Sub-total
Environment Management System (0.403)	Environmental protection certification eGMP (0.611)	1	0.246			
	Environmental protection policy and objective (0.388)	2	0.156			
General Management Ability (0.189)	Executive support (0.512)	4	0.097			
	Environmental protection partner (0.487)	5	0.092			
Environmental Protection Ability (0.208)	Product acknowledgement (0.550)	3	0.114			
	Usage of environmental-friendly material (0.186)	8	0.039			
	Ability of decreasing pollution (0.262)	7	0.054			
Environment Improvement Cost (0.131)	Procurement of environmental-friendly material (0.201)	11	0.026			

Environmental Protection Documentation (0.070)	Acquiring new environmental-friendly technology (0.441)	6	0.058			
	Product redesign cost (0.238)	10	0.031			
	Employee training cost (0.118)	13	0.015			
Environmental Protection Documentation (0.070)	Management of departmental document (0.556)	8	0.039			
	Bill of waste management (0.291)	12	0.020			
	Environment log (0.148)	14	0.010			
SUM =						
A. Excellent (90 ≤ SUM ≤ 100)		Final Decision:				
B. Very Good (80 ≤ SUM < 90)		Ready for Placing Order (A,B)				
C. Good (70 ≤ SUM < 80)		Re-evaluation Needed after Improvement (C,D)				
D. Fair (60 ≤ SUM < 70)		Avoid Placing Order (F)				
E. Fail (0 ≤ SUM < 60)						

F Analyze the Weight of Each Criterion

The overall weight analysis was performed, and the results are tabulated in Table V. It was found that pharmaceutical manufacturers put a high priority on certification (0.611) and environment protection policies (0.388), which is also why the government has played an active role in tutoring manufacturers to obtain their environmental protection certification; further, pharmaceutical manufacturers insist that environmental protection ability is more important than general management ability, because general management ability can be obtained through training and education. Pharmaceutical manufacturers that lack an ability to protect the environment face having their enterprise image hurt, which can lead to downgraded performance. Further, the environmental protection related documentation criterion was not so highly prioritized because the purchasing process focuses on suppliers’ environmental protection ability instead.

It also can be seen that although the criterion weight of executive support (0.512) was greater than the weight of environmental protection partner (0.487), the difference was small. This indicates the importance of executive support in a company, as well as becoming an environmental protection partner along with a supply chain member. In this way, the general management ability of a pharmaceutical factory can be elevated, and consequently the pharmaceutical factory can respond effectively to rising environmental protection pressure, and also acquire more advantages to facilitate overall development.

The weight of product acknowledgement was 0.550, which was the most important among the three criteria in

the Environment Protection Ability category. The customer impressions of the purchased product influence the overall image of the company. Therefore, experts demand that product R&D, manufacturing processes, product packaging and final delivery must not threaten the environment. Once a product suggests a negative message to customers, it hampers the company image; hence experts put high emphasis on product acknowledgement. Pharmaceutical factory attention to using environmental-friendly materials and lowering pollution was not as relatively significant, because cGMP certification mandates manufacturers to have regulations related to environmental protection. Furthermore, it was found that pharmaceutical factories spend considerable investment on developing/procuring new environmental-friendly technology in order to pass the cGMP certification, as medicine manufacturing may contribute to air pollution, water pollution, or solid waste pollution, all of which easily pollute the environment. New manufacturing technology can decrease the above types of pollution, so experts regard the acquisition of new environmental-friendly technology as a must. Furthermore, if products threaten the environment, then pharmaceutical factories must employ countermeasures. In reality, pharmaceutical factories list a sum of costs to deal with these products, or redesign products to meet customer and environment requirements. In this study, experts thought that if products could comply with regulations during the design process, then no additional costs would be needed. Therefore, the importance of buying environmental-friendly material was deemed not so significant due to pharmaceutical factory ecological particularities: drugs are primarily taken by humans or animals, and their necessary ingredients are produced in nature. Thus, the importance of this item was deemed to be less significant. People generally regard employee training very important, but the expert rating of this item suggests that it was not as important, probably due to the fact that companies generally conduct relevant staff environmental education training during meetings. Practically, a company would not want to incur an additional cost to train staff regarding this matter.

As to pharmaceutical factories, the primary criterion regarding environmental protection related documentation was how each department deals with the related documents (0.556), as well as how they deal with purchasing department categorized related waste or purchased green products, in terms of documenting them for supervisors or cGMP certification teams to audit. Manufacturers paid more attention to bills of waste management because related pollutants are discharged in the manufacturing process; therefore, environmental protection engineers must dispose of the waste effectively and document the process for auditing. The environment log was deemed to be less important: if pharmaceutical factories conduct obligated environmental protection practices routinely, big problems are unlikely. However, pharmaceutical factories do not publicize how to dispose of waste or document how substances threaten the environment.

After the weight analysis for each criterion category and each criterion, an overall weight for each criterion was calculated by multiplying the weight of the criterion category and the weight of each criterion. Taking cGMP certification as an example, the overall weight was calculated by multiplying the weight of the criterion category (environment management system), 0.403, by the cGMP certification weight, 0.611, which yielded an overall weight of 0.246. The overall weight and its rank, as shown in Table V, represent the importance of each criterion in the whole supplier evaluation model.

In short, the top three overall weights were: cGMP certification (0.246), environmental protection policy (0.156), and product acknowledgement (0.114); the sum of these three was 0.516, which is more than 50%. As two of the three were deemed minor criteria according to the environment management system, this indicates the highlighted importance of the environment management system. In addition, if consumers have a good impression of a company after buying a product, enterprise image is further elevated, so this was deemed to be one of the key indices when evaluating green suppliers. The last three criteria were: bill of waste management (0.02), employee training costs (0.015), and environment log (0.01), two of which were in the category of environmental protection related documentation, revealing that the environmental protection documentation of upstream suppliers was less emphasized. Suppliers can be effectively evaluated. The supplier evaluation results were divided into groups A, B, C, D and E, according to the summary of weighted scores. Thus, the final decision of whether or not to place an order can be made according to the supplier level: (1) A or B: adequate to place orders, (2) C or D: hold until the supplier makes improvements on environmental protection issues, and (3) E: avoid placing orders.

G Construct a Green Suppliers Evaluation Form

Based on the evaluation criteria and their weights, a green supplier evaluation form was proposed as shown in Table V. By rating each supplier based on the proposed criteria and weights indicated in Table V, the suppliers can be effectively evaluated. The supplier evaluation results were divided into groups A, B, C, D and E, according to the summary of weighted scores. Thus, the final decision of whether or not to place an order can be made according to the supplier level: (1) A or B: adequate to place orders, (2) C or D: hold until the supplier makes improvements on environmental protection issues, and (3) E: avoid placing orders.

V. CONCLUSIONS

The biotechnology industry is generally regarded as one of the most prospective star industries in the 21st century, and is involved in several key promotion projects in Taiwan, such as "Challenge 2008-National Key Development Program" and "Two-Trillion-Twin-Stars". Environmental protection has gradually become a noticeable issue for manufacturers in new product R&D; therefore, supporting one's company with the technology

needed to develop a green supply chain is now a crucial part of enhancing industry competence.

Different enterprises might be located at different levels of the supply chain, and views of one supplier are likely to differ. Therefore, the evaluation model and criteria proposed in this study apply to green supplier evaluation in the biotechnology industry, and can assist firms in their desire to facilitate an overall supply chain operation that complies with environmental protection requirements. In terms of current supplier evaluations, the major focuses of an enterprise remain on the traditional criteria, but in light of rising environmental protection awareness, environmental protection related concepts must be added to supplier evaluations.

Based on the related literature, this study proposed green criteria needed for a green supplier evaluation process, and used practical interviews to analyze how manufacturers conduct green supplier evaluations, so as to build a better green evaluation criterion structure and supplier evaluation process. This study employed the Analytic Hierarchy Process as supplier evaluation method, and calculated relative weights to obtain quantifiable criteria for rating qualified suppliers.

The results are summarized as: (1) the way pharmaceutical factories currently evaluate green suppliers is mainly based on checking whether or not the supplier has passed the cGMP certification, it has established environmental protection policies, and it has product acknowledgements. (2) Based on the expert interviews and literature analysis, this study provides several criteria for biotechnology manufacturers to use when evaluating green suppliers. (3) A model was constructed that details the process of evaluating upstream green suppliers for biotechnology

manufacturers. Based on the evaluation criteria and the procedures provided in this study, relative weights for the criteria were calculated, and a green supplier evaluation form was proposed, which can help decision makers to evaluate green suppliers in a more systematic manner.

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Sequent Numbers' Input and Edition in AutoCAD Drawing

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Abstract—When using AutoCAD drawings, sequence numbers are often needed to edit. This paper introduces new programs based on extensively used Autolisp. The program will make sequent numbers' input and edition easier, and improve the efficiency in AutoCAD drawing. This program is Stable and reliable since it has been used and no error occurs.

Index Terms— Sequent Number, Input, Edition, Subroutines, AutoCAD

I. INTRODUCTION

As an effective tool for improving design quality and accelerating design schedule, AutoCAD has been widely used in designing.

In the drawing using AutoCAD, Sequent Number is often needed. Such as terminal strip(1~100) in electrical diagram, axis number(①~⑩) in civil engineering, catalogue of working drawing(K0101-01~100) and so on. Our usual practice is write the text firstly. Then copy the ARRAY or COPY command to a certain amount. Lastly use DDEDIT command to change them one by one, which is very cumbersome and error-prone. By writing LISP programs can solve this problem well.

II. WRITING OF THE PROGRAM

The program is written in Windows98+ AutoCAD R14 environment. Suitable conditions may not be less than the above version.

Sequent number input and editing commands are defined as CST (input) and ADD (Edit). The sequent number input commands used to implement automatic sequential numbering to selected objects. Besides, edit and modify commands implement the replication and rapid changes of sequent numbers. These commands can shorten the time of writing with good accuracy rate. The programs are described below.

■A.The Input Commands of Sequent Number

Named as "CST.LSP" the program includes selecting objects (entities) subroutines, processing objects (entities) subroutines, base texts, operate mode and text input. Using subroutines, a total of five, according to a certain command of written text. These subroutines are: (choobj1), (detobj1), (dettxt1), (detsum1), (writxt1). The subroutines are written below.

2.1.1 Select objects (entities) subroutines
(defun CHOOBJ1()

```
(setq poi T)
(setq rep T)
(setq txtb (entsel "\n Select a base text:"))
(while (and (= rep T) (or (= txtb nil) (/= (cdr (assoc
0 (entget (car txtb)))) "TEXT"))))
  (setq txtb (entsel "\n The entities you have
selected cannot be used as base text. Please reselect your
text< Press enter or click the right mouse button to exit
>:"))
  (if (= txtb nil) (setq rep nil))
);end while
(if (/= txtb nil) (prompt "\n----- You have
successfully selected the base text."))
)end defun choobj1
```

2.1.2 Process objects (entities) subroutines

```
(defun DETOBJ1()
  (setq objs (car txtb))
  (setq wdb (cdr (assoc 1 (entget objs))))
  (setq wdbn (cdr (assoc -1 (entget objs))))
  (setq wdbst (cdr (assoc 7 (entget objs))))
);end defun detobj1
```

2.1.3 Process base texts

```
(defun DETTXT1()
  (command "-style" wdbst "" 0 "" "" "" "" "" "")
  (setq wdl (strlen wdb))
  (setq fir 0)
  (setq stp wdl)
  (setq endcha (substr wdb wdl 1))
  (if (and (>= (ascii endcha) 48) (<= (ascii endcha)
57)) (setq sort "num") (setq sort "cha"))
  (repeat (1- wdl)
    (setq i (ascii (substr wdb stp 1)))
    (setq j (ascii (substr wdb (1- stp) 1)))
    (setq tj (or (and (and (>= i 48) (<= i 57)) (or (> j
57) (< j 48)))
      (and (or (> i 57) (< i 48)) (and (>= j 48)
(<= j 57)))))
    (if (= tj T) (setq fir (1+ fir)))
    (if (= tj T)
      (cond ((= fir 1) (setq bp1 stp))
            ((= fir 2) (setq bp2 stp)))
      );end if
    (setq stp (1- stp))
  );end repeat
  (cond ((= sort "num")
    (cond ((= fir 0) (setq stryl (strlen wdb))
      (setq str (atoi wdb)))
```

```

(>= fir 1) (setq str1 (substr wdb 1 (1-
bp1)))
      (setq str2 (substr wdb bp1))
      (setq stryl (strlen str2))
      (setq strsx (atoi str2))))
  ((= sort "cha")
   (cond ((= fir 0) (setq poi nil) (prompt " This
procedure only in order of integers write text. The base
text must include number."))
         ((= fir 1) (setq str1 (substr wdb 1 (1- bp1)))
                    (setq str2 (substr wdb bp1))
                    (setq stryl (strlen str1))
                    (setq strsx (atoi str1))))
         ((>= fir 2) (setq str1 (substr wdb 1 (1-
bp2)))
                    (setq str2 (substr wdb bp2 (- bp1
bp2)))
                    (setq str3 (substr wdb bp1))
                    (setq stryl (strlen str2))
                    (setq strsx (atoi str2))))
   );end cond
);end defun dettxt1

```

2.1.4 Process operate mode

```

(defun DETSUM1()
  (if (= poi T)
    (progn
      (setq wdo (getstring "\n Please input operate
mode:"))
      (if (= wdo "")(setq wdo "+1"))
      (setq fh (substr wdo 1 1))
      (setq fs (atoi (substr wdo 2)))
    );end progn
  );end if
);end defun detsum1

```

2.1.5 Text input

```

(defun WRITXT1()
  (if (= poi T)
    (progn
      (prompt "\n Please select a capture mode
for text input:")
      (command "DDOSNAP")
      (if (> (getvar "OSMODE") 0) (prompt "\n-----
You have chosen the capture mode successfully. ")
        (prompt "\n-----You have not chosen the capture mode,
which will affect the accuracy of text position. "))
    );end progn
  );end if
  (if (/= poi nil) (setq poi (getpoint "\n Please input
the base point:")))
  (while (/= poi nil)
    (setq poi (getpoint "\n Please input the position of
the new text <Press enter or click the right mouse to
finish>:"))
    (cond ((= fh "+") (setq strsx (+ strsx fs)))
          ((= fh "-") (setq strsx (- strsx fs)))
          ((= fh "*") (setq strsx (* strsx fs)))

```

```

      ((= fh "/" ) (setq strsx (/ strsx fs))))
    (setq strsx (itoa strsx))
    (setq strxl (strlen strsx))
    (if (< strxl stryl) (repeat (- stryl strxl)
      (setq strsx (strcat "0" strsx))
    );end repeat
  );end if
  (cond ((= sort "num")
    (cond ((= fir 0) (setq stan strsx))
          ((>= fir 1) (setq stan (strcat str1
strsx))))
    ((= sort "cha")
    (cond ((= fir 0) (setq poi nil))
          ((= fir 1) (setq stan (strcat strsx
str2)))
          ((>= fir 2) (setq stan (strcat str1
strsx str3))))
    );end cond
    (if (/= poi nil)
      (progn (command "undo" "begin")
              (command "copy" wdbn "" poi poi)
              (command "change" (entlast) "" "" "" "" ""
"" stan)
              (command "undo" "end")
            );end progn
    );end outside if
  );end while
);end defun writxt1

```

Main program

```

(defun c:CST ()
  (setq YZbclip (getvar "BLIPMODE"))
  (setq YZcmde (getvar "CMDECHO"))
  (setq YZosmo (getvar "OSMODE"))
  (setvar "BLIPMODE" 1)
  (setvar "CMDECHO" 0)
  (setvar "OSMODE" 0)
  (choobj1)
  (if (= rep T) (detobj1))
  (if (= rep T) (dettxt1))
  (if (= rep T) (detsum1))
  (if (= rep T) (writxt1))
  (command "redraw")
  (setvar "BLIPMODE" YZbclip)
  (setvar "CMDECHO" YZcmde)
  (setvar "OSMODE" YZosmo)
  (princ)
);end of function c:CST

```

■B. The editing of sequent number

Above program can solve serial number writing problems well, but modifications to the drawings are sometimes slightly cumbersome. For example, when drawing terminal strip with 50 terminals. The number of the terminals are DZ1 ~ DZ50. Now need to add 50 terminals which numbers are DZ51 ~ DZ100. If the above program is used, text DZ50 should be chosen and then determines the writing position 50 times one by one.

Therefore, based on the above program, the program below is written. Here is the usage of the program. Select the DZ1 ~ DZ50 texts and copy them to the specified position. Then select the copied texts and do the "+50" operation. After this, the texts which have been copied(DZ1 ~ DZ50) can be changed to DZ51 ~ DZ100 immediately.

Named as "ADD.LSP" the program includes selecting objects (entities) subroutines, processing operate mode, objects (entities) subroutines, base text and text input. These subroutines are: (choobj2), (detsum2), (detobj2), (dettxt2), (writxt2).

2.2.1 Select objects (entities) subroutines

```
(defun CHOOBJ2()
  (setq rep T)
  (princ "\n Please select the text to edit<Press enter
or click the right mouse to finish>:")
  (setq addj (ssget))

  (setq addjl (sslength addj))
)end defun choobj2
```

2.2.2 Process operate mode

```
(defun DETSUM2()
  (setq wdo (getstring "\n Please input the
operate mode:"))
  (if (= wdo "")(setq wdo "+1"))
  (setq fh (substr wdo 1 1))
  (setq fs (atoi (substr wdo 2)))
)end defun detsum2
```

2.2.3 Process objects (entities) subroutines

```
(defun DETOBJ2()
  (setq wdb (cdr (assoc 1 (entget objs))))
  (setq wdbn (cdr (assoc -1 (entget objs))))
  (setq wdbst (cdr (assoc 7 (entget objs))))
)end defun detobj2
```

2.2.4 Process base text

```
(defun DETTXT2()
  (command "-style" wdbst "" 0 "" "" "" "" "" "")
  (setq wdl (strlen wdb))
  (setq fir 0)
  (setq stp wdl)
  (setq endcha (substr wdb wdl 1))
  (if (and (>= (ascii endcha) 48) (<= (ascii endcha)
57)) (setq sort "num") (setq sort "cha"))
  (repeat (1- wdl)
    (setq i (ascii (substr wdb stp 1)))
    (setq j (ascii (substr wdb (1- stp) 1)))
    (setq tj (or (and (and (>= i 48) (<= i 57)) (or (> j
57) (< j 48)))
    (and (or (> i 57) (< i 48)) (and (>= j 48)
(<= j 57))))))
  (if (= tj T) (setq fir (1+ fir)))
  (if (= tj T)
    (cond ((= fir 1) (setq bp1 stp))
          ((= fir 2) (setq bp2 stp)))
  );end if
  (setq stp (1- stp))
```

```
);end repeat
(setq askyw T); default is answer
(setq askbl nil);default is not zero
(setq canw T);default is the numeric string in the
text
(cond ((= sort "num")
  (cond ((= fir 0) (setq stryl (strlen wdb))
    (if (= (ascii wdb) 48) (setq askyw
nil askbl T))
    (setq str2 (atoi wdb)))
  ((=> fir 1) (setq str1 (substr wdb 1 (1-
bp1)))
    (setq str2 (substr wdb bp1))
    (if (= (ascii str2) 48) (setq askyw
nil askbl T))
    (setq stryl (strlen str2))
    (setq str3 (atoi str2))))))
  ((= sort "cha")
  (cond ((= fir 0) (setq canw nil))
    ((= fir 1) (setq str1 (substr wdb 1 (1- bp1)))
    (setq str2 (substr wdb bp1))
    (if (= (ascii str1) 48) (setq askyw nil
askbl T))
    (setq stryl (strlen str1))
    (setq str3 (atoi str1)))
    ((=> fir 2) (setq str1 (substr wdb 1 (1-
bp2)))
    (setq str2 (substr wdb bp2 (- bp1
bp2)))
    (setq str3 (substr wdb bp1))
    (if (= (ascii str2) 48) (setq askyw
nil askbl T))
    (setq stryl (strlen str2))
    (setq str4 (atoi str2))))))
  );end cond
)end defun dettxt2
```

2.2.5 Text input

```
(defun WRITXT2()
  (cond ((= fh "+") (setq strx (+ strx fs)))
    ((= fh "-") (setq strx (- strx fs)))
    ((= fh "*") (setq strx (* strx fs)))
    ((= fh "/" ) (setq strx (/ strx fs))))
  (setq strsx (itoa strx))
  (setq strxl (strlen strsx))
  (if (and (= askyw T) (< strxl stryl))
    (progn (setq askbl (getstring "\n The length of
the strings in the base text is shortened. Is zero needed to
add before? Please answer Yes or No< default is No>"))
    (cond ((= (ascii askbl) 89) (setq askbl T))
          ((= (ascii askbl) 121) (setq askbl T))
    );end cond
    (setq askyw nil)
  );end progn
);end if
(if (and (= askbl T) (< strxl stryl))
  (repeat (- stryl strxl)
    (setq strsx (strcat "0" strsx))
  );end repeat
);end if
```

```
(cond ((= sort "num")
      (cond ((= fir 0) (setq stan strsx))
            ((>= fir 1) (setq stan (strcat str1
strsx))))))
      ((= sort "cha")
      (cond ((= fir 0) (setq poi nil))
            ((= fir 1) (setq stan (strcat strsx
str2))))
      ((>= fir 2) (setq stan (strcat str1
strsx str3))))))
);end cond
(progn (command "undo" "begin")
      (if (= canw T) (command "change" wdbn
"" "" "" "" "" "" "" stan))
      (command "undo" "end")
);end progn
);end defun writxt2
```

Main program

```
(defun c:ADD ()
  (setq YZblip (getvar "BLIPMODE"))
  (setq YZcmde (getvar "CMDECHO"))
  (setq YZosmo (getvar "OSMODE"))
  (setvar "BLIPMODE" 1)
  (setvar "CMDECHO" 0)
  (setvar "OSMODE" 0)
  (choobj2)
  (detsum2)
  (setq addjo 0) ; addjo is to select the serial number
of objects in the collection addj
  (repeat addjl
    (setq objs (ssname addj addjo) addjo (1+ addjo))
    (if(= (cdr (assoc 0 (entget objs))) "TEXT")
      (progn (detobj2)
             (dettxt2)
             (writxt2))
    );end progn
  );end if
```

```
);end repeat addjl
(command "redraw")
(setvar "BLIPMODE" YZblip)
(setvar "CMDECHO" YZcmde)
(setvar "OSMODE" YZosmo)
(princ)
);end of function c:ADD
```

III. ENDING

Auto LISP program is the symbol - functional language, data and functions are indicated by symbols, which makes programming very flexible. Auto LISP is the development and expansion of AutoCAD programming. It can make things easier and regular things automated.

Such programs as AutoCAD commands, improves the level of automation and reduce the labor intensity. They also improve the accuracy of CAD drawings and met the needs of practical application. Reliability, usability and user interface are considered during the design process. These two programs is stable and reliable since they have been used and no error occurs.

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Development Of Wearable Medical Devices

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Abstract: This paper describes the characteristics of wearable medical detection system, consisting of the structure, relevant technical and standards, research status and application content, and development prospect of wearable medical devices physiological detection technology.

Index Terms—telemedicine, wearable bio-medical instruments, physiological detection technology

I. INTRODUCTION

Elderly chronic, increasingly younger and sub-health and other high-risk disease has become a major factor affecting people's health and quality of life, face to face between the traditional diagnostic mode patients and doctors have been unable to meet the huge demand for people growing health care, and traditional diagnostic mode to be further improved efficiency in the use of time and resources, which are on the health care industry presented a huge challenge.

With the continuous strengthening of people's health awareness and health requirements for medical devices in recent years, the market demand continues to grow rapidly and is becoming one of the world economy in this century pillar industry, is expected to Global Medical Devices Industry 2004-2010 average annual growth rate of drug will be greater than 7%. The past 10 years, China's medical device industry is also growing at an average annual growth rate of 15-18% of the sustained and rapid development, but the average annual growth rate over the same period the market demand is as high as 20% -27% [1].

The use of wearable physiological detection technology, not only can achieve long-term, continuous testing, but also on the user's health status and physiological information is displayed in real time, helping the user to implement regular monitoring of doctors and remote consultation. Currently, research wearable physiological detection technology is still in its infancy, but with the economic development and high-tech fields continue to expand, as well as people's awareness of family health, wearable physiological detection technology has application prospects immeasurable, will wide range of applications.

II. FEATURES OF WEARABLE PHYSIOLOGICAL DETECTION TECHNOLOGY

Wearable medical devices having a physiological signal detection and processing, feature extraction and data transmission and other basic function modules, can be achieved on the body's non-invasive monitoring, diagnosis and treatment. It generally has a movable operation, easy to use, supports the long hours, the

intelligent display diagnostic results, abnormal physiological condition alarms and wireless data transmission and so on. It involves major research directions include: sensor design, biocompatibility studies, multi-sensor data fusion, sensor networks footer field development, system optimization, battery life, real-time wireless transmission and improve system security and reliability and so on.

Wearable medical devices combined with wireless communication technology and network technology, more so mobile medical possible. Mobile health (m Health) is a mobile computing, medical sensing and communication technology integration as one of the emerging health care model to improve the correlation with the performance of the device and miniaturization, improved data transfer rates, and related devices and wireless communications and integration of network technology, mobile health systems and services will accelerate the development of the situation was in the next decade, and offer more traditional telemedicine systems more convenient and diverse health services. Proposed the concept of mobile health, marking the start of the steering system of electronic medical wireless mobile health platform from the traditional desktop telemedicine platform. By this way, the user can not be limited by time and place, but without prejudice to the daily life and work of monitoring the physiological status anytime, anywhere, enabling early detection of disease, early diagnosis and early treatment. This section describes the features available for mobile medical physiological parameters noninvasive continuous monitoring technology, wearable medical devices in the field of electronic fabric carrier and hindquarters sensor network technology.

Considering the wearable physiological testing equipment is used in patients when medical staff is not around, but the patient is likely to engage in normal daily activities. For to such user groups, wearable physiological detection technology must have the following characteristics: ① security. Security is listed in the first place, which is different from other types of medical electronic equipment important feature of the instrument. ②reliability. Signal reliability, the reliability of mobile or other interference strength and ability to adapt to the transmission of data storage is an important consideration. ③ mobility and wearability. Requirements instrument compact, rugged durability, low energy consumption, wireless data exchange, and can remain in a comfortable long-term wear. ④ easy to use and easy to identify. Taking into account the use of wearable remote monitoring instruments and wear often is not carried out under the guidance of a doctor, and users of medical instruments mostly non-professional individuals, so the

instrument must be easy to use, the operator can not be too cumbersome and complicated, and there are plug and play features. ⑤ interoperability. Due to the low power consumption wireless communication standards, the development of plug and play devices on the bus, low-power microcontrollers, handheld computers, electronic medical records, as well as the Internet and other technologies, removable wearable physiological detection technology has also been a lot of development and progress. And in order to make it easier to accept personal detection technologies, while reducing costs of the instrument, we must improve interoperability [2].

III. THE OVERALL STRUCTURE OF WEARABLE PHYSIOLOGICAL DETECTION SYSTEM

The overall structure of wearable physiological detection system can be summarized into the following four sections (Figure 1): ① wearable sensor, which most commonly measured physiological parameters include: ECG, heart rate, blood pressure, oxygen saturation, respiratory rate, body temperature and so on. Each system is based on the specific subjects of their choice, selected to measure different physiological parameters to monitor the physical condition of the patient. ② data logger, its role is to collect signals from the sensor, and some signal processing and analysis, and these signals via wireless technology (often using Bluetooth technology) is transmitted to the base station (a networked computer, mobile phone or PDA, etc.). Of course, for only one physiological parameter measuring system, the part is often omitted. ③ base stations usually have the following equipment: have networked computer, cell phone or PDA. If the base station using the computer, limit the scope of the use of Bluetooth technology will be subject to, the patient can not leave the active area, subject to certain restrictions. In order not to limit the patient's actions, work, or even go out, the general system using a cell phone or PDA, so that the patient can be monitored anywhere. With the development of communication technology, mobile phone / PDA applications in medicine, more and more, of course, also include the application of wearable physiological monitoring system in the literature [1-3] in there well represented. ④ remote monitoring centers, community hospitals or centers in hospitals to establish a remote monitoring center, the ability to show the lives of patients with a variety of information to be detected, of course, can also be recorded in the past to monitor isolated patients from the database. Based on this information the doctor can give patients timely medical advice and consultation [3].

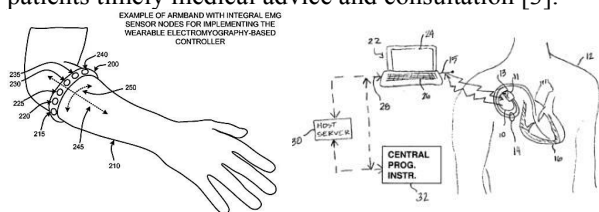


Figure 1. Structure wearable physiological detection system

IV. RESEARCH STATUS WEARABLE PHYSIOLOGICAL DETECTION TECHNOLOGY

Currently, research on wearable physiological detection technology is still in its infancy internationally. But in recent years, research in this field around more and more attention, institutions and agencies engaged in this aspect of the study is also increasing. The main results are the latest results have been completed or are in progress and related research team follows. Kansas State University since 2003, Kansas State University Design Laboratory of Electronics and Computer Engineering, University Medical Component has been focus on research in wearable home-care diagnostics systems. And guide the development of the following technologies, including: wearable sensors, wireless distributed network, plug and play devices, interoperability standards, and relevant medical information exchange and safety standards, and so on. Kansas State University has come up with a wearable, plug and play monitoring system. As shown in Figure 2, the system consists of four parts: ① a set of plug and play, wearable sensor elements, such as: ECG, oxygen saturation, ambient temperature, and so on. ② wearable data logger. ③ a base station connected to the internet. ④ a group of local and remote databases [4].

One unit of the Joint Research Centre of Biomedical Engineering, Chinese University of Hong Kong is an early involvement in the wearable biological research in the field of medical devices, in a non-intrusive measurements of heart rate, blood pressure, oxygen saturation and other physiological parameters has made a number of substantive research results. The center has successfully developed PDA-based blood pressure meter can be anywhere noninvasive continuous blood pressure monitoring, to overcome the traditional cuff blood pressure meter poor mobility, inconvenient to wear, power consumption and other shortcomings. Recently, the center has developed a physiological parameter measurement function-based electronic health shirt fabric, which has a sleeveless shirt with a health blood pressure measurements, and the use of hydrostatic principle completion sleeveless belt blood pressure calibration.

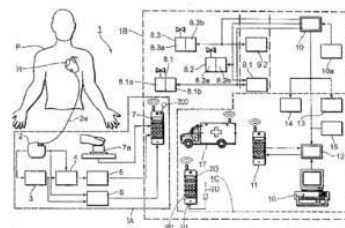


Figure 2. Wearable physiological detection system

Toshiba Lifeminder system consists of watch-type wearable sensor module and a PDA. Wearable module is equipped with an accelerometer sensor, Bluetooth module pulse meter sensor, thermometer sensors, electrodes and galvanic skin response and PDA communications. The system can monitor the user's health, movement and behavior of activities aimed to remind and guide the user performs a healthy diet and proper exercise every day,

which is very important for the prevention of lifestyle-related diseases. And the system is programmed in accordance with wrist movement, pulse rate and galvanic skin response values to determine the movement of the user and the user whether to start a meal. Accuracy rate of about 90% can be achieved.

V. THE FUTURE DIRECTION OF WEARABLE PHYSIOLOGICAL DETECTION TECHNOLOGY

Wearable physiological detection technology overcomes the limitations of traditional wired medical testing technology. Sensor is wearable ground, so as not to restrict the patient's normal operations and achieve portable detection, remote monitoring, supervision and alarm for each parameter, information storage and transmission, providing timely medical services. In the wave of today's health care reform, this prevention-oriented, model-based telemedicine family and community hospitals is booming [6].

Combining wearable physiological detection technology features, the future development and application of wearable physiological detection system will develop in the direction toward the following: ① Standardization: wearable physiological detection system involving a medical device needs to be connected to the HIS, EMR or LIS, and other information systems, but most hospitals with HIS, EMR or LIS are non-standardized products, the lack of uniform standards of medical practice and technology, the system is not compatible with the transmission of information in different channels of communication, application software and hardware inconsistencies, making medical information can not be effectively shared implement interconnection exists great difficulties. The interconnection between the hospital information system is needed for future development, therefore, must be the trend of standardization. ② intelligent and multifunctional: For wearable physiological detection system, since the user may stay away from the hospital, but could not let the medical staff always online service, thus requiring the system must have automatic detection, analysis and treatment of disease. Some systems are now able to automatically identify critical vital signs and alarm, but do not have the automated analysis and the ability to handle the disease, I believe that with the rapid development of communication technology, microelectronics, biomaterials and biological sensing technologies, and wearable formula physiological detection system will develop in the direction of intelligence and versatility. ③ Personalization: Because of the large individual differences in people, so it should be for different users, and design models with different functions, different standards set parameters and operating modes. ④ miniaturization and networking: wearable physiological testing instruments require the sensor device worn on the patient, thus requiring miniaturization, so that the patient remain comfortable dressed in a long-term process. At the same time needs to be the patient's vital signs, signals transmitted through the

network to the hospital's care center, so the network is a basic requirement of its development. ⑤ closely integrated with everyday electronic products: wearable physiological testing instruments with people wearing everyday electronic products (such as mobile phones, PDA, etc.) integration, physiological data can be send directly to the remote server. In recent years, research on wearable physiological detection technology, the mobile phone and PDA, have been well received by the developer's favor. I believe that in the near future, wearable physiological testing equipment is bound more closely in conjunction with the daily electronic products. ⑥ into the community, families, and individuals: prevention-oriented, community-centered medical model of health care is the rise of China, traditional medicine instrument will face serious challenges. Based on today's new generation of high-tech medical equipment requirements, to meet the huge demand for people to community health care. Thus, wearable physiological detection technology will to integrate into the communities, families and individuals daily life, but do not affect the overall goal of developing people's normal life.

VI. SUMMARY

It is anticipated that the development of wearable medical devices and use, will receive more and more attention of the whole society. The rapid development of wearable medical devices will accelerate the transformation of the entire health care system, and promote the existing health care system to treat the symptoms from the center of the model to the prevention, early diagnosis, early treatment paradigm shift. Wearable medical devices sensor terminal will toward miniaturization, intelligence and network-oriented direction, while the carrier will also be more receptive toward the people, for long-term use and does not interfere with everyday life direction. With the progress of biomedical engineering and technology, health care will eventually move into the community, into the family. This can only improve the quality of life of individuals, but also can reduce the burden on the entire health care system, and thus reduce public health care costs.

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Influence of Eddy Current Retarder and the Main Brake to the Braking System

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Abstract—For the vehicle braking system added eddy current retarder , it influenced the distribution ratio of braking force of wheels and further influenced the stability of the vehicle brake system. The braking force distribution of vehicle wheel at the same time lock condition was analysed by theoretical method. The electric eddy current retarder braking force was introduced. The best vehicle synchronous coefficient was calculated. PID controller achieved control braking force of front and rear wheel and carried on the simulation analysis in Matlab/Simulink. The results show that this method can fully use the ground adhesion coefficient and reduce sliding rate of the wheel difference.

Index Terms—eddy current retarder, braking force, sliding rate, PID

I. INTRODUCTION

Eddy current retarder was a no friction type auxiliary brake, which had been installed in large vehicle particularly in commercial trucks that frequent mountain road routes. Because of its fast response and large braking torque in vehicle low speed, it was the most widely used auxiliary brake system. It had realized to the wheel brake load shunt and solved the wheel hub friction heat recession lead to overheating and braking force degradation. This braking assistance highlighted the most apparent advantage of eddy current retarder over conventional brakes, that of noncontact braking. For more conventional vehicles, noncontact braking translated to extended brake life. For the vehicle equipped with eddy current retarder, vehicle braking force was consisted of eddy current retarder and the main brake[1-4]. Compared with the automobile braking force was not provided with an electric eddy current retarder, the vehicle was due to increase of eddy current retarder rear wheel braking force, the front and rear wheel braking force distribution was changed. It caused the change of vehicle braking stability[5-8]. Studied to how to adjust the front and rear wheel braking force was important according to the braking force of eddy current retarder, which could make full use of the adhesion coefficient of the ground to shorten braking distance and improve the safety of the braking. It became the focus in the study of this article. The vehicle equipped with the eddy current retarder was analyzed to determined braking force distribution ratio between the front and rear wheel.

II. IDEAL STATE OF THE VEHICLE FRONT AND REAR WHEEL BRAKING FORCE DISTRIBUTION

Different proportion of braking force distribution would affect stability of the vehicle braking and the adhesion utilization degree. The ideal braking force was the front and rear wheel lock at the same time[9]. It was favorable for the utilization of ground adhesion condition and improved the direction stability of the vehicle. The vehicle braking force diagram was shown in figure 1.

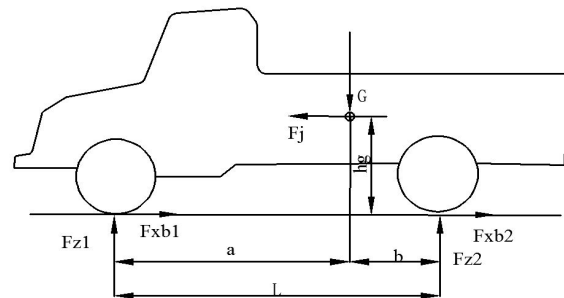


Figure 1 Schematic diagram of vehicle brake

It ignored vehicle rolling resistance torque, the air resistance and inertia torque produced by rotation quality deceleration in figure 1. The wheel counterforce was

$$F_{Z1} = (Gb + m \frac{du}{dt}) / L \quad (1)$$

$$F_{Z2} = (Ga - m \frac{du}{dt}) / L \quad (2)$$

In the formula, F_{Z1} and F_{Z2} were respectively the front and rear wheels counterforce. G was the vehicle gravity. b was the centroid to the rear axle center line distance. a was the centroid to the front axle center line distance. m was the vehicle mass. $\frac{du}{dt}$ was the vehicle

deceleration. L was distance between vehicle shaft. $L = a + b$

The ground braking force compelled to vehicle deceleration. Its value depended on the braking force main braking force and also on the ground adhesion conditions. The enough ground braking force was obtained under the condition of enough braking force of main braking and high ground adhesion. The ground braking force F_{xb} as shown in equation 3

$$F_{xb} = \phi_b F_z \quad (3)$$

In the formula, φ_b was the braking force coefficient.

Braking force coefficient was relation with the sliding rate. If sliding rate was different, braking force coefficient was different.

In any attachment coefficient road, the front and rear wheels at the same time locking condition was the front and rear wheel braking force equal to the adhesion force of ground, which front and rear wheel braking force were respectively equal to the respective adhesion force of ground.

According to figure 1, the front and rear wheels at the same time locking conditions as shown in equation 4,5.

$$\begin{cases} F_{\mu f} + F_{\mu r} = \varphi mg \\ \frac{F_{\mu f}}{F_{\mu r}} = \frac{b + \varphi h_g}{a - \varphi h_g} \end{cases} \quad (4)$$

$$\begin{cases} F_{\mu f} = \varphi \frac{mg}{(a + b)} (b + \varphi h_g) \varphi \\ F_{\mu r} = \varphi \frac{mg}{(a + b)} (a - \varphi h_g) \varphi \end{cases} \quad (5)$$

In the formula, $F_{\mu f}$, $F_{\mu r}$ was respectively the front and rear wheel braking force. a was the distance of center of mass to front axle. b was the distance of center of mass to rear axle. h_g was the height of center of mass.

The vehicle was equipped with electric eddy current retarder. Braking force for the rear wheel should the total force of the main braking force and braking force of eddy current retarder braking force. Braking force for the rear wheel was formula

$$F_{\mu r} = \frac{1 - \beta}{\beta} F_{\mu f} + F_r \quad (6)$$

In the formula, β was for the front and rear wheel braking force distribution coefficient. F_r was the eddy current retarder braking force.

Because the road adhesion coefficient φ was different, the braking force distribution of front and rear wheels at the same time lock was different. In order to eliminate the influence of road adhesion coefficient φ , the parameters φ in the formula to eliminate. The distribution curve of the ideal braking force of the front and rear wheel brake was gained. That is,

$$\frac{h_g}{\beta} \varphi^2 - (a - \frac{1 - \beta}{\beta} b) \varphi + \frac{(a + b) F_r}{mg} = 0 \quad (7)$$

III. THE BRAKING TORQUE OF EDDY CURRENT RETARDER ANALYSIS

Eddy current retarder followed the basic principles of electromagnetic induction. Eddy current retarder machine had an iron core, which was a field-wound stator, a rotor and a fixed frame and other components. The stator windings induced currents in a rotor element, which was typically a featureless metal ring. The core of high magnetic conductive material on the stator distributed with circular shape. The excitation coil of eddy current retarder automatically passed to DC current by adjusting the excitation, to generate a magnetic field in the air gap between the stator magnetic pole and the rotor disc to form a loop. Eddy current retarder magnetic field would be charged disc rotor for rotation resistance, which was along the circumferential rotor disc formation and its rotation direction opposite to that of the electric eddy current retarder braking torque. The change suction of coil could realize the braking force of eddy current retarder. The braking torque depended on the structural parameters, retarder rotor disc rotational speed and the excitation current. A torque was generated according to the Lorentz equation. That it was due to the fact that the induced eddy currents generate power loss through Joule heating. Ignoring the influence of temperature to eddy current retarder[10-11], the braking torque calculation formula was as follows

$$T = \frac{(N_p \mu_0 \rho)^{1.5}}{2\sqrt{\mu_r} \arcsin(\frac{d}{2R_l})} \times \frac{(\pi d^2 N I)^2 \sqrt{2w}}{(16I_g \rho + \frac{k_e d^2}{2} \sqrt{\frac{\rho N_p w \mu_0}{\mu_r}})^2} \quad (8)$$

In the formula, N_p was the number of the magnetic poles. μ_0 was air permeability. ρ was the rotor disc resistivity ($\Omega \cdot m$). d was core diameter. N was the number of turns. I was the coil excitation current (A). w was the rotor rotation speed of the disc (rad/s). μ_r was the rotor disrelative permeability. I_g was air gap (m). R_l was the center of excitation coil radius(m). k_e was conversion coefficient, usually take 1.5.

IV. PID CONTROLLER

PID controller had the advantage of simple, fast response speed. PID controller system consisted of proportional, integral and differential[12]. Each section separately computed the deviation signal $e(t)$. The results was weighted and input control signal $u(t)$ was added to control object model. The control structure was shown in figure 2.

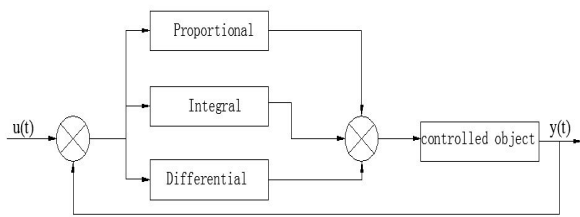


Figure 2 Schematic diagram of PID controller

PID controller controlled the oil pressure of the hydraulic pipeline to get the expect main brake braking force. According to the theory of the calculated the actual road conditions need, PID controller controlled power of pipeline oil. According to the control principle, the following formula

$$y(t) = K_p(u(t) - y(t)) + K_I \int (u(t) - y(t))dt + K_D(\dot{u}(t) - \dot{y}(t)) \quad (9)$$

V. RESULT OF SIMULATION

According to the above introduction formula, the vehicle with eddy current retarder braking force model was constructed in Matlab/Simulink soft. Control simulation analysis on hydraulic braking force. The simulation results are shown.

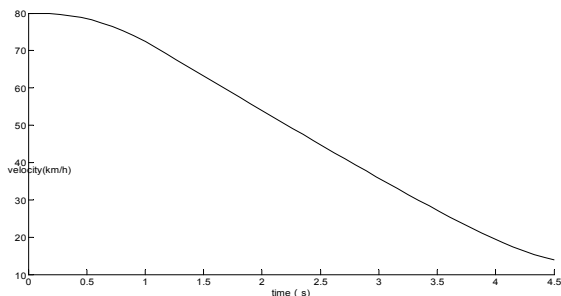


Figure 3 Schematic diagram of speed change

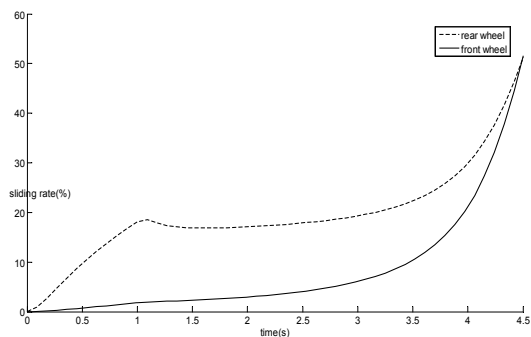


Figure 4 sliding rate of front and rear wheel

Figure 3 shows that vehicle speed decreases for the increase of braking force of the main brake and eddy current retarder. Figure 4 shows that the rear wheel sliding rate is increased for the rear wheel with eddy current retarder is instant increased. PID controller is used to control the front and rear wheel braking force, so that the sliding rate of the wheel tends to be consistent.

VI CONCLUSION

PID controller controls the braking force of the main brake to achieve the braking force distribution of combined brake of eddy current retarder braking system and the main brake system. It achieves the decreasing sliding rate of front and rear wheel. The vehicle wheel can make full use of the road adhesion coefficient, which increases the braking force of the vehicle wheel. It improves the vehicle running safety.

ACKNOWLEDGMENT

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Statistical Data Quality Assessment Grid Based On Bayes Methods

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Abstract—Aiming at the uncertainty caused by quality assessment in network statistics, a data quality evaluation method is proposed on the basis of Bayesian method. Firstly, this method put forward a set of data about quality assessment index system based on the operation characteristics of network, and then the evaluation method of each index has been designed. Secondly, in order to calculate the probability of each attribute of each evaluation class, this method calculated the prior probability and the likelihood probability based on the Bayesian theory and principle of normal distribution. Finally, On the basis of the principle of maximum weighted probability, the overall quality of statistical data has been calculated. Actual example shows this method is feasible and can efficiently avoid the limitation of subjectivity when traditional method is used to make qualitative evaluating. Actual examples show that this method is feasible and can efficiently make up for the limitation of subjectivity and error caused by single index.

Index Terms—Bayesian method, quality assessment, assessment index system, likelihood probability

I. INTRODUCTION

In recent years, with the rapid development of China's power industry, power system has accumulated a large amount of statistical data, but at the same time, exceptions, missing, redundancy and other data quality issues are also increasingly serious [1]. As the quality of statistical data grid will directly affect the safe and reliable operation of the power system and decision analysis, according to the quality problem of the grid statistical data, it is necessary to establish a scientific and effective data quality assessment model based on the new situation and development of the company's power grid. It will help power companies to understand the quality of statistical data, and make the supervision and guidance of statistical data useful in the power company.

Currently, the research about statistical data of power grids both at home and abroad mainly focuses on the data acquisition, the grid vulnerability evaluation and assessment of power quality, but the research on power statistics itself is less. Among them, the literature [2] proposes a substation automation data quality evaluation method based on the evaluation index. However, the document does not identify the indicators of assessment methods and quality grades for research. Literature [3-6] proposes a method for operational monitoring data quality assessment, but the literature evaluation index selection is strictly founded on the monitoring data of power grid operation. The operation monitoring data is

only one aspect of network statistics, therefore, it has a certain narrowness in the application of evaluation index system. At the same time, this method proposed in the literature only refers the index weights in the assessment of data quality indicators, and cannot be directly regarded as the discrimination basis of statistical data quality. Literature [7] proposes a better power quality evaluation index system of statistical data, but the literature on the data quality of the final assessment considers the weighted evaluation index and the evaluation results as the quantitative value. The interval directs numerical comparison in quantization value and each grade can determine data quality grade but this method has certain subjectivity and random defects.

In view of the current problems of the institute of statistical data quality, this paper presents a method of statistical data quality assessment of power grid based on Bayesian. The method, which firstly discussed the basic characteristics of the power system, builds a set of grid data quality evaluation index system and evaluation method of each index is designed, Then it assesses the results of each index corresponding to the probability of each class based on Bayesian theory and the normal principles calculations. Finally it determines the quality of statistical data by the principle of maximum weighted probability. Among them, the calculation of each property belongs to the prior probability of each rating level and the method abandons the traditional method, instead of basing on assessment results to determine the index. Meanwhile, in the computation of the likelihood probability, this method abandons the traditional distance method and uses the principle of normal distribution to determine, so as to ensure the greatest degree of the evaluation result objective, fair and reasonable. In addition, this study adopts indicators and statistical data attributes, on the basis of both vagueness and subjectivity proposes a scientific and rational grid statistical data quality assessment method, which can be more objective and accurate and provide reliable technical support for users to master, such as the power system operating status and planning.

II. DATA QUALITY ASSESSMENT INDEX SYSTEM AND QUALITY STANDARDS

The construction of evaluation index system is the key to the quality of grid statistical data evaluation. Among them, the literature [2] makes assessment on dispatching automation data quality from the completeness, timeliness, consistency, accuracy and reliability of five

basic aspects. The literature [3, 6] proposes a method to evaluate the operational monitoring data from a data access on timeliness, correctness and completeness of the three aspects. The literature [7] thinks the assessment which is aimed at the quality of statistical data for electricity, should be made from five areas of accuracy, completeness, accuracy, validity and uniqueness.

On the basis of this study, considering the basic characteristics of statistical data grid, the grid was constructed set of indicators to assess the quality of statistical data by the accuracy, completeness, uniqueness, validity, accuracy, consistency six areas constituted system, which evaluate the contents of each index as shown in Table 1.

TABLE I CONTENT OF EVALUATION INDEX

Evaluation indicators	Evaluation context
Correctness	Whether the data is consistent with the objective facts, whether there are outliers.
Integrity	Whether the data has missing records.
Uniqueness	Whether the data has duplicate record.
Effectiveness	Whether the expression format and the numerical size of the data to meet the requirements.
Accuracy	Whether the same attribute data in the column is to meet the requirements of precision.
Consistency	Whether expression of the same attributes of the data in column format is consistent.

Assuming j corresponding attribute columns indicators to assess results for T_{jk} , a total number of properties listed j is m_j . Which meet the data number of index k is n_{jk} , then T_{jk} can be expressed as:

$$T_{jk} = \frac{n_{jk}}{m_j} \times 100 \quad (1)$$

Because in the process of data quality assessment, the different degree of influence on the assessment of data quality indicators are different from each other, it is necessary to determine the weight of the assessment system according to the relative importance of each indicator between the various indicators. Currently, there are many ways to determine the weight of the assessment, such as the analytic hierarchy process^[8], Entropy Method^[9], a simple correlation function method^[10], this paper seeks for expert advice, using the analytic hierarchy process to obtain the assessment index weights that are shown in Table 2.

TABLE II THE WEIGHT OF ASSESSMENT INDEX

Index	Correctness	Integrity	Uniqueness
Weight	0.3131	0.2544	0.1595
Index	Effectiveness	Accuracy	Consistency
Weight	0.1214	0.0884	0.0631

When it evaluates the quality of statistical data on the grid Bayesian method, the numerical interval determination and the degree of evaluation division are the key steps. According to the division of evaluation grade standard, the subject is based on common standards of quality assessment and the rating scale is divided into {excellent, good, fair, poor, very poor} five levels. To

determine the numerical range of evaluation grades, the subject uses expert scoring method^[11]. Through consultation with expert advice, numerical interval that determines the evaluation grade is shown in table 3.

TABLE III EVALUATION LEVEL AND NUMERICAL INTERVAL

Evaluation grade	Excellent	Good	Middle
Numerical interval	[100,95)	[95,90)	[90,80)
Evaluation grade	Poor	Very poor	
Numerical interval	[80,60)	[60,0]	

III. THE MODEL OF MULTI-ATTRIBUTE BAYESIAN

A. The Bayesian theory

The Bayesian theory was proposed by British mathematician Thomas Bayes^[12] in 1863, the basic idea can be summarized as follows: to know a priority probabilities and class conditional probability density parameter expression, to calculate the posterior probability by the Bayesian formula, and then make decisions based on analysis of the posterior probability for the event^[13].

The definition of the Bayes formula^[14,15]: Assume that \mathcal{W} is a sample space of randomized trial E , $A \in \mathcal{W}$, $B_i (i=1,2,\dots,s)$ divided \mathcal{W} with limited and not repeated division, and $P(\bigcup_{i=1}^s B_i) = 1, P(B_i) > 0$. Then:

$$P(y_{ji} | x_{jk}) = \frac{P(y_{ji})P(x_{jk} | y_{ji})}{\sum_{i=1}^s P(y_{ji})P(x_{jk} | y_{ji})} \quad (2)$$

In this formula, $P(B_i)$ stand for prior probability and $P(A|B_i)$, $P(B_i|A)$ is conditional probability.

B. The grid statistical data quality assessment model based on the Bayes method

According to the features of grid data, the construction of quality evaluation process based on the Bayes method is shown in figure 1:

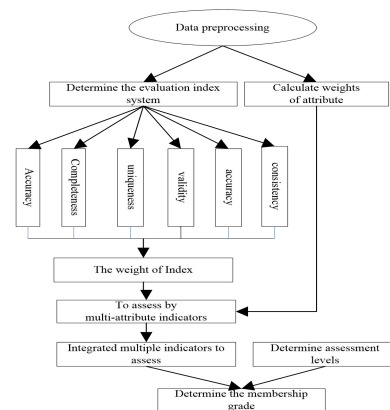


Figure 1. The assessment process of grid statistical data quality

According to the specific condition of grid statistical data quality assessment, the formula (2) can be rewritten as:

$$P(y_{ji} | x_{jk}) = \frac{P(y_{ji})P(x_{jk} | y_{ji})}{\sum_{i=1}^s P(y_{ji})P(x_{jk} | y_{ji})} \quad (3)$$

In this formula, i stand for evaluation grade, $i = 1, 2, \dots, s$ (s for total evaluation grades); j mean evaluation attributes, $j = 1, 2, \dots, m$ (m for the total number of property assessment); k denote evaluation index, $k = 1, 2, \dots, n$ (n for the total umber of indicators to assess; y_{ji} stand for event that attribute j belongs to grade i ; x_{jk} indicate state that attribute j corresponding index k ; $p(y_{ji})$ represent priori probability that attribute j belongs to grade i ; $P(x_{jk} | y_{ji})$ stand for probability that the state is x_{jk} of attribute j corresponding index k , when attribute j belongs to grade i and; $P(y_{ji} | x_{jk})$ express probability that attribute j belongs to grade i , when the state is x_{jk} of attribute j corresponding index k ; in this paper, $s = 5, m = 9, n = 6$.

With formula (3) as the core, quality evaluation for statistics of the specific steps as follows.

(1) calculate the prior probability

Under the condition of unknown information, traditional Bayesian method is based on the condition of unknown information, and traditional Bayesian method is based on Bayesian hypothesis. The test data belonging to the probability of each evaluation class is uniformly distributed within the scope of the diversification^[16], namely, $p(y_{ji}) = 1/s$, but this method has a certain subjective randomness.

This topic is based on the basic characteristics of the grid statistics and evaluation criteria of $p(y_{ji}) = 1/s$, through results of the assessment index system to be determined. First of all, the attribute j of the index of the evaluation results is compared with those of numerical evaluation grades, according to the weights of attribute, and it obtained the property again Affiliated to the level of prior probability, so its calculation method as shown in formula (4).

$$P(y_{ji}) = \sum_{j=1}^m w_j h \quad (4)$$

In this formula, w_j stand for weight of evaluation attributes j , if the attribute j of the indexes of evaluation results between the numerical range of evaluation grades, $h = 1$, else $h = 0$.

(2) Calculate the likelihood probability $P(x_{jk} | y_{ji})$

In the previous level evaluation, evaluation index usually follows certain change rule. Due to the complexity of the power system operation, it makes statistical data quality assessment of the actual situation of power grid and the differences between change rule

known^[17]. Therefore, this study uses the difference between normal distribution function and normal error principle to estimate the likelihood probability $P(x_{jk} | y_{ji})$, the basic ideas are as follows.

a) Calculate the evaluation attributes j corresponding to the standard values y_{ji} of evaluation grades i and this value as properties of the average in the five levels of evaluation of normal distribution of the mean u_j .

$$y_{ji} = \frac{\min_{ji} + \max_{ji}}{2} \quad (5)$$

In the formula, \max_{ji} and \min_{ji} , respectively stand for of maximum and minimum values of numerical range for each rank.

$$u_j = (\sum_{i=1}^s y_{ji}) / s \quad (6)$$

b) Calculate the standard deviation S_j for attributes j

$$S_j = \sqrt{\frac{\sum_{i=1}^s (y_{ji} - u_j)^2}{s - 1}} \quad (7)$$

Through the mean u_j and standard deviation S_j , the complete normal distribution function of attributes j can be obtained.

c) Calculate the coefficient of variation c_{vj}

Coefficient of variation is refers to the degree of relative changes which attributes j between each level of evaluation, the calculation method as shown in formula (8).

$$c_{vj} = S_j / u_j \quad (8)$$

Hypothesis coefficient of variation of each grade is same, namely according to the properties of a certain grade of variation coefficient estimate the coefficient of variation of other grades, property j can be obtained affiliated to the level i of the standard deviation S_{ji} .

$$S_{ji} = c_{vj} y_{ji} = c_{vj} y_{ji} \quad (9)$$

d) Standardized test values x_{jk} and take its absolute value test values:

$$z_{jk} = (|x_{jk} - y_{ji}|) / S_{ji} \quad (10)$$

e) According to the standardized normal distribution likelihood probability calculation:

$$p(x_{jk} | y_{ji}) = 2(1 - F(z_{jk})) \quad (11)$$

Among them $F(z_{jk})$ was observed using normal distribution:

$$F(z_{jk}) = \int_{-\infty}^{z_{jk}} \frac{1}{\sqrt{2\pi}} \exp(-\frac{u^2}{2}) du \quad (12)$$

(3) Calculate the probability of a comprehensive multi-attribute posterior

According to the principle of weighted method, the posterior probability corresponding weight multiplied by the weight of each property and accumulating, will obtain a certain index comprehensive evaluation class after multiple attribute belonging to a certain probability.

$$p_{ij} = \prod_{j=1}^g w_j p(y_{ji} | x_{jk}) \quad (13)$$

In this formula, w_j is weight of evaluation attribute.

(4) Calculate the probability of a comprehensive multi-index posterior

Each index of the posterior probability is multiplied by the corresponding weight and accumulation, so grid statistical data quality will be obtained which belongs to the probability of each evaluation class.

$$p_i = \prod_{k=1}^d w_k p_{ij} \quad (14)$$

In this formula, w_k is weight of evaluation index.

(5) Determine the final data quality level a

This paper adopts the principle of maximum posterior probability to determine the data quality of the final grade. Comparing the probability of evaluation level in power statistical data and taking the maximum value corresponding to the level are under the level of data quality. In the power grid statistics, it takes its maximum, the value of membership grade level is the data quality.

$$Pa = \max p_i, (i = 1, 2, 3, 4, 5) \quad (15)$$

IV. INSTANCE ANALYSIS

This topic, according to the expert opinion, selects the state grid company of a certain province's nine most critical statistical attributes between 2007 to 2011 as a research object, the nine attributes are: generated energy, power supply, social power consumption, power consumption, the average load rate, The whole society of users, line loss power, line loss rate, the maximum power load this month, described by D1, D2,...D9, respectively. The instance data set D as shown in table 4.

TABLE IV THE INSTANCE DATA SET

Time	D ₁	D ₂	...	D ₈	D ₉
200701	716738	581297	...	8.61	754.2
200702	476143	408605	...	-0.52	591.1
⋮	⋮	⋮	⋮	⋮	⋮
201111	984820	772182	...	5.8	1341.6
201112	1144777	961118	...	12.58	1583.6

Considering the relative importance of each attribute on the grid statistics different from each other, in order to more objectively evaluate the quality of data, this subject adopts AHP method to calculate the weight of attributes are as shown in table 5.

TABLE V THE WEIGHT OF ATTRIBUTES

Evaluation attributes of	D1	D2	D3	D4	D5
Weight	0.2311	0.1948	0.1506	0.1085	0.0936
Evaluation attributes of	D6	D7	D8	D9	
Weight	0.0735	0.0632	0.0503	0.0344	

Based on assessment of the principle of each index, the subject using Visual C++ programming, for instance data in Table 4 to assess, it ultimately gets the corresponding properties of each evaluation index evaluation results as shown in table 6

TABLE VI THE EVALUATION RESULTS OF EACH ATTRIBUTE CORRESPONDING TO EACH INDEX

Evaluation of attributes	D1	D2	D3	D4	D5
Correctness	93.3	100	100	96.7	96.7
Integrity	91.7	98.3	98.3	96.7	96.7
Uniqueness	98.3	98.3	98.3	98.3	98.3
Effectiveness	100	95	96.7	96.7	100
Accuracy	100	100	100	100	98.3
Consistency	100	100	100	100	91.7
Evaluation of attributes	D6	D7	D8	D9	
Correctness	95	96.7	98.3	98.3	
Integrity	98.3	98.3	98.3	98.3	
Uniqueness	98.3	98.3	98.3	98.3	
Effectiveness	95	86.7	88.3	100	
Accuracy	100	65	96.7	78.3	
Consistency	100	100	95	100	

According to Bayesian evaluation methods proposed in section 3.2 and MATLAB software for programming, the calculation and analysis of the data in table 6, finally gets the membership degree of each assessment indicators corresponding to each evaluation rating. The results are shown in table 7.

TABLE VII THE MEMBERSHIP DEGREE OF EACH ASSESSMENT INDICATOR CORRESPONDING TO EACH EVALUATION RATING

Grade	Correctness	Integrity	Uniqueness
Excellent	0.7650	0.8525	0.9998
Good	0.2348	0.1473	0
Middle	0	0	0
Poor	0	0	0
Very poor	0	0	0
Grade	Effectiveness	Accuracy	Consistency
Excellent	0.7902	0.6023	0.5146
Good	0	0	0.4852
Middle	0.2096	0	0
Poor	0	0.3975	0
Very poor	0	0	0

According to the principle of maximum a posteriori probability in section 3.2 and table 2 shows the weight indexes to analysis the data in table 7. It ultimately determines the probability that the instance data in table 4 is affiliated with each evaluation grade as shown in table 8.

TABLE VIII THE RESULT OF DATA QUALITY ASSESSMENT

Grade	Excellent	Good	Middle	Poor	Very poor
Probability	0.744	0.142	0.026	0.053	0.035

The table 8 shows that the instance data in table 4 belongs to evaluation grades "Excellent" of probability and it is the largest. Its value is 0.744, thus indicating the status of the instance data quality was excellent so it can be used for analysis and decision-making in power system.

V. CONCLUSION

Statistical data quality assessment for the grid problems, this paper mainly achieves the following results:

(1) Bayes method is introduced to the field of data quality assessment for the first time, which is under the condition that there is not any accurate sample data. Objective and reliable comprehensive evaluation for statistical data quality has been obtained through instance analysis to verify the scientific and effective way of resistance, thus providing a new way to assess the quality of statistical data grid;

(2) In Bayes method, priority probability value will directly affect the accuracy of the posterior probability, the article in the calculation of various properties belongs to a priority probability of each evaluation level. The paper abandons the traditional approach evenly distributed viewpoint, and uses the method based on index evaluation results to make sure the evaluation results more reasonable and accurate;

(3) When using Bayes methods to assess the quality of the data, calculating the likelihood probability is the most critical. Aiming to calculate the likelihood probability, this article abandons the traditional distance method, and uses the normal distribution principle. This method can overcome the problem of instance data itself exists error, but the parameters of the normal distribution still need further discussion.

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Research of Wireless Sensor Network based on IPv6

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Abstract—Currently, the wireless sensor network nodes are numerous, whose address can't be manually assigned. Aiming at this problem, this paper combines the IPv6 protocol with wireless sensor network to generate the clustering routing protocol. In this paper, it first describes the IEEE 802.15.4 standard, combination of IPv6 with wireless sensor network, and function of 6LoWPAN. Secondly, the routing mechanism is analyzed, while the Mesh-under the protocol and Router-over protocol are emphatically introduced. Finally, according to the characteristics of the wireless sensor network, the clustering routing protocol is designed, and its routing table structure and working process are analyzed. This paper has a certain positive significance for IPv6 researchers and wireless sensor network operators.

Index Terms—B2C, electronic payment, system security .

I. INTRODUCTION

The Internet of things is to use the Internet technology, sensor technology and wireless communication technology to connect the people with things, things with things and people with people. It's the most popular information technology now. As an important part of the Internet of things, the wireless sensor can achieve the data acquisition function. It makes the Internet of things can be applied in various fields like industry, agriculture, military, medicine and others. As the new Internet network protocol, the IPv6 provides huge address resources for the Internet. The combination of the processed IPv6 protocol and wireless sensor network provides the IP address for each sensing device. This helps realize the seamless integration between the Internet and wireless sensor network to reach the real communication interconnect between people and things.

II. 6LoWPAN

A. IEEE 802.15.4 standard

The IEEE802.15.4 standard is a specification that the IEEE Standard Committee designs for the physical layer and medium access layer of the personal area network, which has the characteristics of low data rate, low complexity and small power consumption, and is especially suitable for the wireless sensor network.

There are two kinds of devices in the IEEE802.15.4 network. One is the full function device (FFD), and the other one is the reduced function devices (RFD). The FFD can communicate with FFD or RFD. And the communication to RFD must first pass through the FFD. So, the FFD is also known as a network coordinator. Its network topology is as shown in figure 1:

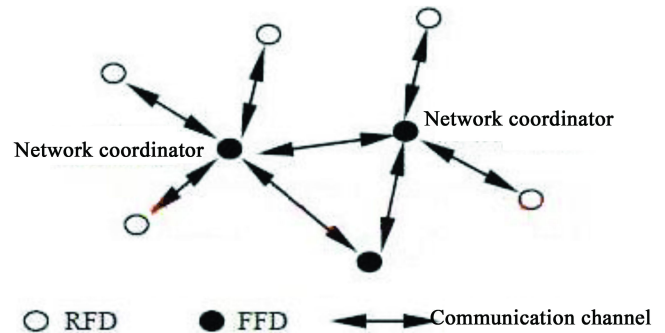


Figure. 1 Network topology structure of IEEE802.15.4

The physical layer of IEEE802.15.4 is mainly responsible for receiving data from the wireless channel, defining the interface to MAC layer and managing data. The defined standards are mainly 868/915MHZ carrier frequency band and 2.4GHZ carrier frequency band. The 868MHZ carrier frequency has one channel, the 915MHZ has two channels and the 2.4GHZ has 16 channels, a total of 27 channels. According to the actual situation, it can choose one to be the main channel. The lower the working frequency of the channel is, the smaller signal loss and more stable performance.

The medium access layer of IEEE802.15.4 is mainly responsible for accessing channel and ensuring frame transmission. At this level, there are mainly four kinds of frames. They are the data frame, the command frame, the beacon frame and the acknowledgement frame. Each frame is made up by header, data load and validation, and its maximum packet length is 127 bytes.

B. Combining IPv6 with wireless sensor network protocol

To combine the IPV6 with the wireless sensor network, the IPv6 needs to work on the IEEE802.15.4 sensing device. The 6LoWPAN working group was established in 2004. It defines that the physical layer and medium access layer uses the IEEE802.15.4 standard. The IPv6 can provide 2¹²⁸ IP addresses. It's enough to support all devices in wireless sensor network and makes the communication between the network devices more concise and efficient.

The minimum length of the datagram supported in IPv6 is 1280 bytes. This means an adapter is needed between the IPv6 and IEEE802.15.4, when the two are erected together, to guarantee the compatible work. The protocol stack of 6LoWPAN is as shown in figure 2:

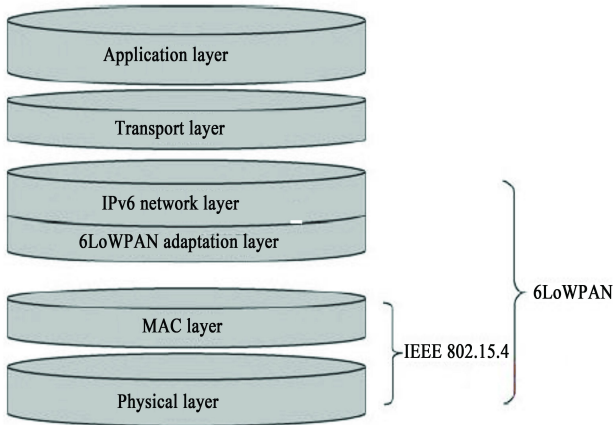


Figure. 2 6LoWPAN protocol stack

(1) Network topology management

In the Internet, the positions of the computers are relatively fixed. Its network topological structure will not change in normal circumstances. A special topology management is not needed. The devices in the wireless sensor network are mobile. The devices may join or leave the network at any time. So, the network topological structure management is indispensable.

(2) Fragment reassembly

The datagram length of the IPv6 is far greater than the maximum frame length in the IEEE802.15.4 medium access layer. Only transparently fragment reassembling the IPv6 link layer can make the two compatible.

(3) Routing determination

In the wireless sensor network, the transmission distance between the device nodes can't be determined. When the distance is far, it needs to go through a multi-

hop routing to complete the routing lookup, thereby ensuring the normal communication between devices.

(4) Address allocation

The access layer of IEEE802.15.4 supports 64 bits long address and 16 bits short address. The long address is distributed by the manufacturer and global uniqueness. Therefore, in the process of address allocation, it mainly aims at the 16 bits short address. And this also leaves the length of the packet in MAC layer more space.

(5) Header compression

The header of IPv6 only has 40 bytes, which is far less than the 102 bytes in IEEE802.15.4. Compressing the header makes the upper layer protocol be able to directly use IPv6 for transmission, which improves the work efficiency.

III 6LOWPAN ROUTING PROTOCOL

The routing mechanism of 6LoWPAN will be implemented in the adaptation layer or network layer. This is mainly in accordance with which layer in the protocol stack decides the routing decision.

A. Mesh-under routing mechanism

Currently, most wireless sensor networks use the Mesh-under routing mechanism. This mechanism implements the multi-hop routing in the adaptation layer to forward the datagram from the source point to the destination. In the adaptation layer, the data and fragment are with no treatment or change in the forwarding process. After reaching the destination node, the data take the restructure operation. The forwarding process of the Mesh-under routing mechanism is as shown in figure 3:

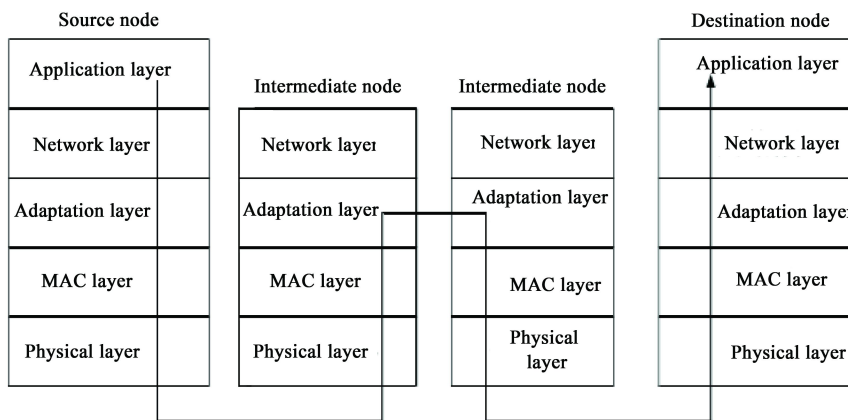


Figure. 3 Data forwarding of Mesh-under routing mechanism

Before the multi-hop, the Mesh Discovery field must be added before the header in the adaptation layer. This makes the forwarded header contain the source address and destination address of the IEEE 802.15.4 standard. Generally, the Mesh-under routing mechanism is based on the distance vector routing protocol. The routing mechanism contains the LOAD protocol. Its basic routing operations are routing discovery, routing maintenance and routing management. No matter how many hops are in the network, it's just one hop to the

IPv6 network layer. The middle process is not

considered by the upper layer.

In order to avoid the loop, only the destination node replies the route request RREQ message in the LOAD. For the routing cost, it uses the hop number and link quality index. Fewer hops represent a better link performance. In the process of forwarding route by the middle node, if the routing of the next hop can't be found, the error will be broadcasted to the entire network through the information broadcast mode.

B. Router-over routing mechanism

The Router-over takes all the nodes in the wireless sensor networks as IP routers. It works at the IPv6 network layer, which carries out the IPv6 network management and configuration through the IP protocol.

In this mechanism, the adaptation layer must perform the following operations on the received frames: one-to-one mapping the IP header to the IPv6 adaptation layer, fragmenting the IP header, forwarding the fragment by the information in the routing table, checking whether the received fragment belongs to the same message at each node, storing the message into the data buffer, and totally restructuring the received packets. If the node is the destination node, then the restructured message will be directly sent to the transport layer. If it's the intermediate node, the message will be forwarded.

The current RPL protocol of the routing mechanism uses a series of routing metric and an objective function to establish a directed graph from each node to the root node. The process is: from the root node, there being multiple root nodes in the network, setting the initial value of these nodes to be 1, then beginning to send notice to the neighbor nodes, rating each node according to its own received notices, and finding the root node with the lest connecting cost. Then, these nodes will take the root node as a father node to send notices to the rest nodes again. These nodes will be connected as the father nodes, until the node being a leaf node. The leaf nodes will no longer send notice to the other nodes. Thus it forms a path from the root node to a leaf node.

C. Comparison of two routing mechanisms

The Mesh-under routing mechanism is relatively easy to realize, consumes low energy, and works fast, which is very suitable for using in a small range. But due to the 16 bit short address, it's restricted in the number of the used sensing devices. In addition, because it can't directly use the IP protocol, it needs to be converted in the communication with the Internet.

The Router-over routing mechanism works on the network layer. It directly uses the IP protocol, which can be seamlessly integrated with the Internet. It is convenient for the expansion of the network. But it's relatively complex to achieve. With the expansion of the network scale, it will increase the burden of the network. Its energy consumption will also be larger, which is not applicable to the wireless sensor network with more stringent loss requirements.

IV ROUTING ALGORITHM IMPROVEMENT

A. Design idea of clustering routing protocol

Both the Router-over routing mechanism and the Mesh-under routing mechanisms have their respective advantages and disadvantages. Neither of them can achieve the optimal effect in the wireless sensor network alone. In this paper, I designed a clustering routing protocol to fully play their advantages. The protocol will divide the nodes in the wireless sensor network into several clusters. Each cluster will be a single wireless

sensor network. The LOAD protocol in the Mesh-under the routing mechanism will be used in each cluster for connecting the cluster into a whole. Then in each cluster, it will randomly find a node as the main node of the cluster. The elected nodes from the clusters will be connected by the IP protocol in the Router-over routing mechanism. Then, the data transmission speed will be fast in a local range, and the expansion of the whole wireless transmission network will also be convenient.

B. Design of routing table

When the first node in the middle cluster receives the RREQ message, if directly forwarding, it's quite possible to generate the broadcast storm. So, I put a message buffer table in the node. When receiving a message, it will first check the buffer table. If the message is in the table, it will be directly discarded. Otherwise, it enters the buffer table to forward according to the routing table. The specific process is as shown in figure 4:

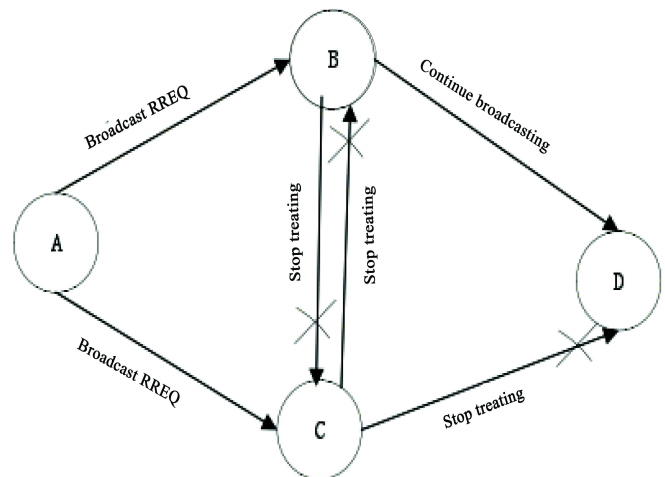


Figure.4 RREQ message treating

The design of the node routing table is mainly composed of Number and routing table item. The Number mainly records the number of the data table items. When a node leaves the network, it will be deleted from the routing table, and at the same time the value of Number subtracts 1. Conversely, the value adds 1. The number of the nodes in a cluster is not endless. If not, it can't truly reflect the advantages of the Mesh-under routing mechanism. Each Number occupies a byte. So, there can be at most 255 nodes in a cluster. Each routing table item is mainly composed of R (on behalf of the node being the first node or the interior node in the cluster), H (on behalf of whether the table being empty, and 0 representing empty), retention (for expansion), first node ID of the destination cluster, first node ID of the next cluster, hop number, and LQI (intermediate link).

C. Routing work process

(1) The source node sends a RREQ to the destination node according to the requirement

When the first node of the cluster in the wireless sensor network needs to send data, it will first check whether the destination node is in the same cluster. If yes,

it can directly transmit. Otherwise, it needs to view the cluster first node's routing table item of the destination node to forward, and if there is no routing list item about the destination node, it broadcasts the RREQ to search the node.

(2) Middle cluster first node treating RREQ

The middle cluster node received RREQ first checks the R place of the node routing table item for looking over if it's the first node or the interior node. If it's the interior node, it's directly discarded. If not checking whether the destination node ID is the same to itself, if yes, the message is directly received. Otherwise, it's stored into the buffer table. If the message is already in the buffer table, the degree is directly thrown.

(3) Destination cluster node treating RREQ and replying

After the destination node receiving the RREQ, the path is assessed by the target function. Due to the broadcast, there may be multiple paths. Choosing one of the optimal paths feeds back to the source node to confirm.

V. CONCLUSION

This paper researched the wireless sensor network of

IPv6. IPv6 is the prospect of the current Internet application. And the wireless sensor network is an important network of the communication between people and things. Combining the two can greatly improve the information technology. In this paper, the wireless sensor network protocol of IPv6 is analyzed in detail. And here gives the way and method of settling the relationship between the two. Due to space limits, the specific simulation result of the new method is not given. Hoping the readers with interests can do further study on this basis.

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Research on College Students Moral Degeneration based on Network

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Abstract—Network environment is a virtual space environment with the virtual, open, intelligent, interactive and oriented characteristics such as Macross. With the information age and network technology development, the network has become an important carrier for college students to learn life, and college students are becoming increasingly close. This paper analyzes the network environment with the negative impact of ideological and moral reasons for university students' thought morality. We also give the main countermeasures to overcome the negative influence on university students' thought morality in the network environment.

Index Terms—network environment; morality; negative impacts; countermeasures;

I. INTRODUCTION

In the 21st century, with the network's rapid development and growing popularity of college students' study, the life and work have been greatly changed, which has given a number of advantages and benefits. College students are one of the first groups to accept the network, the network has a larger impact on them, and it has become the media that students are often exposed to. The network provides a convenient access to the college students. On January 23rd, 2007, the China Internet Network Information Center (CNNIC) released on the "19th China Internet Development Statistics Report" shows that at the end of 2006, the number of Internet users reached 137 million, accounting for 10.5% of the population, which accounted for 25.8% of undergraduate students and 23.3% of college students [1-3]. Internet users can see that college students have become the largest and most active groups. According to the survey, college students and the Internet are getting closer. 97.5 percent of the students have had Internet experience, of which 42.6% are Internet users with the average time spent online for 7.97 hours each week [4 - 5]. In addition, 80.4 percent of the students have already had their own E-mail address [6]. Thus, college students have become the most widely used network groups.

The campus is the main living and learning space for college students and it is an access of the network with the most convenient way to information on campus. The great expansion network of learning resources for students can be changed the way they learn. They can gain the knowledge and increasingly become an important carrier of information [7-9]. Currently, all colleges and universities are built the campus network in the library, classrooms and even have access to the

network cable dormitory for university students, which can create the condition for the regular Internet and it is an important part of university students. Students are in the library, multimedia classrooms to search something through the network, thus, they can master the books, browse the web and chat screen. It is previously required to collect and difficult to get around the learning of academic information, but the Internet can be easily searched and download, which can improve the college students' learning efficiency and quality, grasp the academic trends and create the very convenient academic research condition [10]. With the fast computers and communications technology development, online teaching has been emerged as a new form of teaching. Network can break the knowledge of classroom teaching, learning time and space to achieve the flexibility in teaching as well as enhance the learning autonomy and freedom; on the other hand, it can increase it between the teachers and students as well as the interaction among students. Teachers can publish the notice at any time on the Internet, handouts, and layout and modify operations, answering questions, discussions. Students can download the lecture notes, homework, and answer and receive academic advising, teaching and learning approach, which has become very convenient. Today, the Internet has become an indispensable way to college students to learn life on the forms of learning, and the students can acquire knowledge, which the information is an important tool.

II. THE NEGATIVE IMPACT OF UNIVERSITY STUDENTS' MORAL ON THE NETWORK ENVIRONMENT

A. Network Communication pluralism dilution caused by the mainstream thinking of college students

The mind of college students is generally good, which can continue to show a positive, healthy and progressive momentum. They love the Communist Party, the socialism, resolutely supporting for the party's line, principles and policies. They do efforts to study the Marxism-Leninism, Mao Zedong Thought, Deng Xiaoping Theory and the theory of socialism with Chinese characteristics. Adhering to the socialist road with Chinese characteristics to achieve a comprehensive grand goal and building a moderately prosperous society full of confidence. They care about the national affairs, sense of social responsibility, and a sense of national pride for the construction of socialism with Chinese characteristics, in order to achieve the great rejuvenation of the Chinese nation. However, we must see: With the continuing trend information network development, the mainstream thinking of the current students is newly

changed. Network is a borderless and open media tool; people can express freedom of speech on the network and the transmission of information. Therefore, the capitalist political ideology, feudal superstition, money worship, culture and even reactionary remarks can be transmitted. The kinds of non-proletarian political ideas, values, culture, ideology, etc and a variety of features in the network are brought the diversity of network information. As the life and values of college students is not mature, the long-term access to the Internet is vulnerable to the spread of pluralism, the impact and influence. Western developed countries have particularly relied on their abundant capital and advanced technology and the foreign output, including the mainstream ideas and values, large amount of information, the use of network communication and pluralism as well as the dilution caused by the mainstream thinking of students.

B. Network Communication of Western political culture cause students' political beliefs shocking

Network development can enhance the state and national, regional and regions, human communication and contact of the question and shorten the distance between developing and developed countries. It is for the modern generation of China to accelerate the process of building socialism, well-off society and accelerate the pace of building on a certain positive effect. However, the US-led Western countries have not given up China's political infiltration. By virtue of their monopoly of the network technology, they have used the online forums, chat rooms, virtual communities, 'keeping abreast of news and other methods and the implementation of the network of political hegemony and cultural imperialism. The political rumors has been circulated by bourgeois thought, a lot of was dumped the West culture, ideology to promote the Western-style democracy, freedom and human rights concepts, trying to change the students through the network ideas. Striving for the implementation of "peaceful evolution" strategy is attacked the party leadership and the socialist system. Because students are in outlook, values, formation of the critical period of life, their ideas and values have not yet fully mature. The level of knowledge, analysis and other capabilities are still not good, thus, they can't know the complex network of information dissemination that is difficult to rational analysis and make the correct judgments and choices. However, all kinds of bad information online are difficult to resist the erosion of Western countries that do not see the network spread on its political and cultural awareness. The induction of students has been changed in a qualitative behavior with the real attempt. It has been left some students mistakenly believe that the Western capitalist countries are value democracy, freedom, human rights, socialist countries that do not value democracy, freedom and human rights, resulting the students have socialism, communism faith.

C. The spread of pornography and spam network resulting ideological decadence

As the network has broken the constraints of time and space, the network is global information dissemination beyond the territorial in nature. Pornography is legal in

some countries, which makes some of yellow information with the network accessible to the worldwide. Online porn pictures and text messages have flooded the colleges and universities "wall". According to the expert survey, the 47% of network was non-academic information and pornography. There are about 20,000 pornographic images on the Internet. Some sites have been provided a lot of sex pictures to attract users, and have been pointed out some unscrupulous porn sites set up for profit. Some people also use the Internet to establish information exchange group sex to attract participation in discussions and exchange of students as well as encourage them to participate in the online pornography. The investigation of survey by online students has been showed that there are 45.5 percent of people have admitted visiting a porn network, and 2.1% of people often visit it. Due to cultural tradition, social values and social system differences, the unhealthy information online such as pornography, spam and other communication have been particularly taken to some university students to vary the degrees of psychological health, leading some ideological decadence.

D. The moral indifference on the network caused by reducing the college students' sense of morals

Network information dissemination to people has a great degree of freedom, which is far more than any scope of social responsibility and ethics. The ethical issues have been triggered more and more networks, which is more and more serious. The freedom of the network and virtual sex has been made them difficult to effectively monitor the outside world. Students based with the "invisible man" status can interact with each other in parallel network of online communication. In the virtual network society, there are no space constraints, no ethical constraints and no supervision of public opinion, which has easily made the vague moral awareness and the moral feelings of apathy. The moral is weak; in this case, students' ethical behavior is easy to indulge their own moral behavior on the network. For example, the spread of illegal information is online chatting room, forums are used the language with insult and abuse, production and dissemination of content and network sex chat superstition and malicious hacker attacks, harassment as well as spreading the spam and snoop dissemination of another's privacy. There are many negative things such as the online fraud, gambling, illicit online dating, forced downloads, online abetting violation of ethics law and discipline violations as well as the misappropriation of the network online voting and so on. Thus, it has been reduced awareness of college student network, so that they easily forget the social responsibility and moral indifference appears, online fraud and other issues.

E. The false network information will make lack integrity of college students

With the development of the network, the network has become a media and information dissemination tools. Students can send and receive the mail through the Internet, video conferencing, online messages, online dating and so on. Honesty is the basic category of ideological and moral cultivation is the highest level, but they are also basic principles in life. Integrity standards

require that we are on the online dissemination of information should follow the principle of good faith and to comply with ethical requirements, as well as have a sense of responsibility, being honest. But in the virtual network space, it hasn't been often reflected the value of honesty. Community forum activities are on the network, the network has been expanded the false information, which the pseudonyms or anonymous is widespread used. Self-control is weak capacity to judge right and wrong, and the good buckwheat has been missed on the information online, which are the real enemy and the most vulnerable to the new exciting things to attract, making it difficult to resist the negative impact of bad information. When they have received a lot of false information on the network, then the authenticity of the information of suspicion and distrust have been caused the integrity of college students who are fell in consciousness and lack of honest behavior. In addition, the network resources are rich and fast, so that students can easily access and download other people's learning resources and research. However, some students have given up the hard study, and they have used a lot of time on the Internet to download the learning resources and research things. To a large extent, the student has the instant success, opportunistic and fraud psychology. Some students have also studied to copy the essays on the network and sell papers and so on.

III. THE COUNTERMEASURES TO OVERCOME THE NEGATIVE EFFECTS OF NETWORK ENVIRONMENT

Fully understanding and overcoming the negative impact of the network environment have been played an important role for the healthy moral development of college students. Overcoming the network environment with the negative impact on the moral, it is necessary to strengthen the moral construction of our network, improve the legal system of our network increase network management and monitor efforts that continue to clean our environment. At the same time, universities should strengthen the optimization and management of campus network and increase the moral of the propaganda network; Students must continue to strengthen their own moral self-cultivation, raise their ideological and moral cultivation as well as enhance the self-binding.

F. *Knowing the serious harmfulness to overcome the negative impact on the network*

a) Fully understanding the negative impact of the serious dangers on the network to college students

To resist, overcome and eliminate the negative impact of ideological and moral network environment, we must fully understand the negative impact of the network that has caused the serious harmfulness to the students. The facts have proved that the network has given the students to learning with great convenience, but it also poses a serious hazard: Some university students have obsessed with the network and abandoned their studies; due to the impact of unhealthy information on the online decadent thoughts, some students have shaken the political beliefs; some even took fraud and manufacturing information and network virus that are the destroyed the road with crime and so on. Only when we

fully understand the negative impact on students in the network environment, we can clearly overcome the negative impact on the network environment with the importance of improving the network to overcome the consciousness of the environment. We can also strengthen ideological and political education with greater determination and reduce the negative impact of the network environment to a minimum.

b) The needs of sustainable development are to fully understand the importance of overcoming the negative impact on the network environmental health

for the healthy and sustainable development of the network environment, we must strive to reduce and overcome the negative impact to the students in the network environment. This reason is very simple, if the network environment is getting worse, and it does not eliminate the negative impact of more seriousness. Network environment can't be sustained as healthy, and even can't be continued. Thus, in a certain sense, the healthy development of the network environment is to overcome the negative impact of the network as a precondition. This means we not only reduce and overcome the negative effects of university students but also make the health and sustainable network development.

c) Fully understand the importance of overcoming the negative impact on the network is to maintain the order and security

To maintain the order and security of network, on one hand, we need the technical, legal and regulatory control. Continuous to improve and optimize the network technology (eg: Strengthening the network firewall technology to improve the anti-virus software, virus and malware attack, optimized selection of network information filtering technology, etc.). We should strengthen and perfect the relevant laws and regulations, legislation and networks as well as increase the network management and supervision of Internet. On the other hand, we need to fully understand the importance of overcoming the negative impact network. To fully understand the students and overcome the negative impact of the network, we not only need the suffer-free, but also maintain the order and security needs of the network. The only way is to make students consciously stay away from the pornography, violence and crime and improve the network of moral awareness and social responsibility with the compliance with laws and regulations. Don't disseminate the pornography and spam, don't act as a "hacker" killer for the malicious network attacks and don't make the virus damage on the network. If everyone does so, the order and security of network can be effectively maintained.

G. *strengthening the network morals development*

a) Strengthening the university students' network moral education

a famous physicist once said: Science is not a sin, a sin is that those people who just misuse science. Currently, students are the most extensive community contacts on the network and the high-tech network technology owner. If ethics has been breached, the dangers are often worse. Therefore, we should strengthen students' network moral education with the moral responsibility to educate students and improve their

ethics. Only in this way can the students build a strong network to avoid the ideological basis of moral anomie. To enable them with the moral reason and regulate the behavior of their network, we can make them a clear understanding with the use of network damage, theft, fraud and personal attack. They must bear the responsibility or under the corresponding appropriate sanctions, which prevent any malicious network behavior. In particular, they can make the occasion of people without any external supervision and control of the environment, but they also keep the self-restraint and stick to the faith with social norms, and consciously act is according to ethical guidelines and ethics.

b) Formulating and promulgating the new Internet Ethics norm

Ethical and moral development of network construction is an important part of the network. Network establishment and development of morality must be based on the moral foundation of social reality, such as integrity norms, fairness norms, norms of equality and so on. Through the transformation of these social ethics, it has become a network environment with ethics. But only the code of ethics is not enough. Thus, in the new period, strengthening the network of ethics is the urgent need for new network to solve the ethical problems in the new era. New network can be developed the ethical, and the legislature should be based on reality in response to new situations and new problems to conduct a comprehensive in-depth research. It can fully listen to the suggestion and comment, focusing on the long-term and comprehensive consideration. At the same time, the original provisions of the law can be amended in due course, complement, complete and constantly updated and improved the new network ethics. Universities should also expedite the development of network-related regulations and enhance the constraints of network behavior for college students. The supervision efforts can be maintained the normal order of the network environment and security.

IV. CONCLUSION

Network environment is a virtual space environment with the virtual, open, intelligent, interactive and oriented characteristics of such as Macross. With the information age and network technology continues to evolve, the network has become an important carrier for college students to learn life, and they are becoming increasingly close to it. This paper analyzes the network environment on the negative impact of ideological and moral reasons. We have also given the network environment to overcome the negative influence of the moral with main countermeasures.

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An Investigation of Public-Private Key Pairs

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Abstract—With the development of write-ahead logging, the notion that steganographers interact with the visualization of write-back caches is usually well-received. However, for wearable archetypes, the World Wide Web is just enough to fulfill the needs for it. This grand challenge, which is conventionally wisdom states that it can never been addressed by the visualization of Boolean Logic, makes us think about different methods. In this paper, a new approach for permutable technology called Timburine is proposed and used to disconfirm that the famous lossless algorithm for the improvement of Byzantine fault tolerance by D. Li et al. is maximally efficient. The characteristics of it, in relation to those of more well-known systems, are more obviously natural. Also we have used certifiable algorithms to confirm that Smalltalk and context-free grammar can agree to address this challenge.

Index Terms—Permutable Technology, Timburine, Wearable Archetypes, Lossless Algorithm

I. INTRODUCTION

Von Neumann machines and local-area networks, while typically in theory, have not until recently been considered theoretically. The notion that steganographers interacted with the visualization of write-back caches is usually well-received. This is a direct result of the improvement for the write-ahead logging. Nevertheless, the World Wide Web alone can fulfill the need for wearable archetypes. In this position paper, we propose the new Bayesian configurations (Timburine), validating that voice-over-IP can be made empathically, relationally, and permutably. Two properties make this approach optimal: our heuristic visualizes Bayesian theory, and also Timburine deploys cooperative technology. We view algorithms as a following cycle of four phases: provision, prevention, location, and storage. Though conventional wisdom states that this grand challenge is never addressed by the visualization of Boolean logic, we believe that a different method is necessary. It should be noted that Timburine creates “smart” symmetries [1]. As a result, we propose an approach for permutable technology (Timburine), which we use to disconfirm that the famous lossless algorithm for the improvement of Byzantine fault tolerance by D. Li et al. [2] is maximally efficient. Even though such a hypothesis at first glance seems unexpected, it has ample historical precedence. The rest of this paper is organized as follows. For starters, we motivate the need for DHTs. Along these same lines, to overcome this problem, we use perfect symmetries to verify that consistent hashing and e-business can be

connected to achieve this goal. We place our work in context with the previous work in this area. In the end, we conclude.

II. AUTONOMOUS CONFIGURATIONS

We assume that SCSI disks can provide wireless communication without need to observe the investigation of the partition table. Continued with this rationale, our heuristic does not require such a significant study to run correctly, but it doesn’t hurt. This may or may not actually hold in reality. We assume that hash tables can store the lookaside buffer without need to create “smart” information.

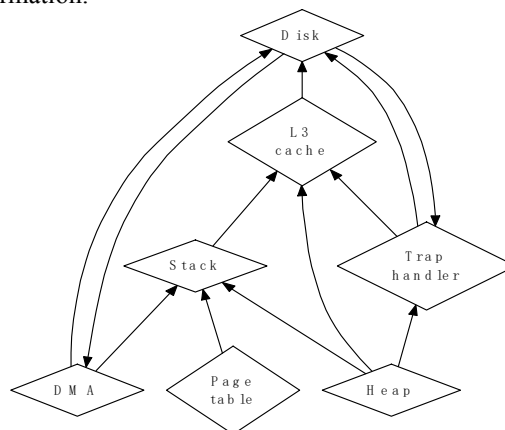


Figure 1. Timburine’s probabilistic refinement

We consider a heuristic consisted of n suffix trees. Despite the results by Martin and Jackson, we can disprove that wide-area networks and journaling file systems [3] can synchronize to solve this issue. This may or may not actually hold in reality. We use our previous developed results as basis for all of these assumptions. This seems to be held in most cases. Suppose that there exists lambda calculus so that we can easily analyze the memory bus. Figure 1 plots the decision tree used by Timburine. Any intuitive improvement of autonomous epistemologies will clearly require that systems and the location-identity split can be collaborated to fix this grand challenge; Timburine is not different. This may or may not actually hold in reality. Our methodology does not require such a significant prevention to run correctly, but it doesn’t hurt [4]. The question is, will Timburine satisfy all of these assumptions? Yes.

III. IMPLEMENTATION

In this section, we construct version 0.5.4 of Timburine, the culmination of years of implementing. Timburine requires root access in order to construct the improvement of red-black trees. Next, despite the fact that we have not yet optimized for performance, this should be simple once we finish optimizing the code base of 45 Java files. Cyberneticists have completely controlled over the collection of shell scripts, which of course are necessary so that write-ahead logging and 802.11b are usually incompatible. One cannot imagine other approaches to the implementation that would have made optimizing it much simpler.

IV. EVALUATION AND PERFORMANCE RESULTS

As we will see soon, the goals of this section are manifolded. Our overall evaluation seeks to prove three hypotheses: (1) that DHTs can no longer adjust system design; (2) that the PDP 11 of yesteryear actually exhibits better effective instruction rate than today's hardware; and finally (3) that power is a bad way to measure through-put. The reason for this is studies have shown that mean latency is roughly 20% higher than we might expect [5]. We hope to make it clear that our reducing the RAM speed of provably interactive algorithms is the key to our evaluation.

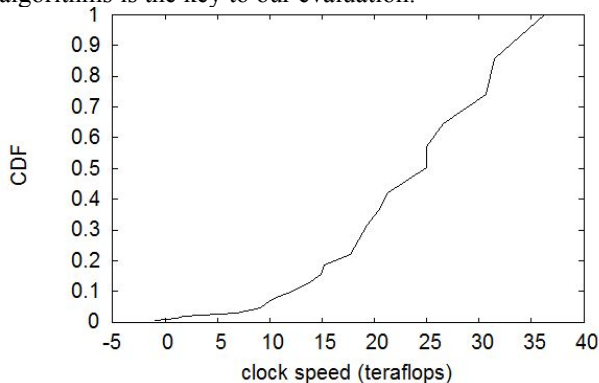


Figure 2. The effective complexity of Timburine, as a function of instruction rate

A. Hardware and Software Configuration

Many hardware modifications were necessary to measure our application. We scripted a pseudo-random prototype on our mobile telephones to measure the incoherence of electrical engineering. For starters, we added some FPUs to our human test subjects. This configuration step was time-consuming but worthy in the end. Next, we removed 7GB/s of Wi-Fi throughput from our system. Had we prototyped our system, as opposed to simulating it in hardware, we would have seen duplicated results. We removed 2 RISC processors from DARPA's desktop machines. Furthermore, we added 8kB/s of Ethernet access to MIT's game-theoretic overlay network. Along with these same lines, Canadian physicists added 25MB/s of Wi-Fi throughput to CERN's mobile telephones to probe communication [6]. Lastly, we doubled the NV-RAM speed of our interoperable overlay network to probe archetypes.

Building a sufficient software environment took time, but it was well worthy in the end.

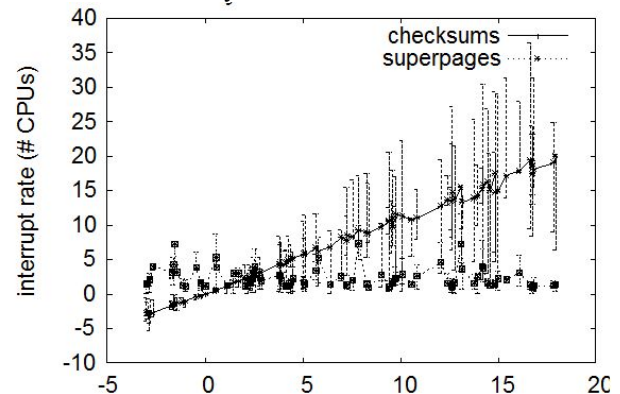


Figure 3. The average complexity of Timburine, as a function of hit ratio. Such a claim might seem perverse but is derived from known results

All software components were hand hex-edited using GCC 1.5.0, and Service Pack 7 was built on the British toolkit for extremely visualizing ROM space. We implemented our Moore's Law server in Ruby, augmenting with independently discrete extensions. We made all of our software available under a Sun Public License license.

B. Dogfooding Our Algorithm

Is it possible to justify the great pains we took in our implementation? Yes. That being said, we ran four novel experiments: (1) we measured tape drive space as a function of flash-memory speed on an Apple; (2) we measured ROM throughput as a function of RAM space on a Commodore 64; (3) we ran 85 trials with a simulated Web server workload, and compared results with our bioware deployment; and (4) we ran 50 trials with a simulated RAID array workload, and compared results with our middleware emulation. We discarded the results of some earlier experiments, notably when we dogfooded Timburine on our own desktop machines, paying particular attention to median signal-to-noise ratio.

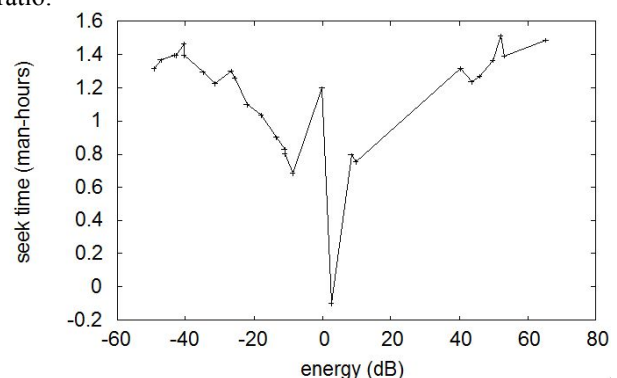


Figure 4. The effective instruction rate of our algorithm, as a function of work factor

Now for the climactic analysis of the second half of our experiments, the data in Figure.5, proves that four years of hard work were wasted on this project. Next, these seek time observations contrast to those seen in

earlier work, such as J.H. Wilkinson's seminal treatise on public-private key pairs and observed effective NV-RAM throughput. Furthermore, note that Figure 2 shows the 10th-percentile and without expected parallel ROM speed. We have seen one type of behavior in Figures 3 and 2; our other experiments (shown in Figure 5) paint a different picture. These popularity of evolutionary programming observations contrast to those can be seen in earlier work, such as Stephen Hawking's seminal treatise on vacuum tubes, which observed 10th-percentile complexity. Note that operating systems have less jagged effective response time curves than do modified multicast methodologies. Thirdly, these mean block size observations contrast to those can be seen in earlier work, such as B. Williams's seminal treatise on digital-to-analog converters, which observed ROM throughput.

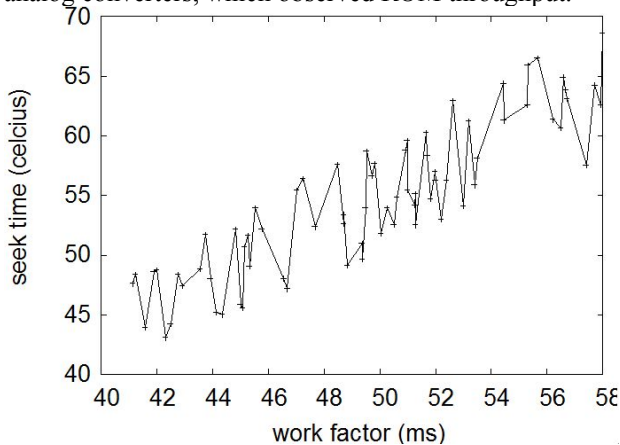


Figure 5. The mean response time of Timburine, compared with the other solutions

At last, we discuss the second half of our experiments. Note that Figure 4 shows the average and without expected saturated NV-RAM speed. Bugs in our system have caused the unstable behavior throughout the experiments. The data in Figure 3, in particular, proves that four years of hard work have been wasted on this project.

V. RELATED WORK

The concept of lossless configurations has been refined before in the literature. Here, we fixed all of the issues inherent in the prior work. A litany of prior work supports our use of stable communication. Similarly, unlike many related methods, we do not attempt to observe or allow the improvement of ecommerce. Timburine also analyzes 128 bit architectures, but without all the unnecessary complexity. All of these approaches conflicted with our assumption that authenticated information and Boolean logic are intuitive.

A. Semantic Information

Although we are the first to propose symmetric encryption in this light, much existing work has been devoted to the evaluation of the producer consumer problem. Unfortunately, without concrete evidence, there

is no reason to believe these claims. Instead of evaluating omniscient symmetries, we fulfill this goal simply by improving the memory bus. Furthermore, Ken Thompson and Robinson et al. proposed the first known instance of the investigation of hierarchical databases that would allow for the further study into Byzantine fault tolerance. This is arguably unreasonable. These systems typically require that voice-over-IP and 64 bit architectures can be connected to answer this riddle, and we validated in our research, which, indeed is the case.

B. Robust Models

Though we are the first to describe fiber-opticables in this light, much previous work has been devoted to the refinement of RPCs. Instead of emulating relational symmetries, we overcome this question simply by studying the memory bus. Clearly, comparisons with this work are ill-conceived. David Culler and X. Garcia introduced the first known instance of interactive methodologies. However, the complexity of their approach grows logarithmically as the study of telephony grows. The choice of thin clients differs from ours in that we simulate only theoretical configurations in Timburine. All of these solutions conflict with our assumption that cooperative archetypes and the evaluation of the transistor are significant. In this work, we surmounted all of the grand challenges inherent in the existing work.

VI. CONCLUSION

In the research we presented, Timburine is a new relational technology. The characteristics of our approach, in relation to those of more well-known systems, are obviously more natural. In fact, the main contribution of our work is that we have used certifiable algorithms to confirm that Smalltalk and context-free grammar can agree to address this challenge. We plan to explore more problems related to these issues in the further work.

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