CONTENTS

A Novel Approach to RBAC

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Abstract **—The objectives of an access control system are often described in terms of protecting system resources against inappropriate or undesired user access. When there is a request for a resource, the system must check who triggered the request (authentication), check if that user has the permission for the request to be fulfilled (authorisation) and as a result allow or deny the request (enforcement). Thus, an implementation of access control requires a specification of the rights associated to users in relation to resources (a policy). We present a language to express RBAC policies on calls to methods in Java, a set of design patterns which Java programs must adhere to for the policy to be enforced statically, and a description of the checks made by our static verifier for static enforcement.**

***Index Terms*—RBAC, Novel Approach, Java Application.**

I. Introduction

Our focus is on enforcement, for which there exist two main approaches, static and dynamic, with a recently emerged third approach combining the two: the hybrid approach. The static approach performs all access checks at compile time, whereas the dynamic approach performs these at run time. In short, the static approach enables policy violations to be detected earlier, facilitating debugging and reducing the impact on testing, and usually involves a lower run-time cost. However, the kinds of policies enforceable statically are not as expressive nor as flexible as those enforceable by the dynamic approach. We refer to [1] for a more detailed comparison; see also [2] for hybrid analysis of programs, although not directly applicable to our problem.

These kinds of code snippets are common in RBAC implementions. In such cases, a programmer would want to be sure that only the authorised role (‘admin’, in this example) can invoke the securitycritical, or protected method (‘wipeData’, in this example). This would usually be done using a dynamic check – the if statement (which in this case utilises Java Servlet API’s isUserInRole() method [3]), before any such method invocation. The program would then have to be rigorously tested to ensure that each role can reach only those invocations that it is allowed to. It would be reasonable to assume that the number of test cases needed would increase as the number of roles increases and the number of protected invocations in the program increases.

Summarising, we propose a static solution to RBAC policy enforcement for Java programs through the use of new RBAC MVC design patterns combined with a set of static verification checks made by our static verifier. The patterns integrate roles into the program as a set of Model-View-Controller (MVC) [4] components (i.e. classes) for each role. Each role’s associated MVC classes act as a rolespecific interface to accessing resources – protected methods in resources are invoked in these role classes only. The flow of the program directs users to the set of role classes associated to their active role. Finally, the protected invocations are checked statically for policy compliance. We present a static verifier, which performs syntactic checks and call graph analysis to ensure the invocations to methods belonging to resource classes are made only in role classes, such invocations are permitted according the policy and role classes do not invoke methods of components belonging to other roles.

II. Concept of Proposed Method

Programs that restrict access to resources from users typically involve an initial user authentication phase, where users log in and retrieve their access rights, then allowing users to undertake user tasks which may involve accessing resources, and finally logging out of the system. We present a simplified model of the general flow of a program which implements RBAC in the left-hand side of Figure 1. In RBAC, authentication also involves retrieving and activating the role(s) associated to the user, and logging out also involves deactivating the role(s). Controlling access most commonly takes place between ‘Tasks’ and ‘Resources’, for example through a reference monitor intercepting all access requests made to resource at run time, stopping those requests which are unauthorised.

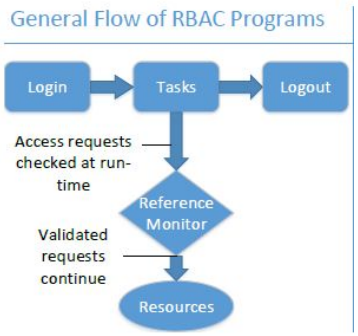

Figure 1: General flow of RBAC

In our approach, we divide user tasks into three groups: role tasks that users with certain roles in the system can perform (these may access resources), other tasks that the policy is not directly concerned with and session tasks related to the functioning of the session. After a successful log-in, users are presented with a session interface. This is made up of MVC components that

implement session tasks e.g. log-out. The session interface will retrieve and hold a list of all the roles assigned to the user in the policy. From here, the user can choose to perform role tasks by selecting one of the retrieved roles, resulting in the session interface displaying the role interface for the selected role. Each role has an associated role interface which implements its role tasks through a set of MVC components: a set of view components, one controller and one model component. Direct access to resources is prevented; resources can only be accessed through a role interface. The user interacts with a Role View which communicates with its Role Controller, which communicates with its Role Model which finally may access a resource. In this way, if an access request is found at compile time in a class that is part of a role interface, then the role that the interface belongs to is the role that can reach and execute this request. Our RBAC MVC patterns guide the implementation of the program to achieve this flow.

III. Policy Language: JPol

A. Syntax and Presentation

The policy language adopts an object-oriented, Java-like syntax designed to make the policy implementer's transition from target program language, Java, to policy language as effortless as possible. However, as we will see later, the static verifier relies solely on the information generated as a result of parsing the policy file. Thus, the syntax of the policy language can change and be adapted to any environment using hierarchical- (or flat-) RBAC. We could, for instance, use one of the existing RBAC specification languages.

```
stmts          ::=  (stmt ';')+
stmt           ::=  decRole | decRoleSubsume | decRes
                    | addActRes | addPermRole
decRole        ::=  'Role' ID '=' 'new' 'Role' name
decRoleSubsume ::=  'Role' ID '=' 'new' 'Role' name
                    'subsumes' ID
decRes         ::=  'Resource' ID '=' 'new' 'Resource' name
addActRes      ::=  ID '.' 'addAction' name
addPermRole    ::=  ID '.' 'addPermission' permission
name           ::=  '(' ID ')'
permission     ::=  '(' ID ',' ID ')'
```

B. Semantics

We can state the semantics of the policy language in a concise manner by mapping the abstract syntax to elements of the RBAC model: there is a one-to-one correspondence between the resources, roles and permissions specified in JPol and in the RBAC model. In particular, an 'addPermission' statement in JPol syntax (see the grammar rule for 'addPermRole' above) corresponds directly to a permission in the RBAC sense. Therefore, we can define policy satisfaction as follows. (Policy Satisfaction). A Java program satisfies a JPol policy if, for any invocation res:m that exists in the program, where res is an instance of a resource class Res and m an action, only authenticated users with active role r, such that the JPol policy specifies the permission [Res;m] for r, can perform res:m.

IV. Program Design Pattern

The class diagrams of the patterns are shown together in the following figure. RBAC Model contains only packages with names containing 'model', describing the design of resource and role model classes. RBAC Controller adds packages with names containing 'controller', describing the design of role controller classes. The empty interface class 'RoleController' simply groups all role controllers to simplify the link with session classes. RBAC View adds packages with names containing 'view.n' (where n represents any valid package identifier in Java) to these, describing the design of sets of role view classes. RBAC Session adds the package 'session', to guide the implementation of two key RBAC concepts: activating a role and users having multiple roles being able to switch between them. It also adds the package 'other' containing other classes, linking the session classes to them.

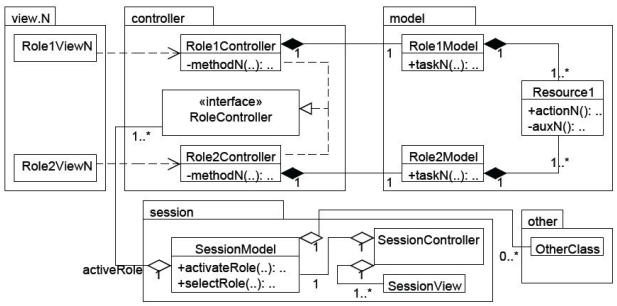

Figure 2: The class diagrams of the patterns are shown together

IV. VerificationProcess

A well-formed program consists of a (syntactically correct) JPol policy file and a Java program that implements the RBAC MVC patterns defined in Section 5. Implementing the patterns means: there is a set of session classes (one model, one controller and multiple views associated to the session), a set of resource classes, a set of role classes (sets of one role model, one role controller and multiple role view classes) and a set of classes which do not fit into the other groups. In particular for session classes, they: correctly authenticate users, activate the correct role(s) allowed for the user, switch roles correctly for the retrieved and selected roles.

In order to group each class, we use naming restrictions on the package and class names, described informally as follows. Names of resource classes must be the same as the name of a resource given in the policy, names of session classes must begin with string 'Session' and can then be followed by any valid identifier in Java - this applies to session model, session view and session controller classes which are grouped together into one group. Names of role model and role controller classes must begin with the name of a role given in the policy followed by the string 'Model' and 'Controller' respectively. Names of role view classes must begin with the name of the role followed by the string 'View' and can then b followed by any valid identifier in Java. This phase also generates tables containing the names of all

classes in each group except Other classes. We call these tables Resource Classes, RoleModel Classes, Role Controller Classes, RoleView- Classes and Session Classes. This is to simplify the process of looking up called classes in the checks made by the verifier.

The static verification checks described in the previous sections ensure that programs that pass the checks do not perform invalid access requests. More precisely, the source code of programs satisfies the propositions stated below, for which we first define the notion of OK-program. A program P is OK, written OK(P), if its actions are 'public' and auxiliary methods are 'private'; resource classes do not invoke methods of a role model, role controller, role view or session class; role model methods do not invoke session classes, role controller classes, role view classes or an action that is not allowed by the policy for the associated role; role controller classes do not invoke session classes or an action that is not allowed by the policy for the associated role; role view methods do not invoke role model or session classes or an action that is not allowed by the policy for the associated role; role classes do not call classes belonging to other roles; session classes do not invoke resource classes or role classes except for role controllers and role views; other class methods do not call role, resource, or session classes. To provide flexibility to programmers, we have allowed actions to be freely invoked within resource classes. We assume that actions are not restricted in their behaviour (i.e., the policy specifies the actions that a role is allowed to call, and it does not restrict the invocations within those actions). The session classes are the critical part of the program in our approach, in which role class invocations are trusted and not verified. The minimal Trusted Computing Base in our approach is therefore the action methods and the session classes. In future work, we will extend the verifier to include checks within actions, to alert programmers if an action calls another action not allowed by the policy.

V. Implementation and Evaluation

Implementation: Our implementation consists of a JPol policy parser, produced using the ANTLRWorks tool [5], and a static analysis program which are both part of a plug-in we have produced for the Eclipse Integrated Development Environment (IDE). Eclipse plugins are able to use the Java Development Tools (JDT) Application Programming Interface (API) provided by Eclipse, whose benefits include simplifying static code analysis. In Java, there are three ways to invoke a method; either invoking a ('static') method on a class e.g. 'ClassName.methodOne()', invoking a method on a variable e.g. 'x.methodOne()' or invoking a method on the object returned by another method call e.g. 'x.methodOne().methodTwo()'. Using JDT we can get the type binding for variables and method invocation expressions, and so we can check if a resource's actions are being called or if one role's components invoke another role's components. This is sufficient to implement all the static checks discussed in Section 6. We have tested our plug-in on a simple doctor's surgery web database application implemented in Java Enterprise Edition (JEE) (refer to [6] for an overview of JEE). The tool outputs helpful error messages in Eclipse's editor window, consisting of the class name and line number where the error occurs, the kind of error that has occurred (e.g. 'Invocation not permitted') and a description of why that error could have occurred.

VI. Conclusion and Future Work

We have described a new system to statically check that a target program respects its RBAC policy. If the program successfully passes the static verifier's checks, then when using the program, the logged in user can only call those methods that have been authorised for the role currently activated for them. Therefore, no run-time access checks are needed.

In future work, we will develop a hybrid approach for policies with dynamic conditions, inlining code in the program to check these at run-time. This hybrid approach would utilise our concept of implementing the groupings which access rights/users are assigned to in the policy (roles in this paper) as a set of MVC components, and then statically verifying static groups whilst dynamically verifying

dynamic groups. The result would allow static parts of the policy to be enforced statically, whilst still allowing dynamic policies to be expressed and then enforced dynamically. Furthermore, we will consider systems where a policy is defined as a combination of existing policies, extending the approach in order to allow programmers to combine validated RBAC implementations without re-doing all the static checks.

References

[1] David Basin, J¨urgen Doser & Torsten Lodderstedt (2006): Model Driven Security: From UML Models to Access Control Infrastructures. ACM Trans. Softw. Eng. Methodol. 15(1), pp. 39–91,

[2] Eric Bodden, Patrick Lam & Laurie Hendren (2012): Partially Evaluating Finite-State Runtime Monitors Ahead of Time. ACM Trans. Program. Lang. Syst. 34(2), pp. 7:1–7:52

[3] Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad & Michael Stal (1996): Patternoriented Software Architecture: A System of Patterns. John Wiley & Sons, Inc., New York, NY, USA.

[4] H. James Gosling, Bill Joy, Guy Steele & Gilad Bracha (2005): Java(TM) Language Specification, The (3rd Edition) (Java (Addison-Wesley))

[5] Arun Gupta (2013): Java EE 7 Essentials. O'Reilly Media.

[6] A. Santana de Oliveira (2008): R´e´criture et Modularit´e pour les Politiques de S´ecurit´e. Ph.D. thesis, Universit ´e Henri Poincare, Nancy, France

The Analysis of Urban Landscape and Planning Based on GIS Technology

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***Abstract*—Geographic information systems (GIS) is a collection, storage, analysis and dissemination of the Earth system information about a particular area. A complete GIS must have input, storage, manipulation and analysis, expressing its strong output four functions. GIS has spatial analysis capabilities and has been used to play in the environment and landscape planning projects in an increasingly important role in its development and practice in certain areas, especially in the field of environmental planning and design are mutually reinforcing. As a powerful and flexible decision-making system, it is not only found in a wide range of urban and regional planning, natural resource conservation and management, and many foreign and urban landscape design-related industries are also undergoing this technology, but it also has some shortcomings, the current GIS analysis and display such as noise, energy balance, the ability to factor climate and other aspects of the urban environment, is still limited.**

***Index Terms*—GIS, urban landscape, data collection**

I. Introduction

GIS is a spatial data input, storage, retrieval operations, analysis, modeling, display and output of a computer system, is set in space science, remote sensing, mapping, modern geography, information science, computer science, environmental science and management science the new interdisciplinary one, and the rapid formation of a melt above all disciplines and all kinds of application objects as an integrated high-tech. It not only can manage data, text and graphics, and is based on spatial data for the study, to computer as a tool, the different sources, different types of data and information related properties of organic binding and comprehensive analysis of the query, and computer information treatment, is a comprehensive analysis of spatial data processing and effective new technology systems. At the same time, it has a prompt, accurate and complete information to access a variety of information, graphics and spatial attribute data query, analysis, calculation and preparation of thematic maps and other functions. And it has good compatibility and resource sharing and so on.

Definition of GIS with the advances and applications of its technology continues to broaden and constantly improve. Different areas of study, and also because of different angles and different emphases, such as database class GIS, cartographic publishing class GIS, real-time monitoring and integrated information processing class GIS GIS and other classes. Currently the most widely accepted definition is: GIS is a collection, storage, analysis and dissemination of information about a particular area of the earth system, the system includes related hardware, software, data, personnel, organization and appropriate institutional arrangements. Among them, the collection, storage, analysis and dissemination of the four functions of a complete GIS must have, namely: input, storage, handling and analysis, expression output.

As a computer-related technology, GIS technology in the brief time had a huge progress, there are four aspects of the following reasons:

(1) Computer hardware prices continue to fall continuously to improve the operating speed. This society has growing and progressive PC and workstation storage capacity.

(2) Development software technology appears graphical operating system, making the user interface more direct and friendly. And developed an operating system for desktop GIS applications, and prices are to be accepted, as ARCVIEW3. 2 In the United States, the price of not more than 1200 US dollars.

(3). National and government agencies at all levels, especially the United States, spending a huge human, material and financial resources, not only to set up the relevant information agency, established a huge database of information resources, information and data to provide cheap, but also developed a appropriate policies, standards, laws and regulations.

(4) Internet strong penetration of social life, so that resource sharing has become a real possibility. GIS itself provides a comprehensive summary of the information, analysis and processing, making it easier to find a solution, such as tropical rain forests disappear, urban sprawl, overpopulation, etc. methods range of complex problems. At the same time, people realized, related to geography or information in the manner described in the geographical expression, always influence and restrict people's decision-making behavior.

II. GIS and Environmental Planning Theory

Split topic maps and layers overlap, is not only the basis of GIS technology to generate and display, but also affect the United States many environmental design master design. Therefore, it can be said to some extent the development of GIS technology and practice in certain areas, especially in the field of environmental planning and design are mutually reinforcing.

A. Adaptability Analysis Model and GIS

Land suitability analysis model is site planning and landscape design is widely used in the theory and methods. It is one of the most influential contemporary American land and landscape planning master, the famous landscape architect Ian Mcharn Georgia [1] in the 20th century made the mid-1960s. Its core is the natural, political, economic, cultural and other elements of quantitative analysis to understand the local context, the existing policy, the economic situation, environmental science and on the basis of appropriate development practices on land suitable for different development ability to make use of the relevant evaluation. When reading about the theory was surprised to find that the overlapping layers McHarg system analysis methods employed in his theory - the pastry mode (layer-cake model) and GIS layers through the establishment of spatial data themes. And the use of spatial analysis to draw relevant conclusions almost exactly the same idea:

(1). GIS layers can be established to collect information on the collection related to natural, political, economic, cultural and other spatial data information, the establishment of project-related (vegetation, water, topography, soils, ownership, administrative division, zoning) to point, line, surface objects that make up the different themes layers. And can also be based on need, merge, split, layer and control layer visible or not.

(2). Subject to display the results as a result of GIS view point "line" side object represents, is the attribute data associated therewith, so that designers can according to their expertise and experience, according to the property, precisely on the theme layer the theme of the classification "shows and free to edit these topics on behalf of a legend, give them different forms (such as the thickness of the line" form, point size, special logos & "color" hatch "transparency.

(3). Conclusion seek spatial analysis, GIS can easily satisfy certain conditions, spatial regions are connected together to form a new theme layer, and all relevant attributes remain unchanged.

(4). Dynamic correction due to the composition of the view point in GIS, keep the line between the "face of the dynamic objects and data connections, it can be based on the actual situation, the planning framework to be adjusted at any time the data changes, the analysis of the results in real-time correction.

B. Environmental Corridor Concept and GIS

WU-MADISON now professor emeritus "famous landscape architect Philip Louis was an influential American alternative land and landscape master planning, environmental corridor concept (Envitonmental, Educational, Ecological, Esthetic, Exercise way. The author of early in the mid-1950s, he realized: if you want to retain a point for future generations of natural and cultural heritage, we must as soon as possible on the environment sensitive to confirm and establish a set of drawings and resource directory files the only way people in order to implement the necessary protection for those areas to the adverse effects from future development. Therefore, he will be classified as landscape types: regional slopes, wetlands, ground water, mineral resources, vegetation, etc. Lewis believes that these basic the type can be a guide for future development-determinants [2]. through a unified system in these water bodies, wetlands, terrain slope, vegetation distribution were plotted, and then together, and researchers can be divided into the so-called - environment Gallery Road., then the environment will be able to take advantage of this corridor, established to guide the future development of relevant research in key areas.

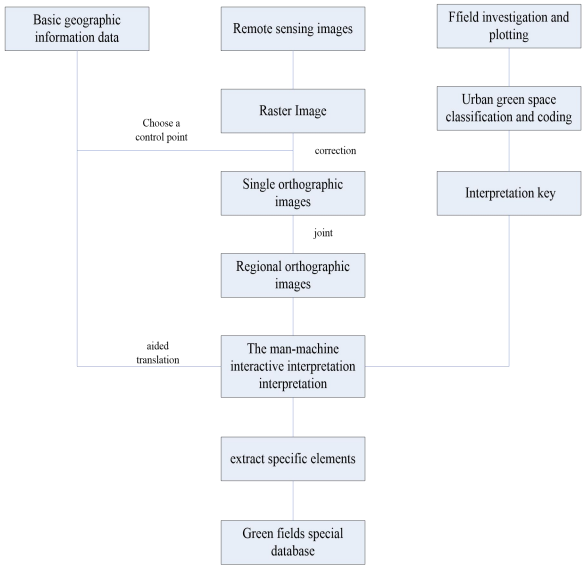

Figure 1 The investigation of the status of green fields in urban parks

The theory of the entire corridor from four aspects of the environment variable definitions: ground water, wetlands, steep slopes and other (forests, wildlife habitat, parks under the jurisdiction of the federal government, public and private protected areas, flood plains, grassland, etc.).

(1).Establish a water layer in GIS buffer analysis using this function, the establishment of environmental corridors in the GIS data of the line drawings in Point soon constituted the original data, line, surface, according to a certain distance into the corresponding extension polygons, for example, can generate a distance a river "PP F buffer to control construction projects, soil and water conservation, protection of vegetation. As for the width of the buffer，it can be controlled according to the water quality, flow rate, and factors such as the width of the river itself.

(2). Establish wet formations. The key to make the existing wetland system digitized map layers coincide with other topics, including projection, coordinate

systems, units, accuracy, etc. This is the basis for the establishment of GIS projects.

(3). Establish steep layers. Use positive phase image generated terrain model of the region, and the surface model into a raster file, and then calculate the slope .GIS spatial analysis is the key to the completion of this project. With this feature, create a grid network file and direct analysis calculated for each grid cell network to determine the average slope adjacent grid. Use slope map, using questioning functions, you can create a new grid network to represent the region has a slope range (such as slope at 12.5 % or more of the area) [3].

(4). Establishment of environmental corridors. 3 relating to the above layers, respectively, established corridor for creating a basic environment elements of the graphics image. Thus, when the. Topics superimposed layers together, the overlapped portion constitutes a diverse and distinct linear characteristic environment corridors . GIS can also automatically connect to other objects adjacent elements, and fill the small gap to extend the corridor area. then we can take advantage of this environment corridor map, planning priority conservation areas.

III. Based on the advantages and value of GIS site analysis

GIS is a spatial data input, storage, retrieval operations, analysis, modeling, display and output of a computer system, is set in space science, remote sensing, mapping, modern geography, information science, computer science, environmental science and management science the new interdisciplinary one, and the rapid formation of a melt above all disciplines and all kinds of application objects as an integrated high-tech. It not only can manage data, text and graphics, and is based on spatial data for the study, to computer as a tool, the different sources, different types of data and information related properties of organic binding and comprehensive analysis of the query, and computer information treatment, is a comprehensive analysis of spatial data processing and effective new technology systems [5]. At the same time, it has a prompt, accurate and complete information to access a variety of information, graphics and spatial attribute data query, analysis, calculation and preparation of thematic maps and other functions. And has good compatibility and resource sharing and so on.

Collected a lot of information, data files to different properties at the different fields and graphics files via the "lay" points of raster and vector files to enter specific geographic information system software, according to the analysis in the preparation of the content of simple or complex mathematical model, or it can be applied directly to a variety of plug-in model-assisted analysis of certain commercial GIS software to carry out site analysis, by virtue of computer information timely and accurate mass analysis capabilities to quickly obtain convincing results and graphically convenient form of image output, so that the whole process of simplifying within the industry, and can significantly improve the scientific and accurate analysis.

In addition, the current common commercial GIS software can be very good compatibility with remote sensing and global positioning system, which is complicated and can save a lot of accuracy is not high outside the industry field survey work hardships. Through the analysis of remote sensing images, with the common remote sensing image analysis software, can analyze field data from satellite images need to aviation picture or appearance, like your eyes always watching you designed this site from space time, However, at any time and observe the entire planning area adjacent to the site and may affect the occurrence of subtle changes in your design ideas [4].

GIS-based analysis of the working space within the industry and outside the industry has undergone revolutionary change, really make the site analysis from qualitative analysis to quantitative empirical analysis of scientific leap, allowing designers to design liberated from the troublesome preparation of out of focus to analyze the impact of the design ideas of the key venue information. Designers can combine the results of GIS analysis, combined with their own practical experience summed up the results of the analysis more rational grounds.

IV. he Application of GIS Technology in the Latter Part of the Work of Green Field Planning

A. The Classification and Coding of Green Fields Information

In accordance with national standards will be divided into green parkland, attached green, green production, ecology, protection green land, living green, green roads, farmland and green fields in the housing category. According to the Ministry of Construction, "urban greening planning and construction requirements" and other standards, urban green coverage level classification system can be 2, Level 1 according to their function and purpose is divided into six categories, according to their nature in level 2 first [6]. Stage divided into 20 subcategories based on the classification system under which each category can be identified coding table. Thus, the extracted information can be classified by the above criteria and coding. Green information recommended by planar features for processing, and then add the relevant attribute information.

B. Unify Standards to Facilitate Data Sharing and Updates

In the process of establishing a database of green topics, mainly the principles to be followed to ensure uniform standards to facilitate data sharing and updating [7]. ESRI information system software can be used to build the library work ARCINFO thematic data. ARCINFO has a powerful spatial data processing functions, you can easily manage and link attribute data, and between it and the remote sensing image processing software ERDAS has a strong compatibility. Add green attribute items can also be used other methods, such as commercial database management software, such as the

property sheet FOXPRO first established, then the use of the property sheet for the graphic spatial data link assignment database. In addition, ARCINFO may also use their secondary AML develop a macro programming language for batch or interactive processing, spatial data use it to edit and update operations, the establishment of topological relations, classification statistics to calculate the area of each of its coverage rate.

C. The Management of Information System

On this basis, in order to scientifically plan for green fields, the need to establish the appropriate management information system [8]. It is mainly based on GIS, database and other technical methods as a basis for the use of spatial analysis algorithms, combined with the constraints of the preparation of the corresponding planning green fields planning information management software. A variety of existing data has been collated by the standard data format grouped together, on top of these basic information, as determined by the conditions of use of certain planners planning software, and then combined with the appropriate policies to modify the actual situation, made green fields Planning Master Plan and various individual plans. The status of the various planning information in the system can be easily query statistics multi-channel, it also has general office automation and graphical operating function to facilitate real-time updates and modifications.

CONCLUSION

Application and development of GIS technology for the development of many industries and areas of society brings opportunities, but this is a trend, it can be said that in future any department behind in GIS applications and will also lag behind our global village technological development. In the current field of GIS technology to the design plan in case there are still many constraints, and how GIS technology to seize the opportunities arising from the development, and benefit from GIS technology in the field of planning is designed to solve the problem first.

GIS analysis in applied research field is still very immature, for any landscape designer, GIS technology is a challenging task. Theory and technical aspects need further study, but with the application of GIS to promote research in the field analysis, GIS technology in the field analysis of the future will be further development and promotion.

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REFERENCES

[1] Chen Shupeng, “Getting started with geographic information system,” Geographic Information System. Shang Hai, vol. A24, pp. 433–442, April 1958.
[2] Yan Li, “GIS in site design: new tools for design profession,” Photogrammetric Engineering and Remote Sensing. China, vol. 54, pp. 1593-1600, August 1988.
[3] Dictor J D, “A overview and A Linear-Time Algorithm.GIS,” Geographic Information System. China, vol. 7, pp. 501-504, August 1993.
[4] James H. Clark, “Aregional design process for sustainability,” Remote Sensing Information. China vol. 16, pp. 127-133, August 1982.
[5] Clark, J.H., “GIS-based information flow in a land-use zoning review process,” Communications of the ACM, vol. 19, pp. 7547-554, 1976.
[6] Chrisman, Nicholas, “Exploring geographic information systems,” *Jon Wiley & Sons, London.*, vol. 2, pp. 123–141, March 2007.
[7] Clarke, Ketith C, “Getting started with Geographic information system” *Upper saddle river*, vol. 11, pp. 150–181, May 1997.
[8] Kand-tsung Chang, “Introduction to Geographic Information Systems,” Science and technology press, Beijing, China, vol. 7, pp. 221–237, 1999.

Dynamic Simulation of Regional Sustainable Tourism Development System

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***Abstract*—With the deterioration of the global ecological environment, economic development and environmental carrying capacity have become increasingly prominent issue of sustainable development has increasingly become a hot topic. According to the concept of sustainable development, to build sustainable development of tourism system includes tourism, population, society, resources and environment of the five sub-systems. On the basis of analysis of the internal sustainable development of tourism related internal systems and dynamic behavior of each element on the establishment of Sustainable Tourism system dynamics model of development. Using system dynamics modeling regional Tourism Sustainable Development was simulated by indicators for key elements of the regulation proposed tourism in Tibet should take into account environmental protection, infrastructure investments, professional training, tourism regulatory development, tourism enterprises and sustainable development model employees and other elements of the decision-making basis for regional tourism sustainable development and scientific management.**

***Index Terms*—Military- Endurance- Solid- Sport-Beverage; Physical Training; Impact Indicators**

I. INTRODUCTION

Sustainable development of tourism in the economic policy priorities, the environment, too commercial and other factors on the sustainable development of tourism poses a severe challenge to economic recession, environmental degradation, decline in social conflicts and travel satisfaction seriously restricting sustainable tourism development of. Integrated existing research, tourism sustainable development is primarily related to tourism, population, society, resources and environment, the five basic elements, therefore, can be considered the essence of sustainable development of tourism that is to promote tourism and population, society, resources, coordinated development side of the environment. Sustainable development of tourism between tourism, population, society, resources and environment by the interaction of a complex system interconnected posed. From the regional tourism system's internal mechanisms for sustainable development, microstructure start, analyze the system and rely on computer simulation techniques to analyze the internal structure of research systems and their dynamic behavior characteristics.

II. MATERIALS AND METHODS

A. Regional sustainable tourism development

Sustainability is a primitive species of human economy. It pre-industrial subsistence lifestyle unique sustainability by understanding the unique nature of consciousness to maintain, namely: the survival of plants and animals and their people have a spiritual connection; who is landscape (that nature) is part of nature rather than from the master. Along with the process of industrialization, the "original sustainability" era is over. Modern concepts of sustainability originated in the people of the forest, fisheries etc. renewable understanding of resource use, especially in understanding the formation of this concept played an important role in forest resource utilization. As human beings continue to deepen understanding of ecosystems, renewable resources in understanding the idea of eco-system, it creates a modern concept of sustainability, namely: the need to maintain the existing ecological situation of humanity in a certain level of benefits, including Human lives of future generations [1].

Regional sustainable development refers to economic, social, environmental and regional resources, coordination, both to meet the needs of the present without jeopardizing the needs of future generations to meet their own development capacity, which is consistent with the interests of the region's population without jeopardizing even the development of the global population benefits elsewhere. Meanwhile, the regional sustainable development can be emphasized on coordination relationships, intergenerational relations and inter-regional relations. Region is the sustainable development of research material entity, is all theory and space vehicle principles are applied.. Any one region, has decided to sustainable development of the five elements: the carrying capacity of the population, production capacity, buffering capacity of the environment, stable social skills and the ability to regulate the management of the area, they constitute a complex support system. That area is the coordinated development of regional sustainable development of population, economy, society, resources and environment, which it is a highly complex, uncertainty, multi-level nature of the giant open system [2].

B. System Dynamic Simulation Analysis

With the development of tourism, the influx of large numbers of tourists, some impact on tourism to the environment, resources, and the normal order of life of residents, and this will, therefore residents travel to face more and more tourists will gradually produce reject, leading to the attitude of the tourism industry will become more indifferent, and ultimately affect the healthy development of the tourism industry.

At the same time, visitor spending will increase tourism income residents, for residents to provide more employment opportunities, which in turn will improve active participation of residents in tourism and draw more tourists to enter. After the increase of tourists, tourism revenue increased tourism economy in the national economy also increases, will attract more enterprises to enter the tourism industry, the prosperity of the tourism market. Tourism economic development will make the government more power to invest in the tourism industry, especially in tourism infrastructure construction, environmental protection, so as to optimize the local tourism environment and attract more tourists to the development of tourism, but also to attract more An increasing number of professional and technical personnel engaged in research and tourism discipline, so that the sustainable development of the tourism industry for more scientific decision-making [3].

The model out of the population according to the average person travel out of the calculation of the rate of the tourism industry, tourism practitioners for new population through the development of tourism on employment factor to measure tourism resource consumption calculated on the basis of tourism resources and the natural attrition rate per million tourism Income consumption of tourism resources, tourism resources, new year means new development of regional tourism resources depends on the rate of visitors to change the number of visitors, tourists change rate of five variables in the model number of travel companies decided to withdraw the decision on the tourism business life cycle. Is the reciprocal of the life cycle of the annual attrition rate of tourism enterprises tourism professional and technical personnel from New tourism professionals and tourism professionals determine the loss of tourism professional and technical personnel turnover rate in accordance with the retirement of specialized technical personnel, new expertise into tourism number of persons affected by tourism enterprises, tourism research funding and tourism revenue in GDP three variables affect tourism Innovation Index by the tourism impact of tourism research funding and the number of professional and technical personnel .

Spatial boundaries of the system for regional, time of 2001 to 2030, a total of 30 years, the simulation step size is 1 year. In 2009 the base year for the simulation studies, whichever is the data for the baseline measures of the index in 2001 initial value of the data to 2001-2009 historical data as a basis for the determining. The results are analyzed as follows: Environmental investment ratio from 0.0034 up to 0.005, tourism enterprises life cycle consists of nine 45 years to 10 years, tourism research funding increased from 0.014 up to 0.02, tourism revenue funding ratio increased to 0.00002, tourism infrastructure investment ratio from. 0.031 up to 0.04 10,000 yuan of tourism revenue pollution emissions from one unit to reduce pollution 0.85 polluters 10,000 yuan of tourism revenue tourism resource consumption by one resource unit is reduced to 8 resource units, tourism industry personnel outflow rate from 0.18 down to 0.175. In this case, the 2030 data and the results of a variable compared to the magnitude of the change was + 9.09%, + 8.98%, more than 13.5%, more than 3.7% - 14.45%, +38.28 % and + 13.74%, and a comparison with the results, the results of the number two in the tourism business, tourism employed population, the number of visitors, tourism professionals and technical personnel continued to maintain a rapid growth, and more growth, and increase the stock of pollution decreased significantly, decreasing trend in tourism resources stocks have a greater ease, residents travel awareness has been maintained at a high level [4]. Fig.1 and Fig.2 show the dynamic simulation results.

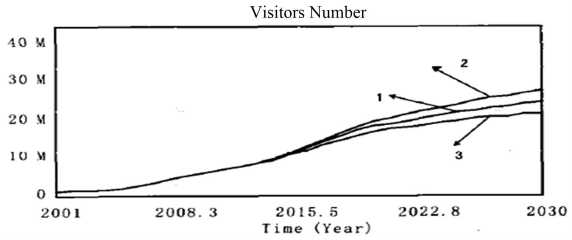

Fig. 1.The visitors number dynamic simulation results

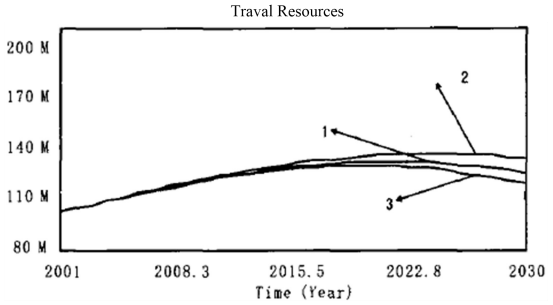

Fig. 2.The tourism resources dynamic simulation results

C. The Evaluation of Sustainable Development of Regional Tourism

Sustainable development of regional tourism assessment is the premise of sustainable development from theory to operational phase. Regional Sustainable Tourism Development Evaluation time to reflect on the speed and sustainability of tourism trends, tourism in space reflect the overall layout and structure of sustainable development. Meanwhile, the

evaluation index system of sustainable development, reflected in the number of scope for sustainable development of tourism, reflecting the structure of sustainable tourism development in terms of quality, reflected in the level of functionality and level of sustainable tourism development, and both describe, evaluate, interpretation, early warning and decision-making, and many other features and value. In general, the area of sustainable tourism development evaluation should follow the following basic principles [5].

The current interest can be able to obtain or achieve benefits in the near future; refers to the interests of long-term interests to get in the future. Calling attention to the long-term interest in the sustainable development of tourism evaluation, a very important issue is the rational use of tourism resources and the protection of the environment of tourism, modern people can't because of their own development and demand immediate interests to the detriment of future generations to meet their needs and environment; on the other hand, we can't blindly pursue the long-term interests of the neglect and disregard of current interest, with emphasis on the protection of resources and the environment in development. Eco-efficiency refers to the natural ecological system to obtain the efficiency of material and energy exchange to maintain ecological balance and improve the ecological environment. Eco-efficiency is naturally formed the basis of objective economic, ecological and economic benefits it is important to improve the social environment and external conditions. Under normal circumstances, when the two come into conflict, we must not be at the expense of ecological benefits in exchange for temporary, local economic benefits.

Because of the large differences in the level difference between the natural conditions of the region, history, cultural background and geographic location, and a regional social and economic development, development among regions caused by the imbalance, that regional differences. Problems in the implementation of the regional tourism sustainable development encountered not the same, so the regional primary objective of sustainable development, the evaluation is not the same focus, the right method to evaluate or index system and index weight but also because of regional differences and different. Static evaluation refers to the evaluation of the status quo, the main analysis of the current status of the system structure, achieved a measure of the overall system functionality and benefit level, static evaluation can reflect the reality of the production capacity and level of the system. Dynamic Evaluation mainly succession rule structure, function and efficiency in all aspects of the system prompt to grasp the laws governing the operation of sustainable tourism development system for effective control system. Static evaluation and dynamic evaluation of the combination, both from the aspect of sustainable tourism development system comprehensively reflect the whole picture [6].

D. Key technologies

Excellent tourism can achieve transformation must rely on the smart of the new technological revolution, in which networking technology, cloud technology, sensor technology, RF technology, network technology, intelligent information processing technology, the most important calculations. These techniques become an excellent tourist city smart transformation vector, urban operations and management tools [7]. Fig.3 shows the measures to prevent the progressive collapse of the structure.

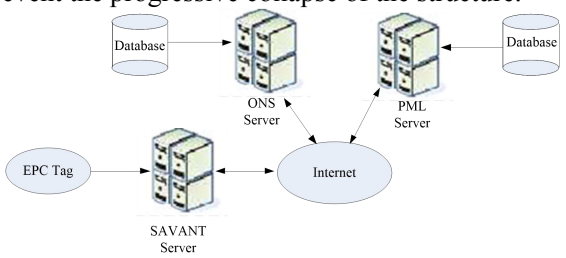

Fig. 3.The schematic diagram of system components

Things sensing technology is through information sensing devices, according to the agreed protocol, to any items connected to the Internet, information exchange and communication in order to achieve intelligent identification, positioning, tracking, monitoring and management of a network. From a technical point of view, things are sensor networks. Sensing technology is about to obtain information from the source and nature of processing (transformation) and the identification of a multidisciplinary modern science and engineering, which involves sensors, planning and design of information processing and recognition, development system construction, testing, application and evaluation of improvement activities. Under the premise to ensure security of information, on the one hand to maximize the tourist information resource utilization, on the other hand to facilitate the exchange between the main tourist market and resource sharing model [8].

Radio Frequency Identification technology is a non-contact automatic identification technology, which can achieve a combination of electromagnetic signals in the non-contact transmission of information objects, RFID system usually consists of RFID tags, antennas, readers, and background processing system components. RFID systems general workflow is: a certain frequency emitted by the reader to the RF signal through the antenna, when the electronic tag reader antenna into the work area is activated, the tag information will be sent through the pre-built antenna.

III. CONCLUSION

Dynamic Modeling System is an important method for complex systems research in the field of socio-economic, sustainable development of tourism as the research object, the number of links between key elements of analysis between internal systems, the establishment of the system of power on Sustainable Development theoretical models. The model is intuitive description and explanation on the internal structure and the development of sustainable tourism in the region as a management study to optimize the pattern of regional tourism sustainable development study concluded that: environmental protection, investment, professional training, development and implementation of tourism enterprises, employees and other elements of travel regulations for sustainable tourism development in the region has a very significant role in promoting the scientific development of indicators system for sustainable development of tourism on the implementation of regional tourism can sustainable development strategy is important; establish evaluation system is an important element in promoting the sustainable development of tourism.

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REFERENCES

[1] Eger, John M. Smart Growth, Smart Cities, and the Crisis at the Pump a Worldwide Phenomenon. I-ways. 2009 (32).
[2] Xinyan Zhang, Haiyan Song, George Q. Huang. Tourism supply chain management: A new research agenda [J]. Tourism Management, 2009:345-357.
[3] Liu, S. et. al., Towards mobility-based clustering, Proceedings of the 16th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining, 2010, 919-928.
[4] Ulrike Gretzel. Review article intelligent system in tourism: A social science perspective [M]. Annals of Tourism Research, 2011, 38(3): 757-779.
[5] Tsai, M., W. Lee and H. Wu. Determinants of RFID adoption intention: Evidence from Taiwanese retail chains. Information & Management, 2010. 47(5-6): p. 255-261.
[6] Watson TA, Blake RJ, Canister R, Garg ML, 2005. Antioxidant-restricted diet reduces plasma nonesterified fatty acids in trained athletes. Lipids,40(4)，433-435.
[7] Quatrowoni P. A, 2008. Clinical observations frc;m nutrition services in college athletics. J Am Diet Assoc, 108(4): G 89-694.
[8] AKPINAR N, TALAY I, CEYLAN C, et al. Rural Women and Agrotourism in the Context of Sustainable Rural Development: a Case Study from Turkey [J].Environment, Development and Sustainability, 2004, 6 (4):473-486.
[9] FRECHTLING A，TCHETCHIK A. Does Rural Tourism Benefit from Agriculture[J].Tourism Management ， 2005，26(4):493-501.
[10] Northcote J, Macbeth J. Conceptualizing yield sustainable tourism management[J]. Annals of Tourism Research, 2006, 33(1): 199-220.
[11] Castellani V, Sala S. Sustainable performance index for tourism policy development [J]. Tourism Management, 2010, 31(6): 871-880.

The Simulation of Reasonable Scheduling Model of Multi Tasks in Business Management

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***Abstract*—In the studies of task scheduling efficiency optimization problem in business management, since in the multi-task scheduling process, the correlation between the tasks is complicated and it is heavily affected by the scheduling order. The traditional task scheduling model based on the optimal single linear sequence, once there are too many tasks, it will result in increased conflicts among different task scheduling and the stability of the model will decline and it is lack of flexibility, resulting in the scheduling efficiency is not high. This paper proposed a reasonable scheduling method of the multi-constrained scheduling model in a multi-enterprise management task. Elaborated the principle of multi-enterprise management task scheduling, building AON network model for virtual scheduling for the network model, searching the optimal solution in the solution space and get more reasonable scheduling method in business management task. Experimental results show that the improved algorithm can improve resource utilization and scheduling efficiency, avoid scheduling model stability doping case in enterprise management task scheduling**

***Index Terms*—Business management, work tasks, scheduling model**

I. Introduction

With the rapid development of the market economy, there are more and more intense competitions among enterprises. Business management task scheduling method as an important factor influences the competitiveness of enterprises, it has attracts more and more attention to corporate managers. Therefore, business management task scheduling method has become a hot topic in business areas that require research attention of many experts. At this stage, the main business management major task scheduling method based on fuzzy clustering algorithm, task scheduling method based on genetic algorithms and ant colony optimization algorithm for scheduling tasks based on task scheduling model. Because task scheduling method has a very broad space for development, it became the focus of a lot of experts to study the issue [1].

Task scheduling model, has become the core business areas of management issues to be studied. Business management mostly uses the pipeline task management mode, in which the management tasks using multi-threaded, multi-tasking mode. In multi-task scheduling process, the correlation between the tasks is complicated by the large mutual influence between the scheduling orders. The traditional task scheduling model based on the optimal single linear sequence, once too many tasks, it will result in increased conflicting among different task scheduling and the stability of the model will decline, being lack of flexibility, resulting in scheduling efficiency is not high.

For the above-mentioned defects of traditional algorithms, we propose a model based on multi-constrained scheduling of enterprise management tasks more reasonable scheduling methods. The principles of corporate management in multi-task scheduling has been described in detail, using this principle to build AON network model for virtual scheduling for the network model, searching the optimal solution in the solution space, get business management multitasking reasonable scheduling method . Experimental results show that the improved algorithm is more enterprise management task scheduling can improve resource utilization, and improve scheduling efficiency, avoid scheduling model stability doping case caused much work to reduce defects[2].

A. Task Classification and Description

The task is often to solve complex problems, the task or just a single program or several interactive programs and it may be using the operating system's command. When dealing with different tasks, resource requirements also vary according to the type of task division includes the following four tasks [3]:

1. Batch task, the task of a running process eliminates the need for manual intervention to perform the task;
2. Interactive tasks, tasks needed to run human-computer interaction;
3. Parallel, the task can be divided into several sub-tasks given to the fleet with ten processors if executed in parallel;
4. With the checkpoint task, you can save the task cycle their status to the file system, so you can feel free to interrupt the execution of the task, perform the task only when you need to perform to the last checkpoint, strict in some the checkpoint task, the task can be

migrated to run on a cluster of different processors. Tasks can be divided according to the different processing times for real-time tasks and non-real-time tasks. Real-time tasks on deadline has strict demands to the task must be completed before the deadline, which requires a certain degree of reliability scheduling system to meet the task must be completed before the deadline. Non-real-time task is not very strict with requirements of task completion time, as long as you can perform the task properly.

B. Resource Utilization Policy

Resource use and includes the following resources: computing cycles, main memory, disk space and peripherals such as printers and disk drives, and other major resource utilization has the following four strategies[4]:

1. Based on resource sharing strategy

A good scheduling system allows the sharing of resources permissions defined hierarchy tree resources, the highest authority roots. Require all clusters provide resources for resource sharing tree, the tree can also equitable sharing of resources allocated to each of the participating departments resources, that will give more of these resources as a compensation for the future, if in the past the department to use fewer resources, the resources department if used in the past much less the future will give more resources as punishment.

2. Based on the performance function of strategy

Resource allocation is based on the departments he wants to achieve the function, such as resource sharing strategy, as it also defines the use of resources, privileges, but the way he allocate resources more flexible and diverse, while the policy is no compensation and punitive measures.

3. Based on the deadline Policy

Real-time tasks have deadlines and requirements prior to the non-real-time tasks to perform before, namely real-time tasks than non-real-time task priority. In order to ensure smooth implementation of real-time task scheduling system, if certain resources to reserve real-time tasks, so that when there is no real-time task to perform, this part of the resource is idle, it will be a waste of resources. Conversely, if the scheduling system does not reserve resources, real-time tasks may not be performed properly. There is a compromise approach is only set aside a certain percentage of resources for real-time tasks, if there is no real-time tasks to perform, then this part of the resources allocated to the non-real-time tasks to perform, so we ensure the normal execution of real-time tasks, but also ensures that no waste of resources. The method can be controlled by the size of the priority.

4. User commands coverage strategy

If you want to undo just published task, the user can then release a task, then the corresponding execution nodes perform only released last mission, in order to get as much as possible to ensure that user requirements are met. Similarly, the super-user can also collect resources available for one or some urgent task by the method.

C. The Principle of Multi-task Scheduling in Business Management

The business management uses the pipeline task management mode, in which the management tasks using multi-threaded, multi-tasking mode. In multi-task scheduling process, the correlation between the tasks is complicated by the large mutual influence between the scheduling orders. Business management, rational allocation of tasks will help improve task efficiency. Its scheduling principles are as follows:

Set $T=\{Task_i\}(1\le i\le l)$ for multi-enterprise management tasks set, the task set can be described by the following matrix.

$$T=\begin{bmatrix} Task_1^{Type}, Task_1^{L}, Task_1^{In}, Task_1^{Out}, Task_1^{E} \\ Task_2^{Type}, Task_2^{L}, Task_2^{In}, Task_2^{Out}, Task_2^{E} \\ \cdots\cdots \\ Task_l^{Type}, Task_l^{L}, Task_l^{In}, Task_l^{Out}, Task_l^{E} \end{bmatrix} \quad (1)$$

Description of tasks corresponding attribute row vector matrix can be used to set. Which, $Task_i^{Type}$ used to describe the types of tasks; $Task_i^{L}$ is the total length of the tasks; $Task_i^{In}$ the size of the input tasks; $Task_i^{Out}$ is the task of the output size; $Task_i^{E}$ expectations for enterprise management tasks.

Business management in the use of the pipeline task management mode, in which the management tasks using multi-threaded and multi-tasking mode. In multi-task scheduling process, the correlation between the tasks is complicated by the large mutual influence between the scheduling orders. The traditional task scheduling model based on the optimal single linear sequence, once too many tasks, it will result in a different task scheduling conflicting increased stability of the model will decline, lack of flexibility, resulting in scheduling efficiency is not high [5].

II. DESIGN METHOD OF SCHEDULING MODEL IN MULTIPLE WORK TASKS CONSTRAINTS

Using traditional algorithms in multi-enterprise management task scheduling model stability cannot be avoided due to human interference caused by defects will decline, reducing the efficiency of the scheduling. This paper presents a reasonable multi-constraint-based scheduling model of corporate governance in multi-task scheduling method.

A. Multi-task Scheduling Principles

Able to multi-task scheduling resource utilization is solved according to the method described above, in the process of scheduling tasks for nonrenewable resource needs are identified. Therefore, in a multi-task scheduling process can ignore the restrictions of nonrenewable resources. Therefore, when performing multi-task scheduling problem, first issue simplified, non-renewable resources involves calculation ignores the

other length of time to complete the task with only renewable resources related to the ability to work selected.

Solution to set up multi-task scheduling problem is the (W,R,S). Where, W is used to describe all the work the number of tasks, w_i used to describe the task i ($w_i \in W$). Resource allocation vector R is used to describe all the tasks, r_i used to describe the situation ($r_i \in R$) to task i allocation of resources. S is used to describe the beginning of the task time vector, s_i used to describe the task begins i. S is acquired by calculated W and R in (W,R,S). Therefore, the process of solving the scheduling problem solving process is W and R values. The process of multi-task scheduling problem can be described as: ① be constructed AON network scheduling problems. ② through the virtual scheduling continuous compression solution space, until it meets the end conditions, exit problem solving process. ③ obtain scheduling problem solving results (no solution or optimal solution) [6].

B. AON Network Structure

Before the multi-task scheduling problem, according to the logic required relationships between tasks, build AON network will be described with reference to Fig. 1.

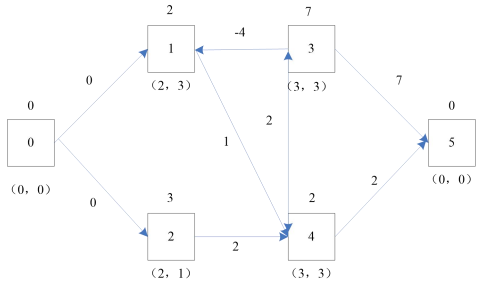

Figure 1 The AON network diagram of Multi-task

In AON network, set $G(V,E,\delta)$ is the need to schedule the project, V is used to describe the tasks, while E is used to describe the links between tasks, weights δ is used to describe the task of the lag time window constraints.

Figure 2 can use to describe the connection between any two nodes in the network AON. Where j,l are two tasks, p_j is the task completion time, r vector used to describe the tasks of the resource needs of the situation. The δ_{jl} time window is used to describe the task j,l between. Time window $[b,e]$ values can utilize δ_{jl} = b and δ_{jl} =-e will be described, as shown in Fig.2.

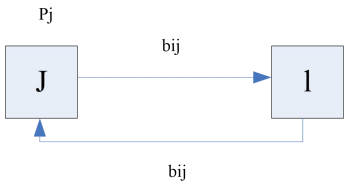

Figure 2 AON network graph

C. Virtual Scheduling

In multi-task scheduling process, the concept of virtual scheduling is needed to be introduced. Virtual Scheduling (R ', S) is a virtual resource allocation and scheduling start time vector composition. Differs between the actual scheduling is scheduled tasks allocated virtual resource is a collection, while the actual scheduling of resources is allocated to a specific resource. Virtual scheduling is based on relaxation theory evolved, so scheduling is a virtual intermediate process scheduling scheme for solving process. Setting is a proper subset of r_i, the initial state, r_i is the type of resource task all i can assign. The actual process of solving scheduling problems, namely the continuous compression of virtual scheduling process, and ultimately all r_i is only an optional resource then the solution is the solution of the scheduling of virtual real scheduling problems [7].

D. Solution Space Structure

By carrying out the process of multi-task scheduling problem solving, because inequality of resources, there may be multiple tasks demand uniform resource situation at the same time, then there will be a conflict of resources. Way to avoid conflict is need to build a separate set of conflict, in order to ensure the implementation of the priority tasks to be part of the work. Because there are several classification schemes, each of which there is a branch of the program. Therefore, according to the knapsack the problem solving method for calculation is of all branches. After selecting a solution, you need to set the priority tasks of allocating resources to their needs. For example there are two tasks and resources and two different resource allocation schemes are the presences of different allocation methods have different solutions for the branch. Use the method described above can obtain the scheduling problem tree structure of the solution space. Construction process is the solution space tree scheduling problem solving process. When faced with a node cannot be solved, such as the current caused by the separation plan does not comply with the time window constraints between tasks, you need to give up this separation program and return to the upper node [8].

III. Analysis of Experimental Results

In order to verify the reasonableness of multi-constraint-based scheduling algorithm in multi-enterprise management task scheduling method, the need for a single experiment. During the experiment, with resource utilization, staff utilization and scheduling efficiency to

measure the performance of multi-task scheduling method. Corporate officers, the relationship between the resources and tasks can use the Table 1, Table 2 and Table 3 will be described:

TABLE I.
COMPARISON OF DIFFERENT ALGORITHMS RESOURCE UTILIZATION

Number of trials	Traditional algorithms	Improved algorithm
1	95	98
2	91	97
3	89	96
4	88	95
5	86	95
6	83	95
7	81	95
8	81	94
9	80	93
10	76	93

TABLE II.
TABLE 2 COMPARISON OF DIFFERENT ALGORITHMS STAFF UTILIZATION

Number of trials	Traditional algorithms	Improved algorithm
1	95	98
2	92	98
3	88	98
4	86	98
5	85	99
6	84	99
7	82	99
8	79	98
9	77	97
10	74	97

TABLE III.
COMPARISON OF DIFFERENT SCHEDULING ALGORITHMS EFFICIENCY

Number of trials	Traditional algorithms	Improved algorithm
1	86	98
2	86	98
3	85	97
4	83	95
5	82	95
6	80	95
7	77	93
8	75	94
9	74	93
10	72	94

According to the table can be learned, the improved algorithm is a multi-business management tasks reasonable scheduling can improve resource utilization and staff utilization, improve scheduling efficiency.

Ⅳ CONCLUSION

Traditional business management algorithm cannot avoid the process of multi-task scheduling model stability due to interference caused by the decline of the defects of human factors, proposed multi-constrained scheduling model in a multi-enterprise management tasks based on reasonable dispatch. Principles of business management more scheduling tasks are described, using the above principle to build AON network model, and the model of virtual scheduling, space in the search for solutions to scheduling problems the optimal solution to obtain reasonable business management in multi-task scheduling methods. Experimental results show that the improved algorithm is more enterprise management task scheduling can improve resource utilization, and improve scheduling efficiency, avoid scheduling model stability doping case caused much work to reduce defects and achieved satisfactory effect.

APPENDIX A APPENDIX TITLE

Appendixes, if needed, is numbered by A, B, C... Use two spaces before APPENDIX TITLE.

ACKNOWLEDGMENT

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REFERENCES

[1] Chen Shupeng, “Modeling and Simulation of multi-model vehicle scheduling problem,” Shang Hai, vol. A24, pp. 433–442, April 1958.
[2] Yan Li, “For logistics distribution routing Improved Genetic Algorithm”. China, vol. 54, pp. 1593-1600, August 1988.
[3] Dictor J D, “Task scheduling resource reliability model and scheduling algorithm”, vol. 7, pp. 501-504, August 1993.
[4] James H. Clark, “Ant Algorithm Based Grid Task Scheduling” Remote Sensing Information. China vol. 16, pp. 127-133, August 1982.
[5] Clark, J.H., “GIS-based information flow in a land-use zoning review process,” Communications of the ACM, vol. 19, pp. 7547-554, 1976.
[6] Chrisman, Nicholas, “Grid Scheduling any genetic algorithm based on ant colony,” *Jon Wiley & Sons, London.*, vol. 2, pp. 123–141, March 2007.
[7] Clarke, Ketith C, “Technology Status and Development Trend shop scheduling problem” *Upper saddle river*, vol. 11, pp. 150–181, May 1997.
[8] Kand-tsung Chang, “Vehicle scheduling optimization model simulation,” Science and technology press, Beijing, China, vol. 7, pp. 221–237, 1999.

Back to the Middle Ages - On the Historical Value of the Pre-Raphaelite Brotherhood

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***Abstract*—Throughout the history of Western painting , many Western painting factions have had their own successors since the Renaissance. However, the pre-Raphaelite just like a meteor acrossing the night sky, leaving the eternally immortal works of art in history, and now hard to find its traces. This paper discusses the indissoluble bound between the Pre-Raphaelite and the Medieval painting and the artistic value of Pre-Raphaelite in the 19th century in United Kingdom.**

***IndexTerms*—Medieval-painting, Pre-Raphaelite,Historical value**

I. Introduction

Throughout the history of Western painting ,since the Renaissance, the rise and replacement of painting genres have continuous element links like life extension .Such as Caravaggio bridge in Rembrandt, neoclassicism of the Renaissance, expressionism is to the post-impressionist painting ... Almost every Western faction have its own successors.[1] There are few factions vanishing like the disappearance of the dinosaurs and becoming silent fossils with past glory which can only be seen in the museum. The Pre-Raphaelite is like a meteor acrossing the night sky, but leaving the eternally immortal artists and works of art in history.[2-4] Its style and background have been fixed by many art critics and artists, which have no need to repeat . And this article is going to discusses the indissoluble bound between the Pre-Raphaelite and the Medieval painting and the artistic value of Pre-Raphaelite in the 19th century in United Kingdom.

II. Return to the Middle Ages, the wise choice by the Pre-Raphaelite

At the time of the Pre-Raphaelite painters, many fractions can be chosen, such as Impressionism, Romanticism, Neoclassicism, Realism and so on. Then why they choose Botticelli, Giotto which are before Raphael or even earlier medieval painting style and spirit of the Middle Ages as a reference of manifestation and the soul to guide them? In fact, if back to the time of Pre-Raphaelite, a little clues can be found. In the mid-19th century, the development of human civilization enters into a time that large industrial machines develop rapidly.[5] French bourgeois revolution in 1793, the revolution of the Paris Commune in 1853, a variety of artistic genres come and go, crying for a new era, but also confusing many artists. However, as a mainstream style of the Royal Academy of Arts, they think that they should follow Rafael style, not crossing the step. Thus, the Pre-Raphaelite painters attempt to save the art by reviving religious and moral spirit through the medieval spirit.

As a movement in art, Pre-Raphaelite reflects the people's mental confusion in the impact of industrial civilization , reflecting the values of the industrial age. It hopes to return to the images painted by the painters at the end of Middle Ages and the early Renaissance. On the artistic expression, they pursue poetry and aestheticism, and praise highly on natural realist approach. They advocate direct study of natural phenomena, pursuing the combination of religious spirit moralization while portraying image beauty. In terms of ideology, they reject the official art, not following the crowd, pursuing pure soul, advocating sincere expression of ideas, and stressing the symbolic and implied meaning of art. A wealth of philosophical and social questions exist in specific symbolic realist works.

III.the historical value of the Pre-Raphaelite

A. The pursuit of poetic expression of the Pre-Raphaelite is in consonance with the Botticelli

The author believes that only way to find the pursuit of Pre-Raphaelite painting trace is to return to the Middle Ages in Europe. Interestingly, with the Pre-Raphaelite style is closest to the early Renaissance painter Sandro Botticelli, which we can get an answer from a number of pre-Raphaelite paintings.

In the late 15th century Florence, Italy, the famous painter Botticelli with a prominent reputation, is an lyric poet with a faint sadness who longings and pursues the ideal beauty. His famous painting "Spring" (Figure 1) and "Birth of Venus" are both aesthetic and poetic works. Comparing to the works of Leonardo da Vinci during the heyday of Renaissance with flickering character outline and hazy pastel shading, Botticelli's characters edge is clearly depicted using the medieval techniques.

Figure 1 "Spring" • Italian Sandro Botticelli

Characters and backgrounds are very clearly separated, which has a very clear dramatic effect, even flowers on the floor as decoration and golden fruit hanging in the branches, are significantly prominent in the background, like a jewel shining bright luster.

Figure2 Apollo and Daphne

Figure 3 Blind Girl

The author thinks that the only person who has the ability to conduct spiritual dialogue with Botticelli is Rossetti. The character images in Rossetti's works----- "Annunciation," "Maria's girlhood," etc. are melancholy and poetic. Of course, from the similarity of style, Burne Jones's "Apollo and Daphne" is almost a continuation of Botticelli's style, which also uses mythological stories as painting themes. The only difference is that in Botticelli's painting "Spring" (Figure 1), the characters are slender. And the style just born out from the medieval style. The color is though bright, strong but slightly monotonous; and in Byrne Jones's "Apollo and Daphne" (Figure 2), although the technique is a continuation from Botticelli features----the main characters and the background plants and flowers using for decoration are all meticulously painted, and their edge profile is very clear. But from the color change, Jone's work is better than Botticelli's. Then what's the reason? It stems from the influence of Impressionism to Pre-Raphaelite painters. The characters in the picture seem more real because of the dark portions of objects or the subtle color change of the environment when objects is in shadow , coupled with the cold or warm colors of mountains, which make the screen is full of light perception. It's just the impressionist submits to the classical impressionist brushstrokes. In short, the pursuit of poetic and mythological paintings is an important principle what the Pre-Raphaelite painters most follow, and the impact of Botticelli is no trivial matter, so in 19th century in England, Botticelli style be respected again.

B. Pre-Raphaelite paintings in the role of religion and morality.

The Pre-Raphaelite is a group full of illusion and has a very strong emotion of Christian. The fantasy is often their religious ideals. The fraternity, piety, kindness and other religious morality in Christian makes this illusion eventually transformed into a concern of reality. This kind of religious piety has gradually lost since the Renaissance. But in a few hundred years later, a group of betrayers full of independent, free spirit brings rebellion. For example, from the Pre-Raphaelite Millais's "Blind Girl" (Figure 3), we can see two little girls sitting together on wilderness after a summer storm. Beautiful nature and the blind girl with inner peace constitute a harmonious theme. Thick books are placed on her knees. Her little sister who leads road for her reclines in her arms to describe everything carefully, lettingher to share lights. From her closed eyes it seems that she can feel the sun shines after the rain. Conversely, if there is no piety of religion, the picture with pure soul will never be created. Most of the Pre-Raphaelite painters are like Millais, who pursues pure of the heart and devout of religion, so that makes this group jointly pursue religious spirit that lost for centuries, and forms aesthetic style with strong religious atmosphere.

REFERENCE

[1] Zhu Lihua. "sing beautifully in fans crazy, poets before Raphael Swinburne" [J]. Journal of world culture. 2011 (05)

[2] "Clique before Shi Qiao." [J]. Journal of Foreign literature. 2010 (05).

[3] Li Jianqun. "From romance to symbol and beautiful - Raphael sent before" [J]. Road art. 2008 (02)

[4] Abreu, Union, Chun. British "Dan pella painting of the Renaissance - Sent before and its ties with the United States" [J]. Journal of world art. 2000 (01)

[5] Simon Wilson, Eugene Chen. Rossetti, "Burne-jones symbolism and aestheticism painting" [J]. Journal of world art. 1986 (3)

Self-compacting concrete mixture ratio design

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***Abstract*—Self-compacting concrete is a new type of high performance concrete research and development in recent years. It has a good ability of deformation to completely rely on the weight to fill the template. It has the good cohesiveness to prevent bleeding and segregation. The mixture is uniform and compact, so it has good mechanical and durable properties after hardening. These advantages are well made up for some defects, such as ordinary concrete pouring vibrating difficulties, vibrating pollution to the environment, dense steel decoration vibrating difficulties. So at home and abroad for the design principle and method of self-compacting concrete were studied. This paper introduces the domestic and foreign 6 kind of mixture ratio design principles and methods of self-compacting concrete, analyzed and summarized. The control measures of self-compacting concrete mixture ratio design principle, configuration technology and corresponding quality was put forward.**

***IndexTerms*—Self-compacting concrete; self-compacting capability; mechanical property; mixture ratio**

I. Overview

Self-compacting concrete is a new type of high performance concrete research and development in recent years. It has a good ability of deformation to completely rely on the weight to fill the template. It has the good cohesiveness to prevent bleeding and segregation. The mixture is uniform and compact, so it has good mechanical and durable properties after hardening. Compared to ordinary concrete, self-compacting concrete has the following performance characteristics. Firstly, it can rely on the weight to fill and compact directly without additional manual vibrating in the new mixed phase. Secondly, the original defect can be avoided in the early ages. Thirdly, it has enough ability to resist the erosion of the external environment after hardening. These advantages are well made up for some defects, such as ordinary concrete pouring vibrating difficulties, vibrating pollution to the environment, dense steel decoration vibrating difficulties.

There have been many design method of self-compacting concrete mixture ratio, but self-compacting concrete mixture ratio design is still a lack of effective theoretical guidance at present. It makes wide application of self-compacting concrete by the resistance. So it is very important to study this problem from a practical sense.

II. Self-compacting concrete design method of mixture ratio

There are the following several main self-compacting concrete mixture ratio design method at home and abroad. Such as the overall calculation method, fixed volume content of aggregate method, parametric design method, modified overall calculation method, simple and easy mixture ratio design method, aggregate method of specific surface area and so on. The following 6 characteristics of mixture ratio calculation method were introduced.

(1)Fixed sand volume method: fixed sand by volume method proposed by Professor Fu village is the earliest and most widely applicable mixture ratio design method for self-compacting concrete. The method on the basis of ensuring the strength, reflects the requirements according to the working principle of design of self-compacting concrete. That volume content and sand volume content of coarse aggregate in the mortar mixing effect is the flow of the important parameters. This understanding will self-compacting concrete and other concrete distinguish from the working performance.

(2)The overall calculation method: this method is the first proposed by Professor Chen Jiankui of Wuhan University of industry, as a kind of design method of high performance concrete. Jiang Demin of the North China University of Technology, Gao Zhenlin with the overall calculation method, the high performance self-compacting concrete mixture ratio design [2]. This method is a quantitative design method. It deduces the high performance concrete per cubic meter of water and sand ratio calculation formula [3]. Direct than the overall calculation method of high performance concrete mixture ratio calculation for the calculation of self-compacting high performance concrete, as the sand ratio and paste aggregate ratio are very low, it is difficult to meet the requirements of self compacting. It is not suitable for self-compacting concrete mixture ratio calculation.

(3)Improvement of calculation method: Central South University combined with the characteristics of the fixed sand volume method, the calculation method is used to calculate the mixture ratio of the self-compacting concrete. This method is the overall calculation method with fixed sand volume method, the main features of the improved calculation is Calculation of sand is not taken the calculation formula of sand ratio in the overall calculation method any more, but the introduction of the method of calculation of fixed volume content of sand, the preservation of the calculation equation of water use in the overall calculation method. The slurry volume with the traditional water binder ratio rule together, the

concrete mix proportion parameters can be quantitatively calculated, simple formulas and steps, the clear physical meaning of formula [4].

(4)The parameter method: Tianjin University in summing up the previous research results, proposes a new mixture ratio design method for self-compacting concrete-the parameter method [5]. The parameter method uses 4 main parameters to control the quality of materials in the mixture ratio . The coarse aggregate coefficient α is used to calculate the amount of sand gravel; The Sand pushing coefficient β is used in the calculation of the amount of sand; The admixture coefficient γ and water cement ratio W/B reflects the composition of cement paste. This is according to the specific materials to determine the specific value of a parameter. From the self-compacting concrete is very sensitive of raw materials quality to control the raw materials quality of the mixture ratio . But the range of the two parameter α and β are according to the test raw materials and set the value. When the raw materials performance is not same, the two parameter α and β should be adjusted properly.

(5)The simple mix design method: this method is proposed by Professor Su nan of Taiwan national Yunlin University of science and technology. This method is novel and unique, simple and easy. Design of concrete sand ratio is large and coarse aggregate and cementitious material consumption less. This is helpful to improve the ability of liquidity and through reinforced concrete space, and cost savings. But in mixture ratio design, the fly ash on concrete compressive strength of 28 d contribution is very small, so they ignore the role that the strength of concrete is made of cement to provide all. This will generate errors, on the other hand, when the need for preparation of high strength concrete will greatly increase the amount of cement and glue the amount of cementing material, the corresponding decrease in the aggregate amount, which are detrimental to the economy and the durability of concrete. This method is only suitable for the preparation of low strength self compacting concrete.

(6)The specific surface area criterion of aggregate method: the establishment of Zhejiang University aggregate surface aggregate in raw materials on the basis of surface area calculation method and calculation model of surplus pulp, theoretical research on the raw materials under the condition of self compacting concrete mix design, and put forward the self compacting concrete aggregate surface method of mix design steps. The innovation of this method is studied on the aggregate surface area and surplus slurry volume theory, combined with the dosage, the porosity and aggregate surface area established the calculation model of self-compacting concrete surplus pulp [6]. However, the process is very complicated when the actual mix is calculated.

Above all between the raw materials, process configuration and evaluation methods of workability exist difference. There have been many self-compacting concrete mixture ratio design methods, but there is a big difference in mixture ratio after the above methods used . There was poor reproducibility when verified by test. Therefore, on the systemic and general applicability of these methods is relatively lack. We still need to deep analysis and discussion to make the design of self-compacting concrete mix design method more effective.

III. THE SELECTION OF SELF-COMPACTING CONCRETE RAW MATERIAL

(1)Cement: for self-compacting concrete, usually can be different types of cement. But high efficiency water reducing agent in terms of adaptability will be affected by the mineral composition of cement. For self-compacting concrete, more suitable for using low C3A content and low water consumption standard consistency of cement to make, whether can blend each other, between them can be used to determine the compatibility of cement and water reducer compatibility test.

(2)Fine admixture: with "active effect", "interface effect", "micro filling effect" and "water reducing effect" comprehensive effect, development direction and key technology is the application of micro concrete admixture. Fine admixture has obvious effect in reducing the yield of fresh self compacting concrete internal shear stress, improving the rheological properties of water and reducing heat effect. It can also improve the pore structure of self-compacting concrete structures and mechanical properties.

(3)Fine aggregate: low silt content, good shape and distribution, in medium sand fineness modulus is within the scope of the choosing principle of fine aggregate. Fine and coarse sand are unfavorable choose, because need more cement to sand packages, relatively reduced the surplus plasma volume. The water retention of coarse sand is poor, so it's prone to bleeding phenomenon.

(4)Coarse aggregate: pebbles, gravel are appropriate, because the pebble is good for liquidity and the gravel is good for the improvement of the strength. Reinforced with dense and thin wall structure commonly used self-compacting concrete, and thus for the coarse aggregate, the largest particle size should strictly follow the standard, minimize needle flake gravel content of coarse aggregate.

(5)Admixture: self-compacting concrete can achieve high flow gap, high stability, carrying capacity and filling. Many kinds of additives used in self-compacting concrete. Considering the composite performance of admixture, there is some requirement to admixture. Such as good compatibility, high water reducing rate, slow solidification, plastic. More than 20% water-reducing rate of superplasticizer is more suitable.More than 40% water-reducing rate of polycarboxylate series superplasticizer can provide a powerful water reducing effect is the best choice.

IV. THE BASIC POINTS OF SELF-COMPACTING CONCRETE MIXTURE RATIO DESIGN

(1)To meet the requirements of workability

The most main characteristic of self-compacting concrete is its good workability. Self-compacting concrete can depend on the weight of compacted fill is to ensure the workability of liquidity, stability, water retention and cohesion. Therefore, the design of self-compacting concrete must focus on the first consideration is the workability.

(2)To meet the requirements of strength

Fully meet the requirements of work under the premise, to achieve the required strength, through other mixture ratio with adjustments to achieve. The water cement ratio, sand ratio, fine admixture of varieties and content, additives have great influence on the development of the strength of self-compacting concrete.

(3)To meet the requirements of durability

From the existing research and engineering practice, an important defect in its impact on the durability of self-compacting concrete is characteristic of easy shrinkage cracking. Self-compacting concrete due to large amount of cementing material, low water cement ratio, sand ratio is higher, resulting in shrinkage, need to be taken corresponding control measures ， such as fiber, shrinkage reducing agent, fly ash and expansive agent.

V. CONCLUSION

Self-compacting concrete has many advantages and broad application prospect. At present although the self-compacting concrete has more experimental study and theoretical analysis, but still lack of systematic study, nor has mixture ratio design method of universal adaptability is put forward. Because of self-compacting concrete and vibrated concrete either in performance or composition have obvious difference. Therefore, we must take the characteristics of self-compacting concrete as the basis, to develop a new and effective mixture ratio design and method of performance evaluation, for self-compacting concrete is easier to master in practical application.

REFERENCES

[1] LUO Surong, ZHENG Jianlan, WANG Guojie, WANG Xuefang. Research on and application of self-compacting high performance concrete structures [J]. China civil engineering journal, 2005, 38(4): 46-52.

[2] QU Qundi, ZHOU Huaqiang, HOU Chaojiong. Discussion on mining technology with paste backfilling in mine[J]. Coal science and technology, 2004, 32(10): 67-69.

[3] SUN Wenbiao, SUN Henghu, LIU Jianzhuang. Research on proportion of paste-like backfilling material[J]. China mining magazine, 2005, 14(8): 70-71.

[4] ZHAO Caizhi, ZHOU Huaqiang, BO Jianbiao. Experimental research on fly ash total tailing paste filling[J]. Mental mine, 2006(12): 4-6.

[5] ZHOU Huaqiang, HOU Chaojiong, SUN Xikui. Solid waste paste filling for none-village-relocation coal mining[J]. Journal of china university of mining & technology, 2004,33(2): 154-158.

[6] PAN Jie. Paste-like backfilling mining technology to solve the problem[N]. China chemical industry news, 2005-12-2.

Study on Corporate Social Responsibility Investor Protection and Corporate Performance

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***Abstract*— This paper examines the impacts of corporate social responsibility and external legal environment on corporate performance by introducing CSR scores and investor protection index with a sample of listed companies in Shanghai and Shenzhen Stock Exchange from 2008 to 2012. The result shows that corporate social responsibility has no significant effect on corporate performance, investor protection has significant positive effect on corporate performance. Finally, this essay provides suggestions about how to supervise financial situation with focus and how to improve corporate performance.**

***Index Terms*— Corporate Social Responsibility; Investor Protection; Corporate Performance.**

I. Introduction

With the economic development and social progress, as an important component of China's economic development, the enterprises play an increasing prominent role in the society and resources sustainable development. Therefore, the society is calling for the enterprises to take the social responsibility. Liang Jing(2014) pointed out that lots of enterprises have proposed to take the social responsibility fulfillment as the development strategy[1]. What's more, some enterprises have taken the social responsibility as their unique competitive advantage. They held that the social responsibility will create favorable reputation for the enterprises, establish the positive image and then bring about long-term interests (Preston and O'Bannon, Simpson and Kohers)[2][3]. However, some scholars represented by the Milton held that the social responsibility fulfillment will not only create profit, but increase expenditure and cost[4]. Therefore, the social responsibility cannot be compatible with the company performance.

The present researches mainly discussed the effect of corporate social responsibility on the company performance without the literature to conduct the analysis from the perspective of corporate social responsibility and investor protection. The corporate social responsibility and investor protection reflect the relevant contents of corporate internal system and external system respectively. Whether the combined action will affect the company performance shall be further studied. At first, this paper emphasizes on the corporate social responsibility. The company with conscience usually have favorable corporate governance mechanism with higher transparency on the information disclosure, which can safeguard the legal interest of various stakeholders to gain the support of investors and promote the company performance improvement; next, the area with more complete investor protection system will have higher legal institutions level and stronger law enforcement effect to standardize the behavior of listed companies and then gain the trust of investors so as to increase the company performance eventually. This paper applied the panel data of China A Share Listed Company within five years from 2008 to 2012. There are 1174 to 1831 observation companies every year with at least 300 companies to disclose the CSR reports; we also introduced the RKS rating and the scores in *China Urban Competitiveness Report* as the main explanatory variable to explore the correlation between corporate social responsibility, investor protection and corporate performance and then provide suggestions on how to enhance the investor protection and increase corporate performance.

II. Literature Review and Research Hypothesis

A. Literature Review

(1)Corporate Social Responsibility and Corporate Performance

In the past forty years, many scholars studied the problem of the relationship between corporate social responsibility and corporate performance, but until now there is not a consistent conclusion. Markowitz (1972) established a set of evaluation system of social responsibility in 1972. On this basis, earlier studies abroad selected 14 listed companies as the research object, which is better in the field of social responsibility performance, carried on the analysis to the stock performance, the results showed that those enterprise's stock income greatly exceeds that of other enterprises. With the rise of CSR, the relevant research is also improving. Cochran and wood (1984) compares the fulfillment of American companies' social responsibility, with earnings sales rate, operating assets profit rate, asset turnover as the representative of corporate performance, and it also found that there is a positive relationship between them[6]. There are also studies find that CSR is negatively related to corporate performance, but these researches are only a little. In the study of Bragdon and Marlin in 1976, it is considered that the social responsibility means paying cost; this kind of behavior will not only increase the company's profit, but also damage the interests of shareholders, eventually leading to the decrease of corporate performance. And some scholars even believe that corporate social responsibility is not related to corporate performance.

In recent years, our country paid more attention to the problem of social responsibility, there are much more discussions between corporate social responsibility and corporate performance in our country. Li Guiyan and Wang Hongrui's (2009) study found that the fulfillment of corporate social responsibility to the customer is negatively related with corporate performance. The results of the study by Zhong Xiangdong in 2011 show that financial performance are not significantly affected by current and last period corporate social responsibility. In the study, Zhong Xiangdong (2011) used the corporate social responsibility score to measure corporate social performance, and he used the rate of return on total assets, net assets income rate and stock return rate as the representative of corporate performance.

(2)Investor Protection and Company Performance

In the existing studies about the effect of investor protection on corporate performance, there are two perspectives to reflect investor protection-- the stock structure and the legal system. Klapper and love (2002) studied the level of corporate governance in the emerging countries. The results show that in the emerging market countries, t the higher level of governance, the better performance of the corporate.

The study of the relationship between investor protection and corporate performance in China is relatively late. In the study of Wang Kemin and Chen Jingyong in 2004[9], they put the equity structure, investor protection and corporate performance into a unified framework system. The results of the study show that the settings of large shareholders can be seen as another type of investor protection. Because large shareholders can play a role of supervisor, reduce the agency cost, increase corporate performance. Lizheng, sun Yongxiang (2003) examines the effects of China's securities market legal system on investor protection and found that, the legal environment for investor protection in China is much lower than western countries [10]. The imperfect of our legal system can cause the enterprise external governance environment worse, the degree of investor protection much lower, and then cause serious agency problem, and ultimately reduce the value of the company. Wang Peng (2008) studied the 2001-2004 China's A-share listed company, using "National Regulations Database" to construct the investor protection index, and he found there is a positive correlation between the level of investor protection and corporate performance[11].

B. Research Hypothesis

According to the six aspects of shareholders, customers, creditors, suppliers, government and employees that related to corporate social responsibility, we believe that the behaviors of damaging shareholders' interests because of managers' own interests, the enterprise failing to fulfill enterprises' own promise to the creditor, paying no attention to environmental protection and sustainable development and does not make contribution to social welfare, ignoring the quality of the products, does not have harmonious relations with supplier, does not response the government's call and regardless of the employees feeling will have a negative impact on corporate performance; therefore, based on the above arguments, our first hypothesis is as follows:

H1: Corporate social responsibility is positively related to corporate performance.

Based on the introduction about investor protection in literature review, we know that most of the existing researches think the higher of the investor protection degree, the better of the corporate performance; therefore we test the following hypothesis:

H2: Investor protection is positively related to corporate performance.

III RESEARCH DESIGN

A. Model

Because of the short time of China's listed companies began to publish social responsibility report and the cycle of observations' sample is only five years (2008-2012), these may lead to biased and inconsistent of OLS estimation parameters, therefore we choose panel regression estimation method in this paper. Reference to the study of Wang Qian (2014), in order to test the above hypothesis, with the control of firm size, debt to asset ratio, quick ratio and corporate property, we estimate the following model:

$$CFP_{it} = \alpha_0 + \alpha_1 CSR_{it} + \alpha_2 Legal_{it} + \alpha_3 CSR_{it} * Legal_{it} + \alpha_4 LnAsset_{it} + \alpha_5 Lev_{it} + \alpha_6 SR_{it} + \alpha_7 State_{it} + \mu_{it} \quad (1)$$

where CFP_{it} is corporate performance, *ROE* and *Tobin's q* measures *CFP* . CSR_{it} is the CSR score according to RKS. $Legal_{it}$ is the degree of investor protection, measured by legal system. $Lnasset_{it}$ is firm size, measured by the log of the firm's total assets. Lev_{it} is debt to asset ratio, measured by total liability divided by total asset. SR_{it} is current ratio, measured by current asset divided by current liability. $State_{it}$ is corporate property that equals 1 if the firm is state-owned enterprise, and 0 otherwise.

B. Measurement of corporate social responsibility

There are a lot of ways to measure CSR, such as Reputation index method(Moskowitz, 1972), Content analysis method(Anderson and Frankel, 1980; Lanis and Richardson, 2012), KLD index method(Griffin and Mahon, 1997)and so on. In our country for the evaluation of social responsibility, there are also many ways to measure it, such as social responsibility development index provided by the Academy of Social Sciences and "the A-share listed company corporate social responsibility report rating database" provided by Run Ling commonweal career counseling. The latter is a comprehensive evaluation of the social responsibility of all listing Corporation disclosed, but the former contains only social responsibility score of 100 state-owned enterprises, private 100 strong and foreign companies. So this paper uses the latter method to measure the information disclosure of CSR. The score take the corporate social responsibility

fulfillment and disclosure reflected in the corporate social responsibility report as the basis, including four indicators such as integrity, content, technology and industry, and set up primary and secondary indexes for comprehensive evaluation. This paper use the total score results in the evaluation system to measure the corporate social responsibility fulfillment of the listing Corporation.

C. The measurement of investor protection

We want to measure investor protection from the perspective of external legal environment. Most of the existing studies about this topic used the indexes of development of market intermediaries and legal environment, Fan Gang's NERI Index of Marketization of China's Provinces Report. While in reality, even in the same province, different cities' legal environment are quite different, what's more, the above index only involve 31 provinces, which does not include cities, therefore, considering the index's detailed degree and data availability, we will use the index in Ni Pengfei's Annual Report on China's Urban Competitiveness. The report includes 51 main cities' index in our country, measuring investor protection from two aspects of the corporate system power and laws and regulations of the city, the higher of the score the better of the city's investor protection system. Corporate system power refers to the clarity of corporate right system and the protection degree of intellectual property, local laws and regulations include how strongly the rule of law, the sustainable level of Laws and policies and the understanding of citizens to legal institution. Due to the annual disclosure of the index system is not completely consistent, in 2008 and 2011 we use the average value of the sum of Z2 enterprise identity competitiveness(Z2.7 enterprise system power) and Z7 innovation environment competitiveness(Z7.5 incentive system—intellectual property protection) as the index. In 2009 we use the average value of the sum of Z2.7 corporate system power(property right clarity) and Z7.5 incentive system(intellectual property protection). In 2010 we use the average value of the sum of Z9.1 property protection system index and Z9.5 legal soundness index. In 2012 we use the average value of the sum of the appropriate business city competitiveness index and cultural city competitiveness index. In these segments, the stronger the power of corporate, the more clearly the property rights, the higher the protection degree, shows that the better the legal environment of the city.

D. The Measurement of Corporate Performance.

In evaluating the corporate performance, we should not only consider the accounting indicators, but also reference the market indicators. The accounting indicators that reflect the corporate performance include: ROA 、 ROE 、 Operating Profit Ratio 、 Earning Per Share(EPS), etc. But taking into the comprehensiveness、objectivity and availability of the indicators, most scholars believe ROE is more appropriate. So this paper chooses ROE as the accounting indicator of corporate performance. ROE is the net profit divided by the average net assets. The index directly reflects listed companies' profitability level. The higher value of ROE shows that the corporate obtains more benefits from the investment.

In the aspect of market index, common used index is Tobin's Q, which represents the ratio of market value divided by reinstatement value of corporate. Because of reinstatement value is difficult to obtain, we can use the year-end total assets to instead of the reinstatement value. The formula is as follows:

Tobin's Q=(Year-end circulation market value +The amount of non tradable shares in net assets +Long-term liabilities +Current Liabilities)/Year-end total assets.

The index is used to measure relative value of the corporate, the higher of the index shows that the investors have more intense willingness to invest in the business.

In researching the relationship between the corporate social responsibility, investor protection and corporate performance, we will use corporate size, debt to asset ratio and corporate property as control variables. In addition, referencing Wang Choi and Li's (2008) study about the above problems, Slack Resource is also be used as a control variable[12]. The formula is: Current assets/Current liabilities.

IV. EMPIRICAL ANALYSIS

A. Data Processing

(1)Study Period and Data

We selected the listed companies in Shanghai and Shenzhen Stock Exchange from 2008 to 2012 as a sample. The data sources of this paper are as following: ROE and Tobin's Q value which measure the corporate performance are from CSMAR; CSR scores are from the RKS; other corporate financial data and control variables are all taken from CSMAR financial index analysis database and CCER database; the data of investor protection are taken from "China Urban Competitiveness Report" from 2008-2012.

(2)Sample Selection

First, we select the corporate listed in Shenzhen and Shanghai Stock Exchange from 2008-2012 in CSMAR database as the research sample, and screen according to the following criteria: considering financial companies' specificity of the accounting system and business characteristics, we will delete these corporate; excluding those companies which financial data is discontinuous for the three years; deleting the corporate which financial data is absent or belongs to PT and ST; deleting those companies that headquarters are not in the cities of *China's competitiveness report*; using Winsorize to shrink tail of 1% extreme data, finally, the sample of this paper was 1174 in year 2008, 1285 in year 2009, 1337 in year 2010, 1501 in year 2011, 1831 in year 2012, and 7128 in total.

B. Empirical Results

(1)Descriptive Statistics

From table 1 we can find that the mean of CSR score is 34.362, which means that the level of listed

corporate social responsibility performance in our country is low. The mean of investor protection is 0.716 (out of 1), which means that the legal environment of the corporate headquarters is relatively perfect; The mean of ROE is 0.064, indicating that the profitability of sample enterprise is in moderate level, the difference between the maximum and minimum is very big, that means the profitability of the sample enterprise varies greatly; the mean of Tobin's Q is 1.887; about control variables, the mean of BM are less than 1, indicating that the corporate has a certain degree of growth; the mean of Lev was 0.476, which shows that China's listed companies average debt rate is on the high side ; the mean of ROA is 0.043, indicating that the overall profitability of the sample enterprises are not very high; non state-owned enterprise accounting for 43 percent, indicating that state-owned enterprise in the sample are a little more; the mean of SR is 7.692, it means that the debt paying ability of the corporate assets is relatively strong.

Table1 Descriptive Statistics of Variables

Variable	N	Mean	SD	Max	Min
ROE	5265	0.064	0.508	3.410	-34.326
Tobin's q	5265	1.887	1.191	15.113	0.616
CSR	5265	34.362	11.849	82.438	13.330
Legal	5265	0.716	0.135	0.944	0.340
Lnasset	5265	22.085	1.232	27.852	19.021
BM	5265	0.707	0.303	2.703	0.000
Lev	5265	0.476	0.199	1.151	0.000
ROA	5265	0.043	0.052	0.340	-0.558
State	5265	0.430	0.495	1.000	0.000
SR	5265	7.692	195.686	12223.450	-143.000

C. The Regression Results

Considering our data belongs to typical large N small T type, the results of using OLS method may have deviation, while compared with the simple cross section data and time series data, panel data has the advantage of using larger scale data to analysis, therefore, we think panel model is more suitable.

Table 2 The Result of OLS、Fixed Effect and Random Effect

Dependent Variable	Independent Variable	Wald F Test	Breush-Pagan LM Test	Hausman Test
ROE	*CSR&Legal*	2.26 (0.000)	98.02 (0.000)	29.65 (0.000)
Tobin's q	*CSR&Legal*	5.24 (0.000)	339.44 (0.000)	5.93 (0.655)

Table 2 shows that for model (1), the panel data model is better than OLS model, in model 3.1 when the dependent variable is Tobin's Q we choose random effects model, in other conditions, fixed effect models are better than random effect models.

Table 3 shows that although CSR is negatively correlated with ROE and Tobin's Q, the result is not significant, indicating that CSR has no effect on corporate performance. In this paper, legal system and ROE is positive correlated at 5% level of significance, but legal system is not related with Tobin's Q. This conclusion is different from Huang Xianbing (2012) [13], in whose study investor protection and Tobin's Q is positive correlation. We think the reason is Huang Xianbing used multiple linear regression method and the study period only from 2008-2010, that is relatively short. Therefore, both in the research methods and cycle, this paper have more advantages. The interaction of CSR and investor protection is not related to ROE and is negative related to Tobin's Q. We think in the area where investor protection degree is higher, the local legal system will be more strict, the corporate management are more likely to cover up the real using of spending by implementing CSR activities, however once the above behavior is being disclosure, it will make investors lose the trust of the corporate, and eventually reduce the corporate performance. When we consider the impact of both CSR and investor protection on corporate performance at the same time, CSR is positively correlated with ROE and Tobin's Q, but the results are not significant, indicating that CSR has no effect on corporate performance. Legal system is positive related with ROE and Tobin's Q at the significance level of 5% and 1%, indicating that in the area which the legal system is more perfect, the degree of investor protection is much higher, the local corporate performance is better, partial support for hypothesis 1. The relationship between the interaction and the corporate performance is not significant. We found that CSR cannot improve corporate performance as some scholars said, but investor protection can really promote the corporate performance. We can explain it in this way. There is a certain period of time for corporate to obtain feedback of fulfilling their social responsibility, it cannot reflect in the financial indicators in the short term. About control variables, the corporate size and ROE are significant positive correlated at the significance level of 1%, and the corporate size and Tobin's Q are significant negative correlated at the significance level of 1%, indicating that the larger the size of the corporate, the stronger the profitability of the corporate, the weaker of the willing that investors want to invest in it; Lev are significantly negative related with ROE and Tobin's Q. The corporate property is positively related with Tobin's Q at the significance level of 1%. It means the stronger of the willing for the investors to invest in the state-owned enterprise, the higher of the relative value of state-owned enterprise

Table 3 The Relationship between CSR、Investor Protection and Financial Performance(1)

Independent Variable	Dependent Variable			
	ROE			
CSR	-0.005 (-0.81)			0.0002 (0.03)
Legal		0.007** (2.46)		0.012** (2.14)
*CSR*Legal*			0.002 (0.40)	0.002 (0.39)
Lnasset	0.050*** (3.06)	0.022*** (2.70)	0.067*** (4.26)	-0.279*** (-4.22)
Lev	-0.177*** (-2.78)	-0.232*** (-1.44)	-0.228*** (-2.61)	-0.297 (-0.95)
SR	0.000 (1.87)	0.000 (0.59)	0.000* (1.8 7)	0.000 (1.50)
State	-0.017 (-1.31)	0.028** (2.27)	-0.023 (-1.58)	-0.021 (-1.40)
Cons	-0.841***	-0.325**	-1.311***	-1.244***

	(-2.62)	(-2.54)	(-3.81)	(-3.07)
R^2	0.021	0.005	0.044	0.052
F-statistic	3.81 [0.002]	3.45 [0.005]	5.01 [0.000]	4.60 [0.000]

* represent the level of significance at 10%， ** represent the level of significance at 5%， *** represent the level of significance at 1%；The parentheses are t value and the square brackets are P value.

Table4 The Relationship between CSR、 Investor Protection and Financial Performance(2)

Independent Variable	Dependent Variable *Tobin's q*			
CSR	-0.011 (-0.29)			0.037 (1.22)
Legal		0.202 (9.93)		0.137*** (4.78)
*CSR*Legal*			-0.068*** (-3.28)	-0.073 (-3.77)
Lnasset	0.050*** (3.06)	-0.304*** (-6.31)	-0.267*** (-6.16)	-0.301*** (-6.91)
Lev	-0.177*** (-2.78)	-0.222 (-0.99)	-1.330*** (-5.34)	-1.243*** (-5.01)
SR	0.000*** (4.64)	0.000 (-1.47)	0.001 (0.50)	0.000 (0.67)
State	0.097 (1.11)	-0.176 (1.12)	0.334*** (2.91)	0.342*** (2.96)
Cons	8.265*** (5.63)	8.640*** (8.39)	8.503*** (8.31)	9.224*** (9.01)
R^2	0.018	0.061	0.022	0.044
F-statistic	10.88 [0.002]	28.20 [0.000]	73.63 [0.000]	92.96 [0.000]

* represent the level of significance at 10%， ** represent the level of significance at 5%， *** represent the level of significance at 1%；The parentheses are t value and the square brackets are P value.

In summary, to strengthen investor protection and improve financial performance, we make suggestions for the following two aspects: Firstly, most of the studies have shown that both the stability of a country's capital market and the development of economy will be affected by the legal system, although the related content about the investor legal protection is establishing gradually in our country, the overall level is still lower than that in Western countries. Therefore, China should develop and improve the relevant laws and regulations related to investor protection as soon as possible, to improve corporate performance through enhancing investor protection and reducing agency costs; second, enterprises should coordinate with the external environment actively and adapt to it, and develop an appropriate strategy to exert the positive effects of corporate social responsibility and investor protection at the same time as far as possible.

V. CONCLUSION

Fulfilling social responsibility is a trend of corporate achieving internal competitiveness under the sustainable development background, enhancing the protection to investor is also the result of countries paying more attention to the external environment and should be perfect link, then better fulfilling corporate social responsibility, whether strengthening the protection to investor is helpful to the promotion of corporate performance, ensuring the transparency of corporate information are issues that civil, investors and Regulatory officer are more concerned about. This paper examines the relationship between corporate social responsibility, investor protection and corporate performance, founding that fulfilling social responsibility has no effect on company performance and investor protection has a role in promoting the company's performance. In addition, we also found that the larger scale and the lower debt ratio of state-owned enterprises, the operating performance is better.

This study also exists the following disadvantages: First, for the measure of the variable of CSR, we have adopted the rating of Yun Ling agency. But the rating has some subjectivity. Moreover, since the availability of Yun Ling data under current stage, the period this paper studying is only five years from year 2008 to 2012 and there may exists some limitations. Second, the paper emphatically examines the indicator of the degree of investor protection from the perspective of the legal system, but ownership structure also may be one of the factors which could reflect the investor protection.

REFERENCES

[1] Liang Jing. Corporate Social Responsibility Will Change The Efficient Frontier of Information Disclosure[N]. China Securities Journal，2014.

[2] Preston，Lee E，and O'Bannon，Douglas P. The Corporate Social－Financial Performance Relationship：A Typology and Analysis[J]. Business and Society，1997，Vol. 36(4)，419－429.

[3] Simpson G W.，Kohers T. The link between corporate social and financial Performance：evidence from the banking industry[J]. Journal of Business Ethics，2002，97－110.

[4] Milton Friedman. Social Responsibility of Business Is to Increase Its Profit. The New York Times Magazine，1970.

[5] CoChran，Wood. Corporate Social Responsibility and Financial Performance[J]. Academy of Management Journal，1984，42－56.

[6] Bragdon J. H.，Marlin J. Is pollution profitable[J]. Risk Management，1972，9－18.

[7] Li Guiyan，Wang Hongrui. The Study of The Relation Between Corporate Social Responsibility and Corporate Performance [J]. Industrial and Science Tribune，2009，(8)：27－30.

[8] Klapper，L.，and I. Love，Corporate Governance. Investor protection and Performance in Emerging Markets[J]. World Bank Policy Research，Working Paper，2002.

[9] Wang Kemin，Chen Jingyong. Ownership Structure, Investor Protection and Corporate Performance [J]. Management World，2004，(7)：127－133.

[10] Li Zheng，Sun Yongxiang. The Relationship Between Law and Corporate Governance and Its Influence on China [J]. Journal of ShaoXing University，2003，(1)：78－83

[11] Wang Peng. Investor Protection, Agency Costs and Corporate Performance [J]. Economic Research Journal，2008，(2)：68－82.

[12] Wang，H.，Choi，J. & Li，J. Too Little or Too Much? Untangling the Relationship between Corporate Philanthropy and Firm Financial Performance[J]. Organization Science，2008，19(1)，143－59.

[13] Huang Xianbing. Study of The Effect of Investor Protection on Corporate Performance [D]. Southwest University of Finance and Economics Master Thesis，2012.

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A Hollow Slab Simply Supported Beam Bridge Load Test Analysis

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***Abstract*— As China's economic development, transport plays an important role. In the domestic the original design of part of the bridges do not meet the existing usage in the development of traffic . Overloading make bridge load more heavy, making the bridges appear disease in service, and severely affecting the structural security. Load test of the bridge can effectively determine the health of bridges to ensure the safe use of the bridge structure. this paper uses MIDAS to make theoretical modeling and analysis a simply supported hollow slab bridge, and detect the static load test and dynamic load test. theoretical calculations and load tests evaluate the health of the bridge, and provide a reliable test data for the normal operation of the bridge.**

***Index Terms*— Hollow plate, simply supported beam bridge, Load Test.**

I. Introduction

As we focus on the bridge safe, the occurrence of accidents can been effectively prevented. Using state of the bridge and road traffic safety have a great significance for the protection of the smooth flow, but because of the long-term effect of the load, the natural aging structure, the adverse impact on the environment and the lack of maintenance and repair, bridge during use will inevitably occurs damage .When the bridge appeared disease, people should take effective measures to deal with it. Taking a bridge appeared diseases as the research object, load test can been designed for the bridge in case hinge joints possibly destroyed completely, combining theoretical calculations and field survey to assess the structural safety of the bridge, and propose effective conservation recommendations to ensure that the bridge structure security operations.

II. Engineering situation

A. Bridge overview

The bridge superstructure uses 1 × 10m of reinforced concrete hollow skew, the skew angle 20 °. We used a total of 12 single bridge hollow slab bridge wide 12.5m, designed for one-way three-lane driveway. Hollow plate with 30 reinforced concrete. Hollow beam height 52cm, bottom side plate width 0.99m, flange plate width 0.25m, the floor plate width 0.99m, abutments using gravity abutment. The bridge was built in 2004 opening. Design load for the car - Super 20, trailer -120, the actual operating load for the city -A level.

FIGURE 1. Bridge elevation

B. Status bridge

Lateral connecting bridge hollow plate is used in the form of a small hinge joints. 8 selected # ~ 9 # plate, at mid-span position between 2 # ~ 3 # plate Fissure slotting verified. From the actual situation, the two hinge joints have a diameter of 10mm, spacing of 20cm of embedded steel, 8 # to 9 # plate hinge slit width 8.9cm, Room 2 # 3 # plate hinge slit width 9.0cm , which are small hinge form, which is consistent with the design drawings.

The inspection found that the presence of a plurality of longitudinal bridge deck through the cracks between 2 # 9 # plate - plate hinge joints position the most obvious; hollow exist between many Fissure off and seepage hinge sutural efflorescence serious, leading to the bridge positive below the long muddy road; when overweight vehicles crossing the bridge, under the hollow torsion margin, beam abnormal vibration occurs, and between 2 # 9 # plate - plate hinge joints have a vertical position of the bridge deck through the cracks this phenomenon is relatively Cinema.

FIGURE 2. The destruction of hinge seam

When the 2012 testing, found between the 2 # 3 # plate hinge joints badly damaged, almost completely embedded steel hinge seam defects, Hinge joints has expired, the late addition of maintenance Pavement

diameter of 10mm 10cm × 10cm steel mesh , and the hinge joints concrete restoration, but for embedded steel hinge joints to recover.

The bridge Fissure detected more serious damage, but not a complete failure, if the further development of disease, hinge joints will fail, the cause hollow board by force, will significantly increase the internal forces monolithic slab, causing the upper structure damage, along with cracked deck, dislocation.

III. LOADING ARRANGEMENT AND LOAD TEST

A. Theoretical calculation

MIDAS use finite element analysis software, will be divided into 12 bridge lateral hollow, vertical partitions of 1m grid, the entire model beam element 120, node 132, a finite element model. For 2 #, 3 # hollow twist seriously damaged joints, partial load conditions to select 2 # 3 # the most unfavorable state board test. Calculated to obtain partial load conditions change # 2, # 3 load efficiency panels.

TABLE I.
PARTIAL LOAD CONDITIONS NO.2 PLATE, PLATE LOAD 3 #

Control liang No.	Control moment(kN.m)	Test moment(kN.m)	Load efficiency
2#	246.9	236.6	0.96
3#	216.5	210.7	0.97

Calculation of the bridge eigenvalues calculation results as shown, through finite element analysis, the Simply Supported Hollow Slab first order frequency: f1 = 10.22Hz.

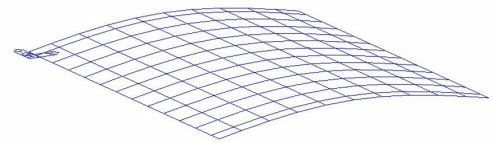

FIGURE 3. The first order of formation

B. Measuring points

Identification of bridge bearing capacity in order to meet the requirements of reliability, choice can reflect the most unfavorable stress state and the most unfavorable force sectional bridge structure. According to the bridge structure and bridge internal force calculations, select the middle section of the bridge load test section. Static load test mainly includes control sectional strain and deflection, dynamic load test control section of the main contents including dynamic strain and bridge vibration frequency. Static load test were arranged a total of five F1 ~ F5 deflection measurement points, each corresponding to the bottom position hollow webs arranged a strain gauge. Static load test for measuring points shown in Figure 4.

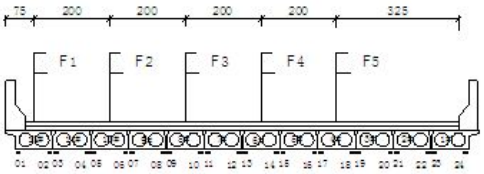

FIGURE 4 Static load test measuring point layout

C. Vehicle parameters

The test load using the 3-axis drive grading loaded. Located in the most unfavorable loading car parts forces influence line, according to the elastic structure of the measuring point is computed in theory at different load levels of computing strain (or displacement) in order to load the testing process analysis and control.

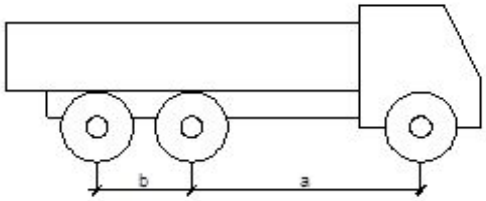

FIGURE 5 Vehicles loaded schematic

TABLE II.
LOAD VEHICLE PARAMETER TABLE

Vehicle ID	Tread a(m)	Tread b(m)	Lateral tread (m)	Front axle load(t)	Rear axle load(t)	Total load (t)
1#	3.20	1.40	1.80	7.22	29.22	36.44
2#	3.20	1.40	1.80	7.06	29.08	36.14
3#	3.20	1.40	1.80	7.08	29.22	36.30

D. Static load test

By measuring the bridge structure in the static load test of the control section under stress and structural deformation of the bridge structure to determine the actual working conditions with the calculated values are quite different. When the static loading interface across the lower edge of each strain transverse to the beam profile shown in Figure 6.

TABLE III.
TEST LOAD TESTING AND CALIBRATION COEFFICIENTS STRAIN J1-SECTION

Beam No.	Measuring point	Actual value (με)	Residual value (με)	Elastic value (με)		Theoretical value (με)	Relative residual	Calibration coefficients
		①	②	③=①-②	Average value③	④	②/①(%)	③/④
12#	1	152	10	142	143	198	6.58	0.72
	2	150	6	144			4.00	0.73
11#	3	141	12	129	128	174	8.51	0.74

	4	139	13	126			9.35	0.72
10#	5	165	10	155	155	170	6.06	0.91
	6	162	8	154			4.94	0.91
9#	7	157	13	144	139	164	8.28	0.88
	8	146	12	134			8.22	0.82
8#	9	132	13	119	120	148	9.85	0.80
	10	133	12	121			9.02	0.82
7#	11	118	10	108	106	126	8.47	0.86
	12	115	12	103			10.43	0.82
6#	13	95	10	85	83	100	10.53	0.85
	14	89	8	81			8.99	0.81
5#	15	65	6	59	60	74	9.23	0.80
	16	66	6	60			9.09	0.81
4#	17	38	4	34	35	55	10.53	0.62
	18	37	2	35			5.41	0.64
3#	19	30	2	28	27	43	6.67	0.65
	20	28	2	26			7.14	0.60
2#	21	21	1	20	21	35	4.76	0.57
	22	22	1	21			4.55	0.60
1#	23	21	1	20	20	35	4.76	0.57
	24	21	2	19			9.52	0.54

TABLE IV.
TEST LOAD TESTING AND CALIBRATION COEFFICIENTS SECTIONAL DEFLECTION

Point	Total Under deflection (mm)	Remnant value (mm)	Elastic value (mm)	Theoretical value (mm)	Relative residual	Calibration coefficients
F1	6.32	0.32	6.00	7.99	5.06	0.75
F2	7.98	1.10	6.88	6.84	13.78	1.01
F3	7.26	1.20	6.06	5.97	16.53	1.02
F4	2.69	0.26	2.43	4.05	9.67	0.60
F5	1.65	0.18	1.47	2.21	10.91	0.66

Under the test load, the bridge test sectional strain calibration coefficients from 0.54 to 0.91, the measured stress values are less than the theoretical value, 3 # to 8 # hollow-point load efficiency strain between 0.80 to 0.91, and the other plate significantly larger than the first, after the uninstall is complete, the test section max relative residual 10.53%. Test results show that the strength of the test bridge span structure to meet the design load requirements, but the poor performance of the overall bridge.Comparison of the data calculated based on the measured deflection data and theoretical model to calculate calibration coefficients for each deflection measuring point. Static load deflection when each measurement point in Table 3.

Under the test load, bridge deflection test calibration coefficient sectional 0.66 ~ 1.02, F2, F3 deflection calibration coefficient measuring point in the range of 1.01 to 1.02, two-point calibration coefficients are already more than 1.0, the uninstall is complete, the maximum relative residual deformation test sectional 16.53%. Test results show that the test bridge across poor work performance, test the bridge span structural rigidity does not meet the design load requirements.

E. Dynamic load test

Dynamic load test is aimed at the dynamic performance of the bridge structure, which is an important indicator to judge the performance of the bridge operating conditions and carrying capacity. Dynamic signal measurement and analysis system to collect power bridge structures under fluctuating state response. Dynamic characteristics of bridge inspection, including natural frequency, damping ratio; bridge test sectional dynamic response testing, including dynamic strain, acceleration, shock effect.

Dynamic characteristics of the test results of the bridge shown in Fig.7

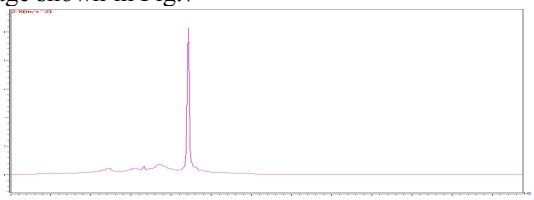

FIGURE 6 Pulsating test sectional acceleration signal FFT analysis

Measured test bridge spans a vertical natural frequency of order 10.510Hz, theoretical natural frequency of 10.221Hz, the measured value is greater than the theoretical value, the ratio of 1.028, indicating that the test rate is greater than the actual bridge structure theory stiffness.

Car test using a #-loaded centering uniform excitation of the structure by a bridge, car speed of 20km/h~50km/h, car deck were accessibility test. Brake test using a #-loaded centering constant speed (40km/h), the test-section emergency brake. Car and brake in response to the measured results are shown in Table 5 test power.

TABLE V. MOVING VEHICLES AND VEHICLE BRAKE TEST DYNAMIC RESPONSE TEST RESULTS

Speed per hour	20km/h	30km/h	40km/h	50km/h	40km/h
Vertical acceleration $a_{p\text{-}p}(m/s^2)$	0.073	0.099	0.109	0.124	0.068

Maximum dynamic strain (με)	86	76	85	88	82

Note: The table is dynamic strain dynamic strain time history of the maximum.

20km/h, 30km/h, 40km/h, 50km/h cycling test car, 40km/h brake test, the test actually measured vibration acceleration sectional 0.068m/s2~0.124 m/s^2, the measured vibration acceleration test is small cross section. Found strain increases coefficient between 1.102 ~ 1.381, knock-on effects test section increases with increasing vehicle speed, dynamic incremental obviously, greater impact. Loaded emergency brake in the test section dynamic strain and vibration acceleration test section in response to normal, vertical vibration of the rear brake bridge energy consumption slow, slower vibration stabilized.

To sum up: the bridge measured vertical natural frequency is greater than the theoretical value, the actual rate is greater than the theoretical bridge stiffness, vehicle load impact effect and specification recommends a value close to the bridge, we found a large dynamic strain amplitude. Bridge structure dynamic performance test normal, basically meet the requirements of Bridges.

IV. In conclusion

According to the theoretical analysis and field investigations, load test results, a comprehensive assessment of the bridge the following conclusions:

1.The theoretical analysis taking into account the stress state of the bridge board, the current carrying capacity of the main structure of the bridge does not meet the "city -A class" load rating requirements;

2.The site inspection survey of the bridge, the bridge condition rating of D overall technology level to be defective state, should be carried out immediately in the repair or overhaul works;

3.Load testing Assessment bridge safety rating of "unqualified rating": bridge structural member damage, which affects bridge safety, recommended the immediate overhaul of the right pieces of the bridge, on the left pieces of bridge Reinforcement for durability.

V. Proposal

According bridge maintenance technical regulations, combined with bridge detection and evaluation of the results, it is recommended immediate overhaul of the bridge, and the maintenance and repair of the recommendations put forward the following:

1.For the hollow hinge joints damage this disease, it is recommended to take measures to deal with immediate reinforcement. Fissure position in bold encryption deck reinforced concrete deck suitable thickening layer was dry hard epoxy mortar or epoxy mortar remastered micro-expansion joints;

2.For the hollow floor, cracks appeared abutment crack width is greater than or equal to crack 0.15 ㎜ take pressure grouting to repair the crack width of cracks less than 0.15 ㎜ take open "U" groove surface-blocking treatment, and periodically observer status crack developments;

3. For bridge deck pavement pothole appeared, subsidence, cracks serious regional chiseled original asphalt concrete pavement, re-laid steel mesh, encryption bold steel deck shop using waterproof concrete C40;

4. In view of the location of the bridge traffic Jiaotong University, overweight more vehicles, the proposed bridge to set a clear identification signs, strengthen the management and guidance of social vehicles to prevent overweight vehicles on the bridge damage;

5. Recommends strict accordance with the "City Bridge Maintenance Technical Specifications" (CJJ 99-2003) the relevant provisions do routine inspection and maintenance of the bridge.

References

[1] JTG D62-2004 "reinforced concrete and prestressed concrete highway bridges and culverts" [S].

[2] JTG D60-2004 "General Specification for Highway Bridge Design" [S].

[3] Gao Jun, Xu Changcheng,a continuous beam bridge piers and strengthening deviation Treatment [J]. *road traffic technology*, 2012, (6): 80-83.

[4] He Hai, deviation of a continuous curved girder bridge Causes and Treatment [J].*Urban Roads Bridges & Flood Control*, 2008, (9): 68-70.

[5] Ke Daichuan.a Pier Foundation Drift stress analysis and correction Construction research [J].*bridge science and technology*, 2014, (22): 188-189.

[6] Sun Wenlong, TESTING AND pier deviation Cause Analysis and Treatment recommendations of a bridge [J].*Northern Jiaotong*, 2013, (7): 39-41.

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Research of Enhanced Oil Recovery Application

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***Abstract*—Today the oil market is experiencing high production demand from mature oil fields in a possibly near-future carbonconstrained world. This demand will result in numerous new anthropogenic CO2 sources near oil fields currently producing under primary production. Many of the new areas for CO2 EOR application will lie where sandstone reservoirs dominate, with their higher-quality petrophysical characteristics. A review of today's and previous experiences in the Gulf Coast could help when new floods are designed and implemented in pioneer areas. To characterize Gulf Coast sandstone CO2 EOR experience, information from both full floods and pilots was assembled. Published and publicly available data were used in the study, emphasizing geologic setting of the reservoir, flooding methods, slug size, CO2 utilization, and other measures that indicate flood results. O2 EOR is applied in reservoirs deposited as barrier/strandplain, submarine-fan, and fluvial/deltaic sandstones. Solvent gases are predominantly combinations of CO2, N2, and CH4, and are applied as WAG, gravity-stable, continuous injection, and huff n' puff flooding methods. Tools such as pulsed neutron and pressure and sponge cores measure pre-EOR residual oil saturations to be between 0.2 and 0.38, averaging 0.25. Expected recovery efficiency for all flood types range from 17 to 23% of OOIP, with permeable Gulf Coast floods typically displaying 5 to 6 months' breakthrough timing. Applying recovery characteristics from the projects summarized and applying CO2 screening criteria resulted in delineation of an oilresource target of 4.7 BSTB of miscible floodable oil along the Gulf Coast.**

***Index Terms*— CO2 EOR, Oil Recovery, Residual Oil Saturation, Reserve Growth Potential**

I. Introduction

The Permian Basin in West Texas has recently become the global epicenter of CO_2 EOR because of a supply of natural CO_2 piped in from Colorado and New Mexico. Another area in the region that contains prolific oil deposits is the Gulf Coast, which historically has not had a natural CO_2 source for EOR. However, several pilots and small projects have occurred along the upper Texas Gulf Coast and along the Louisiana coast (Fig. 1), and a natural-sourced CO_2 pipeline has resulted in sizable floods. Published information on these EOR pilots is summarized herein to aid in future engineering design as both natural and anthropogenic CO_2 becomes available.

II. Reservoirs Characteristics

Geologically, Gulf Coast reservoirs are characterized by Miocene sandstone in submarine-fan, barrier/strandplain, and fluvial/deltaic depositional environments. Little Creek is an exception because it is part of the lower Tuscaloosa. The reservoirs are structurally complex, traps being associated with deep-seated salt domes, piercement salt domes, and growth faulting. These associations result in the possibility of fault-bounded compartments with steeply dipping bedding within a reservoir. Reported dip angles for CO_2 EOR pilots range from 4° to 36° (Table 1). Because reservoirs typically experience natural water-drive mechanism, primary production results in residual oil saturation. All reservoirs tested are fairly deep, ranging from 7,400 to 12,800 ft in depth. Because of the depositional character of sandstones typical of the Gulf Coast, reservoir net pay thickness is thin, ranging from 15 to 67 ft and averaging 33 ft.

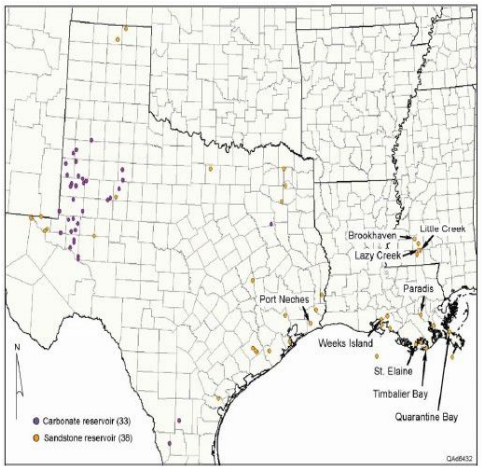

Figure 1: Sandstone gas displacement recovery pilots and floods implemented along the upper Gulf Coast and Louisiana.

Oil characteristics of the reservoirs tested are those of a light crude. Oil API gravity ranges from 32 to 39 and averages 36 at initial reservoir temperatures ranging from 164° to 248° F and pressures ranging from 2,700 to 6,013 psi (Table 2). All but Port Neches field report minimum miscibility pressures less than initial reservoir pressure.

TABLE I.
Reservoir Characteristics Of Gulf Coast CO2 EOR Pilot Projects

Field	Pay zone	Trap type	Reservoir average dip (degrees)	Drive type	Depth (ft)	Net pay (ft)
Bay St. Elaine	Miocene E Sand	Deep-seated salt dome	38	WD	8,000	35
Port Neches	Marginulina	Piercement salt dome		Weak WD	5,900	30.0
Little Creek	Lw. Tuscaloosa				10,750	25.0
Quarantine Bay	Miocene	Deep-seated salt dome	4	WD	8,180	15
Timbalier Bay	Miocene		7 to 14	WD	7,400	67
Weeks Island	Miocene S Sand	Piercement salt dome	26	WD	12,800	21
Paradis	Miocene		7		9,600	38

TABLE II.
Oil Characteristics Of Gulf Coast CO2 EOR Pilot Projects

Field	Initial reservoir pressure (psi)	Temp. (F)	Oil API gravity	GOR	Oil viscosity (cp)	Boi	Minimum miscibility pressure (psi)
Bay St. Elaine	3,334	164	36	584		1.28	2,065
Port Neches	2,700	165	35	11	0.97	1.05	3,310
Little Creek Quarantine	4,840	248	39	555	0.40	1.32	3,452
Bay		183	32	435	0.94	1.23	2,713
Timbalier Bay	3,497	180	39	722	0.39	1.392	2,136
Weeks Island	6,013	225	33		0.6	1.62	3,528
Paradis		192	39				4,000

III. Gulf Coast Residual Oil Saturation

The basic target for EOR in Gulf Coast reservoirs is the residual oil saturation left behind by capillary forces after water invasion or waterflooding. Most Gulf Coast sandstone reservoirs have natural water drive, either as bottom-water or edge-water drive. Because of this natural water drive, EOR can be the next stage of production after primary.

An example of average residual oil saturation is found in Holtz and McRae (1995). This report shows that for Frio fluvial-deltaic sandstone reservoirs, residual oil saturation ranges from 0.1 to 0.6, with a median value of 0.26 (Fig. 2). These values are similar to those reported for upper Gulf Coast and Louisiana reservoirs. Seven reservoirs with pilot tests report average residual oil saturation of from 0.20 to 0.38 in highly porous sandstones (Table 3). This range of residual oil saturation demonstrates that there is a sizable target of oil for EOR.

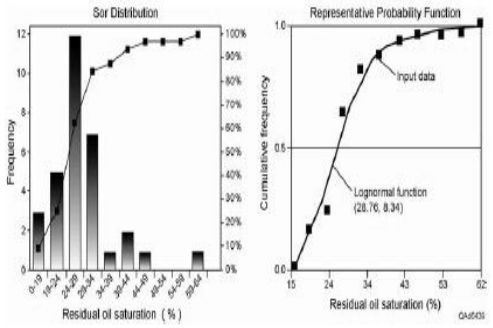

Figure 2. Distribution of average reservoir residual oil saturation in Frio fluvial-deltaic reservoirs ranging form 0. 1 to 0.6, with a median of 0.26.

Table III.
Residual Oil Saturation Of Gulf Coast Sandstone Reservoirs

Company	Reservoir	Porosity (fraction)	Residual saturation (fraction)
Texaco	Paradis	0.329	0.20
Gulf/Chevron	Quarantine Bay	0.264	0.38
Chevron	Timbalier Bay	0.3	0.29
Shell	Weeks Island S Sand	0.26	0.22
Denbury	Little Creek	0.23	0.21
Texaco	Paradis	0.27	0.20
Texaco	Port Neches	0.3	0.30

Another example of residual oil saturation values was presented by Perry , who described the Weeks Island CO_2 pilot. In this pilot, oil saturation measurements were taken in the well vertical profile pre- and post-CO_2 injection. Pre- CO_2 injection oil saturation represented residual saturation to water influx. Measurements showed a minimum residual oil saturation of 0.154, a maximum of 0.376, and an average of 0.221. This variation occurred throughout the vertical profile(Fig 3). Post-CO_2 injection measurements showed a minimum residual oil saturation of 0.0, a maximum of 0.073, and an average of 0.022. These measurements indicate that an average of 0.2 oil saturation should be a target for CO_2 EOR.

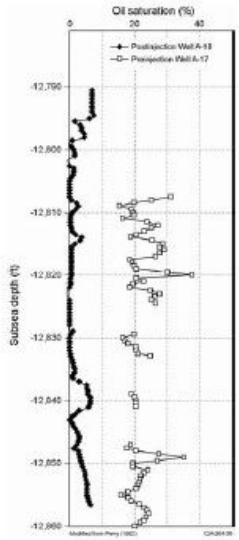

Figure 3. Residual oil saturation varying through a vertical sandstone profile.

Another approach to obtaining residual oil saturation is to apply empirical correlation. Sandstone in the oil reservoirs along the Gulf Coast are dominated by interparticle pore geometry. Holtz developed a correlation that predicted residual gas saturation in water. An overlaying of residual oil saturation data from Gulf Coast samples indicated that this correlation may also apply (Fig. 4) because it allows estimating residual oil saturation as a function of porosity.

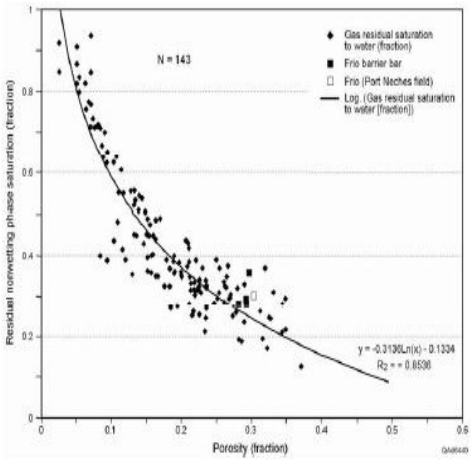

Figure 4. Empirical correlation used to estimate residual oil saturation in Gulf Coast sandstones because they are dominated by interparticle pores.

A. Flooding Techniques

A variety of flooding techniques have been applied in Gulf Coast sandstone CO_2 EOR floods. Hsie and Moore (1988) reported a water-after-gas (WAG) flood for the Quarantine Bay pilot. In this pilot, an injector well was placed at the top of a fault-trapping compartment (Fig 5). The WAG cycle was 87 tons of CO_2 per day for 23 days, followed by 2,500 STB of water per day for 10 days. A 1:1 WAG cycle of this type was applied through five cycles and then changed to a 2:1 WAG. Cumulative CO_2 injected was 28,100 tons, and cumulative water injected was 346,000 STBs, over 16 months.

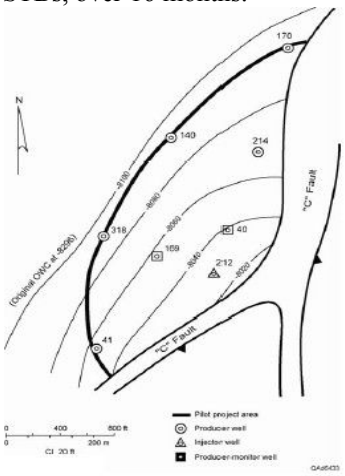

Figure 5. Injector at the top of the structure in water-after-gas (WAG) flood for the Quarantine Bay pilot.

Moore described a gravity-stable pilot test at Timbalier Bay. This field, located on the coast of South Louisiana, is a fairly steeply dipping reservoir at 7.5° to 14°, with a gas cap and oil leg. The gravity-stable flood was set up for injection just below the gas cap (Fig. 6). Gravity-stable injection was designed with a 5.15 MMscf/d injection of CO_2 for 333 days. This injection was then chased by an injection of methane at a rate of 4 MMscf/d. Cumulative CO_2 injected was 100,000 tons, and cumulative chase methane injected was 1.44 Bcf.

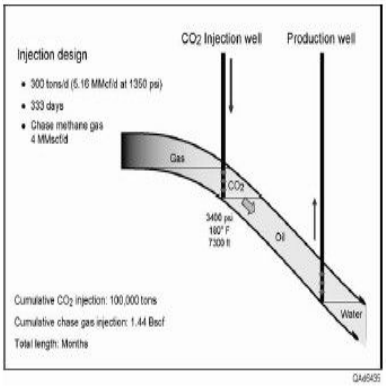

Figure 6. In Timbalier Bay gravity-stable flood CO2 injected right below the gas cap.

A well-published gravity-stable pilot was tested at Weeks Island field, Louisiana. Johnston (1986) and Perry (1982) described this pilot, which was conducted in a steeply dipping fault-bounded compartment (Fig. 7). The flood consisted of a 24% pore volume (853 Bcf) of CO_2 with 6 mole percent of methane (55 Bcf). Methane gas was injected to reduce overall injectant density so as to maintain gravity stability; however, the usefulness of this injection was questioned. In this project, a well in the water leg (Fig. 7) was produced during injection until oil production began at the base of the sandstone, and approximately 100 ft of vertical displacement occurred (Fig. 8).

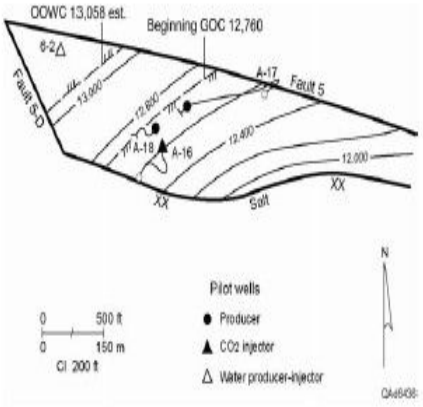

Figure 7. Weeks Island S sand gravity-stable pilot conducted in steeply dipping structure.

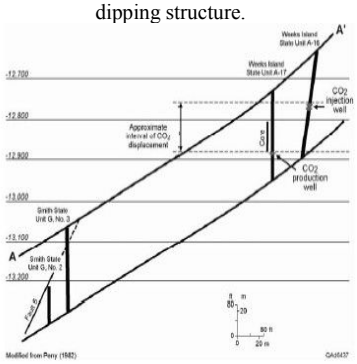

Figure 8. Weeks Island pilot with oil production at the base of the sandstone and approximately 100 ft of vertical displacement.

Palmer et al. and Nute both published information on the gravity-stable St. Elaine Bay field pilot. This pilot was run in a compartment bounded by faults and an unconformity (Fig. 9), and two producers were downdip of one injector. CO_2 injection was at a rate of 2.62 MMscf/d (136 metric tons/d), with a total of 84.4 metric tons, equivalent to 0.33 pore volume. The critical velocity of 2.2ft/d was calculated to maintain gravity stability; therefore, the design was set up for a CO_2 velocity front of 1.6 ft/d, or 70% of critical.

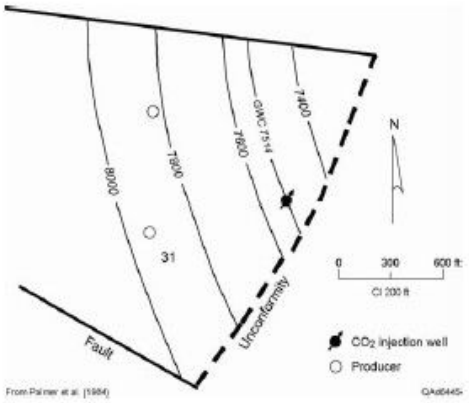

Figure 9. St. Elaine Bay field gravity-stable pilot run in a compartment bounded by faults and an unconformity.

Little Creek field in Mississippi had a CO_2 pilot run in 1974 and is now under full-field CO_2 injection. The field

had been originally produced under primary and secondary recovery practices before CO_2 EOR was applied. Hansen (1977) described a pilot flood with one injector, four producers, and a curtain of four water injectors (Fig. 10). This miscible displacement pilot injected 3.6 MMscf/d of CO_2. In 6 months, oil production in well 1-1 increased from 3 to 87 BOPD, and CO_2 broke through. Prior to CO_2 injection, water had been injected into six wells to increase reservoir pressure, so water was injected until pressure reached 5,500 psi. Recent information indicates that a full-field flood under a continuous CO_2 injection scheme has increased production in the field from 1,350 to 3,201 STB/d

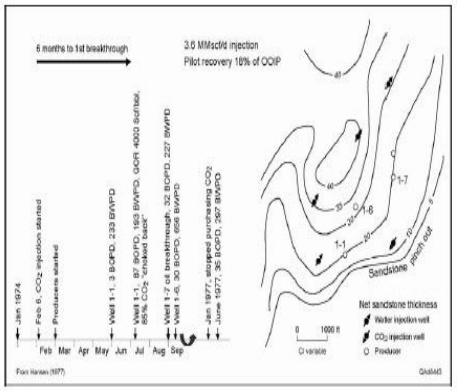

Figure 10. Little Creek field pilot consisting of one injector, four producers, and a curtain of four water injectors.

B.Recovery Response

For Gulf Coast sandstone reservoirs there have been six CO_2 EOR projects in which recovery response has been published (Table 4). Recovery factors have a small range of 15 to 23% of original oil in place (OOIP), averaging 17%. This is approximately half of the primary water-drive recovery for these types of reservoirs, or half of the primary plus the secondary response. Data on utilization rates of amount of CO_2 needed to recover 1 STB of oil are sparse. The low value of 2.75 Mscf/STB was reported for Quarantine Bay field, 5 Mscf/STB for Bay St. Elaine, and 7.9 Mscf/STB for Weeks Island.

Interestingly, lowest utilization occurred in the WAG flood, and equal or more than continuous injection or gravity stable floods were reported. Little Creek reported the highest utilization rate, 26 Mscf/STB, 12.2 of which was purchased, and the remaining came from recycled gas. This high utilization rate was reported as part of an operator production scheme to obtain gas lift on oil producers.

Table IV.
Recovery Efficiencies Of Gulf Coast Sandstone CO2 EOR Pilots

Company	Reservoir	Flood type	Recovery factor (% of OOIP)
Texaco	Paradis	Miscible gravity stable	15
Gulf/Chevron	Quarantine Bay	WAG	17
Chevron	Timbalier Bay	Gravity stable	23
Shell	Weeks Island S Reservoir	Gravity stable	15
Denbury	Little Creek	Miscible CO_2	17
Texaco	Paradis	Nearly gravity stable	15

The EOR flood in Paradis field was a mixed CO_2-N_2 gas-displacement recovery (GDR) project. The nearly pure CO_2 obtained from an ammonia plant had up to 10 mole percent of N_2 added to reduce solvent density in order to help prevent viscose fingering from keeping movement of the solvent below critical velocity. Produced gas from the project was recycled (Bears et al., 1984).

Overall, because of the small number of CO_2 EOR floods to date, it is difficult to determine a production scheme or reservoir characteristic that affects recovery. Single-well huff n' puff projects display the lowest recovery efficiency, whereas whether reservoir depositional environment has an effect remains undetermined (Fig. 11). It has been shown that vertical permeability variation affects recovery efficiency (Fig. 12). This variation measured as a function of the Dykstra-Parsons coefficient indicates that increasing it (larger Dykstra-Parsons coefficient) reduces CO_2 EOR recovery efficiency. In the Gulf Coast Port Neches example, a somewhat higher recovery efficiency is expected for the given Dykstra-Parsons coefficient.

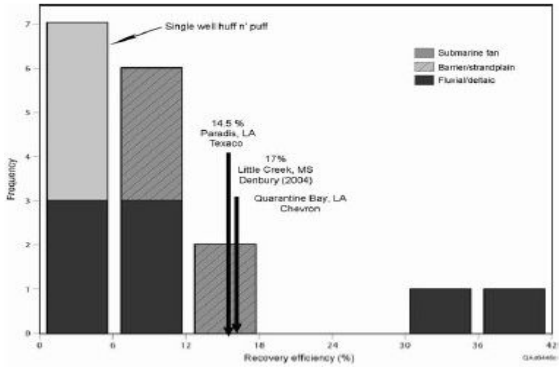

Figure 11. Recovery efficiency of CO2 EOR and depositional environment.

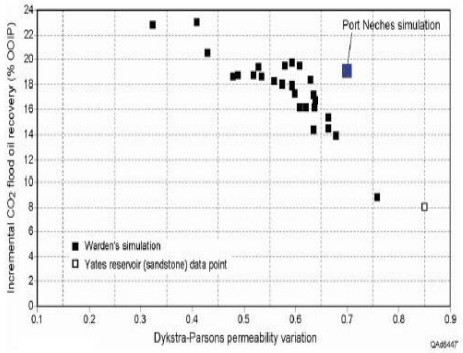

Figure 12. Increasing vertical permeability variation decreasing CO2 EOR recovery efficiency.

Reservoir simulation work done by Davis (1994) presents the effect of geologic layering and vertical permeability variation. He compared three basic sandstone cyclic depositional patterns, including upward coarsening, upward fining, and massive. Upward-fining sedimentation displays the best recovery character, reaching over 20% of OOIP (Fig. 13), probably because of the interplay of gravity effects and higher permeability at the base of the sandstone.

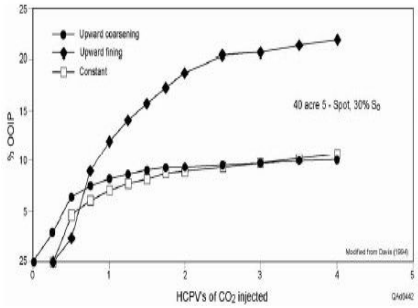

Figure 13. Upward-fining sedimentation displaying best recovery character, reaching over 20% of OOIP.

IV.Gulf Coast CO2 EOR Reserve Growth Potential

The onshore Gulf Coast is a mature oil province in which significant-sized oil fields have experienced both peak primary and secondary production. Fields that have been developed and infill drilled are now producing at low-oil and highwater rates. Yet most fields have experienced recovery efficiencies of between 35 and 50%, resulting in a large resource of unrecovered oil. In contrast, the West Texas Permian Basin has seen a long history of CO_2-enhanced oil recovery (EOR). Over 65 sandstone, limestone, and dolomite reservoirs have been subjected to miscible CO_2 floods in the last 30 years. The current economic and environmental situation now favors extending this recovery process to the much more porous and permeable clastic depositional systems in the Gulf of Mexico. With its combination of mature oil fields, oil prices, newly developed anthropogenic CO_2 sources, and new technology, CO_2 EOR has the potential of stimulating reserve growth in the Gulf Coast.

A large oil-reservoir database was constructed and analyzed to determine the geologic distribution of CO_2 EOR potential in Gulf Coast oil reservoirs. Key factors for screening reservoirs for miscible CO_2 include minimum miscibility pressure (MMP) and cumulative oil production. A literature review determined past and present CO_2 EOR practices and results. Conditions under which floods were implemented were determined, along with design and implementation of CO_2 floods. These results were summarized to extract characteristics and applicable practices.

This study indicates an oil resource target of 4.7 BSTB of miscible floodable oil. Because Gulf Coast past and current pilot and full-field floods indicate an average recovery of 17% of OOIP, these data were applied to the resource assessment. Reservoirs with more than 1 MMSTB cumulative production were analyzed; however, the few giant reservoirs dominated the analysis. Because there was not much difference in recovery efficiency between gravity-stable, WAG, and continuousinjection

flooding, there was no need to separate out which reservoir would make a better candidate for a certain type of flood. Proximity to anthropogenic CO_2 sources enabling reduced costs and infrastructure and significant-sized residual saturations, as well as obtainable recovery efficiencies, are salient attributes that showcase Gulf Coast formations as an attractive option for this type of tertiary recovery.

V.Summary

Previous pilot and full-field CO_2 floods in the Gulf Coast were technically successful and were run in reservoirs characterized by submarine-fan, barrier/strandplain, and fluvial/deltaic depositional environments. These reservoirs typically experience natural water drive that leaves behind average residual oil saturation in the range of 0.22 to 0.26. Several different flood types have been applied, with miscibility and gravity-stable types predominating. These pilot floods have resulted in recovery efficiencies that average 17% of the OOIP as reserve growth from applying CO_2 EOR.

REFERENCES

[1] Le Jianjun, Liu Fang, Zhang Jiyuan, " Reservoirs after polymer flooding oil field testing of ". Acta petrolei Sinica . 2014 (01)

[2] Zhu Weiyao, Xia Xiaoxue, Guo Shengxue “High-pressure conditions endogenous microorganisms under high temperature reservoir microscopic oil displacement mechanism of “. Acta petrolei Sinica. 2014 (03)

[3] Ren Houyi, Wu Xiufang. “A review of development of microbial oil recovery technology”. Sinopec.2008 (10)

[4] Li Fan . “Between microorganisms and reservoir environment mutual influence and effect of ”. Chemical Enterprise Management. 2014 (36)

[5] Yang Jian, Li Bin, Dong Xiaoli. “The oil microbial diversity and screening of flooding in Ansai Oilfield”.Petrochemical Technology Application.2015 (01)

[6] Zhang Chunying advice. “Status of microbial enhanced oil recovery in the world ”. Oilfield Chemistry.1986 (01)

[7] Fu Qiang. “Review on the research of microbe oil recovery technology”. Petrochemical Technology & Application.2014 (32)

[8] Liu Yang. “Organic substances on the microorganism to influence oil migration”. Chemical Engineering & Equipment. 2014 (11)

[9] Chen Jiaming, Gu Guizhou, Li Zheng, Jiang LinShengli “Oilfield crude oil gasification of residual microorganism”. Chemistry & Bioengineering. 2015 (01)

[10] [10] Dong Zhaoxia , Lin Meiqin, “Influence of surfactants used in surfactant-polymer flooding on the stability of Gudong crude oil emulsion”. Petroleum Science. 2010(02)

[11] Zhang Liehui,Guo Jingjing . “A well test model for stress-sensitive and heterogeneous reservoirs with non-uniform thicknesses”. Petroleum Science. 2010(04)

[12] Feng Qihong ,Zhang Ge , “Numerical simulation of the blocking process of gelled particles in porous media with remaining polymers”. Petroleum Science. 2009(03)

[13] Heitz, M. P,Carlier, C,deGrazia, J,Harrison, K. L,Johnston, K. P,Randolph, T. W,Bright, F. V.Water core within perfluoropolyether-based microemulsions formed in supercritical carbon dioxide. Journal of Physics . 1997

[14] Liu J C,Han B X,Li G Z. Investigation of Nonionic Surfactant Dynol-604 Based Reverse Microemulsions Formed in Supercritical Carbon Dioxide. Langmuir . 2001

[15] Dong Zhaoxia, Li Yi, Lin Meiqin. A study of the mechanism of enhancing oil recovery using supercritical carbon dioxide microemulsions.Petroleum Science. 2013.3

[16] Liu Zhiwen, Zhu Qingzhong, Yang Zhen. “A preliminary study on the microbial flooding test in low permeability reservoir”. Science and technology and enterprise. 2014 (16)

Factors Influencing Participation Behavior in Virtual Communities

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***Abstract*—More and more people have adapted to joining online virtual communities to get and share information. Little is known about what makes a virtual community more appealing to users. In order to address the gap in existing research regarding why and how consumers identify with virtual communities, the current research focuses on virtual community of interactivity, and analyzes its main attributes and the relation between these attributes and user's participation behavior. The research results indicate that there're five key attributes (target & positioning, standardization, technical support, interactivity and content richness) of virtual community acting as important factors that exert a positive influence on online consumer's participation behavior.**

***Index Terms*—virtual community, online consumer behavior, participation behavior**

I. Introduction

One of the most important features of virtual community is that members of common interests or goals can gather and share information and knowledge via online interaction. The size of the members is the basis of the existence of a virtual community. But it doesn't mean that an arbitrarily constructed virtual community will be able to attract people to engage in its information interaction or sharing. Therefore, in order to help founders of virtual communities to successfully attract people to join and participate in activities on regular bases, it'll be meaningful to find out the key attributes of virtual communities and how these attributes affect the user's behavior. The current research will focus on one of the mainstream forms of virtual communities, virtual community of interactivity, which is founded mainly for communication purpose, analyze its main attributes and explore the relationship between these attributes and users' participation behaviors.

II. Literature Review

A. The definition of virtual community

According to the definitions of virtual community by former researches, some important factors, such as online virtual space [1] [3-12], community formation elements and users' participation purposes (common interests [6] [9] [13], specific community subjects [3] [8] [10] [11], interactivity [1] [4] [7] [9] and social relationship [2] [4]), the formation of community users and community management factors (technical support, specification) [15], are the most important features concerned. Therefore, to sum up former definitions, the current study concludes that virtual community is a kind of online virtual space supported by information technology; it gathers people of common interests or objectives through the Internet and provides a platform for these people to communicate freely, so as to realize the information sharing and even commodity trading activities.

B. The The classification of virtual community

The current classification standards of virtual community are various regarding different emphases: according to consumer needs, virtual community is divided into the four categorizes—trading, interest, fantasy and relationship [3]; according to the its commerciality, interaction richness and transactional difference, virtual community is divided into the five categorizes — game community, interest community, B2B community, B2C community and C2C community [16]; according to the outward manifestation, virtual community is divided into mail servers, newsgroups, bulletin boards, Internet relay chat, MUD and so forth [12]; according to the purpose of virtual community, it is divided into discussion or conversation community, task or goal oriented community or mixed community [17]. However, apart from the differences of the classification methods, as for the functions of current types of virtual communities, they either provide an information-sharing platform for users to communicate or offer an electronic commerce platform to facilitate commodity transaction.

The virtual community of interactivity occupies the dominant position in the development process of virtual community in China. However, there has been relatively little research conducted on this type of virtual community. Therefore, the current research aims at the analysis of virtual community of interactivity and the survey sample will be strictly limited within the scope of this kind of community.

C. Attributes of virtual community affecting consumer paticipation behavior

Through the review of related research on the main attributes of virtual communities, the current research groups important attributes of virtual community into six categories:

1) Target & positioning [14] [18]: the purpose and goal of a virtual community are the most important features that distinguish it from others. The purposes could be either accomplishing a task or meeting specific needs of the members. A virtual community without a certain purpose won't be founded or couldn't be maintained in

the long run. Therefore, a virtual community needs at least a clear target and accurate positioning.

2) Technical support [5] [14]: in the aspects of technology and safety, a virtual community should be able to offer its users the feelings of affinity, trust and flexibility. Therefore, system stability and information security are important features of a virtual community.

3) Standardization [13] [18]: restrictions, entry rules, basic authorizations, processing rules and misbehavior penalties are basic regulations that a virtual community should clarify.

4) Anonymous [18]: virtual community users should be able to conceal the true identity, name, gender, age, appearance, etc.

5) Interactivity [13]: there're adequate network and digital tools that enable virtual community users to transmit information, describe subjects, and share feelings.

6) Content richness [5]: in the aspect of resource and content richness, a virtual community should be able to provide its members with various information and different opinions.

III. METHOD

A. Radical Online Consumer Participation Influencing Factors

The current study aims to find the key attributes which act as important influencing factors of consumer participation behavior in a virtual community of interactivity. According to Fishbein's multi-attribute attitude model, consumer attitude toward an object are generally determined by two factors --strength of the belief that the object has some attribute and the evaluation of the attribute [19]. Therefore, based on the strength of the belief consumers hold for key attributes, we can predict their attitude and further discover the relationship between the key attributes and their behavioral outcomes.

Based on the literature review of virtual communities' attributes as listed in the part II, and combined with the purpose of information-sharing characteristics of virtual community of interactivity, six major attributes are selected. Therefore, it can be deduced:

H1. There are six key attributes (target & positioning, standardization, technical support, anonymous, interactivity and content richness) of a virtual community of interactivity that may influence consumers' participation behavior.

According to Fishbein's model, the strength of the belief consumers hold for the key attributes of virtual community of interactivity is correlated to consumer attitude. Therefore:

H2. The six key attributes of virtual community of interactivity are correlated with consumers' participation behavior.

The theoretical model of the current study is illustrated in Figure1.

B. Data Collecting

The survey was conducted both online and offline with total 230 questionnaires recovered. 210 (110 from online, 100 from offline) out of the 230 questionnaires were valid with an effective rate of 86.9%. Male samples accounted for 53% in the survey, while female samples accounted for 47%.

Regard to data processing, principal component analysis was adopted to verify the key attributes of the virtual community of interactivity which affect users' behavior. And regression analysis was adopted to find out the relation between the key attributes and behavioral outcomes.

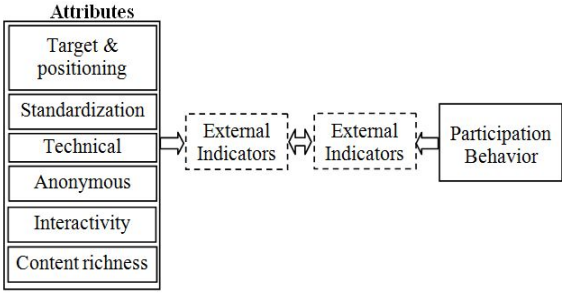

FIGURE1 The theoretical model

IV. RESULTS

A. Principal Components Analysis on key attributes

Partial correlation between the variables of the key attributes of virtual community was tested. Based on the KMO value 0.864, the degree of common variance among the variables was quite high. Therefore, factor analysis could be conducted. As the result of Bartlett's test of sphericity showed that the sig. was extremely significant. Therefore, the 16 variables designed to represent the key attributes of virtual community were not independent but interrelated, which meant the extraction of common factors would be needed to be applied.

Based on the data of total variance explained (Table I), the first five components explained 90.4% of the total variance indicating that these five components were able to represent key attributes of virtual community of interactivity.

TABLE I.
TOTAL VARIANCE EXPLAINED

Compo-nent	Total	Initial Eigenvalues	
		% of Variance	Cumulative %
1	**5.81**	**36.32**	**36.32**
2	**3.77**	**23.53**	**59.85**
3	**1.97**	**12.30**	**72.15**
4	**1.86**	**11.59**	**83.74**
5	**1.06**	**6.63**	**90.37**
6	0.48	3.02	93.39
7	0.39	2.41	95.80

Compo-nent	Total	Initial Eigenvalues	
		% of Variance	Cumulative %
8	0.29	1.82	97.62
9	0.16	1.02	98.64
10	0.11	0.66	99.30
11	0.07	0.41	99.72
12	0.02	0.12	99.83
13	0.01	0.07	99.91
14	0.01	0.06	99.96
15	0.01	0.04	100.00

TABLE II.
TOTAL VARIANCE EXPLAINED FACTOR ANALYSIS OF THE KEY ATTRIBUTES

Attributes	Component				
	Item1	Item2	Item3	Item4	Item5
Attractive information	**.84**				
Accurate goal	**.85**				
Common interests	**.88**				
Standard of conduct		**.79**			
Information security		**.80**			
System of rewards & penalties		**.82**			
Ease of use			**.70**		
Clarity of navigation			**.70**		
System stability			**.72**		
Anonymity	.17	.25	.15	.07	.31
Free from interference	.16	.23	.13	.03	.16
Self expression	.18	.27	.13	.12	.40
Empathy				**.70**	
Emotional expression				**.66**	
Understanding other people	.42	.54	.01	.30	.33
Content richness					**.91**

The results of principal component analysis are illustrated in Table II. In total, four items were removed from the key attribute questionnaire. It was decided to retain the items that loaded on two factors with the factor where the highest factor loading was evident. Coincidentally, 12 of the originally designed 16 variables fitted conceptually well in five principal components. The interpretation of the refined principal component analysis produced the following components: target & positioning, standardization, technical support, interactivity and content richness (Table III). Anonymity was excluded, not necessarily because it was unimportant in influencing user behavior, but because it might be interoperated by indicators of other components.

TABLE III.
FACTOR ANALYSIS OF THE KEY ATTRIBUTES

Principal Components	Items
Target & positioning	Attractive information, accurate goal, common interests
Standardization	Standard of conduct, information security, System of rewards & penalties
Technical support	Ease of use, clarity of navigation, system stability
Interactivity	Empathy , emotional expression
Content richness	Content richness

B. Analysis on effect of key attributes on users' behavior

1) Regression analysis on user's collecting behavior

After regression analysis, five variables (attractive information, system of rewards & penalties, system stability, empathy and content richness) were retained. And, the linear relationship between key attributes of virtual community and collecting behavior was:

Collecting behavior = 0.78 + 0.53** (Attractive information) + 0.31** (System of rewards & penalties) + 0.13** (System stability) + 0.01* (Empathy) + 0.071*(Content richness), correlation statistics are shown in Table IV.

TABLE IV.
THE REGRESSION COEFFICIENTS OF COLLECTING BEHAVIOR

Model	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	0.78	0.31		4.28	.000
Attractive information	0.53	0.08	0.45	6.43	.000
System of rewards & penalties	0.31	0.06	0.41	5.58	.000
System stability	0.13	0.06	0.11	2.15	.003
Empathy	0.01	0.04	0.02	0.32	.027
Content richness	0.07	0.05	0.08	1.54	.026

2) Regression analysis on user's recommendatory behavior

Through stepwise regression analysis, five variables (common interests, system of rewards & penalties, system stability, emotional expression and content richness) are retained (Table V).

And, the linear relationship between key attributes of virtual community and recommendatory behavior was:

Recommendatory behavior = 0.91 + 0.30* (Common interests) + 0.27**(System of rewards & penalties) + 0.18**(System stability)+0.18**(Emotional expression) +0.14**(Content richness).

TABLE V.
THE REGRESSION COEFFICIENTS OF RECOMMENDATORY BEHAVIOR

Model	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	0.91	0.37		14.29	.000
Common interests	0.30	0.05	0.16	2.30	.002
System of rewards & penalties	0.27	0.07	0.14	3.25	.000
System	0.18	0.06	0.16	3.27	.001

stability					
Emotional expression	0.18	0.06	0.18	6.70	.000
Content richness	0.14	0.04	0.04	0.96	.001

V. CONCLUSION

Based on the current study, five key attributes of virtual community (target & positioning, standardization, technical support, interactivity and content richness) and their regression relationship with consumer participation behavior were determined.

1) The regression results showed that the variables which respectively had significant influence on collecting behavior and recommendatory behavior were attractive information and common interests. As the two variables all belonged to the target & positioning attribute of virtual community, it can be acknowledged that the primary task of running a virtual community is clarifying its objective and positioning and matching it to the interest of the target audience.

2) Although virtual community of interactivity is run in the virtual environment, it is built up on the basis of individual participation in real life. Therefore, similar to communities in the real world, rules and norms are essential. A standardized and reasonable system of rewards and penalties can effectively improve the user's participation enthusiasm.

3) Besides accurate positioning and standardization, system stability is another important attribute of a virtual community because it's technically the premise to ensure normal function of the whole community.

4) Empathy and emotional expression respectively have certain effect on user's collecting and recommendatory behavior.

5) Rich resources and content enable community members to get access to various information and views, which play an important role in attracting and retaining users.

REFERENCES

[1] E. Reid, "VIRTUAL WOR LDS: CULTURE AND IMAGINATION." Cybersociety: Computer-mediated communication and community (1994): 164.

[2] J. Fernback and B. Thompson, "Computer-mediated communication and the American collectivity: The dimensions of community within cyberspace", annual convention of the International Communication Association, New Mexico, 1995.

[3] A. Armstrong and J. Hagel J, "The real value of online communities", Havard Business Review, vol. 23, May.-Jun. 1996, pp. 134-141.

[4] Q. Jones, "Virtual‐Communities, Virtual Settlements & Cyber‐Archaeology: A Theoretical Outline", Journal of Computer‐Mediated Communication, vol. 3, 1997.

[5] P. Roberts and R. Henderson, "Information technology acceptance in a sample of government employees: a test of the technology acceptance model", Interacting with Computers, vol. 12, 2000, pp. 427-443 .

[6] C. Romm, N. Pliskin, and R. Clarke, "Virtual communities and society: toward an integrative three phase model", International journal of information management, vol. 17, 1997, pp. 261-270.

[7] L. Komito, "The Net as a foraging society: Flexible communities", The Information Society, vol.14, 1998, pp.97-106.

[8] S. Turkle, "Identity in the Age of the Internet", The media reader: Continuity and transformation, London, Thousand Oaks, New Delhi: Sage, 1999.

[9] P. Richard Adler and J. Anthony Christopher, "Internet community primer overview and business opportunities", Internet Community Primer, 1998.

[10] J. Hagel, "Net gain: expanding markets through virtual communities" , Journal of Interactive Marketing, vol. 13, 1999, pp. 55-65.

[11] T. Anderson, "The virtual conference: Extending professional education in cyberspace", International Journal of Educational Telecommunications, vol. 2, 1996, pp.121-135.

[12] J. Preece, "Online communities: Designing usability and supporting socialbilty", John Wiley & Sons, Inc., 2000.

[13] Y. Shenghui, "Discussion on the business model of virtual community with the idea of experiential marketing", Taiwan, 2001.

[14] P. Richard Bagozzi and M. Utpal Dholakia, "Intentional social action in virtual communities", Journal of interactive marketing, vol. 16, 2002, pp. 2-21.

[15] C. Elise Porter, "A Typology of Virtual Communities: A Multi‐Disciplinary Foundation for Future Research", Journal of Computer‐Mediated Communication, vol.10, 2004.

[16] J. Hummel and U. Lechner, "Social profiles of virtual communities", System Sciences, 2002, HICSS. Proceedings of the 35th Annual Hawaii International Conference on. IEEE, 2002, pp. 2245-2254.

[17] K. Stanoevska-Slabeva, "Toward a community-oriented design of Internet platforms", International Journal of Electronic Commerce, vol.6, 2002, pp. 71-95.

[18] X. P. Fan, Q. G. Ma, "The effect of interactivity on online purchasing intention in virtual community", Journal of Zhejiang University, vol.5, 2009.

[19] R. D. Blackwell, P. W. Miniard and J. F. Engel, "Consumer behavior (10th edition)", Thomson/South-Western, 2006.

Analysis On The Research Status Of Flat Plate Solar Water Heater Collector

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Abstract—**This paper describes the classification of the solar collector, it's advantages and disadvantages have been compared between flat plate solar collector and vacuum tube solar collector with the aspects of service life, initial investment, pressure, and the combination with building, it was concluded that flat plate solar collector is better than vacuum tube solar collector. Then some improvement measures were proposed by analyzing the influence mechanism with the aspects of transparent cover, air cavity, absorber plate, selective coating of flat plate solar collector.**

Index terms— **Flat plate solar collector, vacuum tube solar collector, absorber plate, air cavity**

Ⅰ. INTRODUCTION

Solar energy is inexhaustible renewable energy which has the advantages of abundant, safe, clean and harmless. It is one of the most widely used renewable energy. Now, the most common ways of using solar energy has its transformation heat energy through thermal collector.

In the heat utilization of solar energy, solar collector is the main component for absorbing heat from solar beam and utilizing it for heating purposes. The higher thermal efficiency of the solar collector, the more solar energy converted into thermal energy. That is to say, the more useful energy can be achieved. Therefore, the current research focuses on improving the efficiency of solar collector. Main breakthroughs during the last years include improvements in the hydraulic geometric design, use of alternative material[1], and reduce the thermal losses[2-3].

Ⅱ. COMARATION OF FLAT PLATE SOLAR COLLECTOR AND VACUUM TUBE SOLAR COLLECTOR

At present, the common types of solar collector consist of flat plate solar collector, vacuum tube solar collector and concentrating solar collector. Among them, the flat plate solar collector and vacuum tube solar collector are more common[4]. The introduction and comparison of advantages and disadvantages between the flat plate solar collector and vacuum tube solar collector are followed.

A. Flat plate solar collector

The common types of flat plate solar collector consist of tube plate, wing tube, flat-shell and serpentine tube. The collector is a device which absorbs the most of incoming solar radiation, convert it into heat, and transfers this heat to a fluid flowing through the collector. At the same time, the achieved energy would be rejected to outside by means of radiation, convection and conduction, which leads to energy loss.

Flat plate solar collector is the most basic type used in solar water-heating systems, with the following advantages: (1) flat plate solar collectors most suited for pressure system; (2) best suited for dual circulating solar water heaters; (3) most easily to combine solar collector and building[5-6]; (4) collector run on high efficiency with the working condition of low temperature (under 100℃); (5) flat plate collector for solar energy heating system can be convenient to solve the overheating problems of the system in the non-heating season; (6) large unit collector area and high heat leads to larger water production per unit area than other types of solar collectors[7]; (7) low maintenance costs under long service life. Therefore, in the place of solar system engineering, split type solar water heater and having a need in the combination of solar energy and building, flat plate solar collector has obvious advantages in system lifetime, maintenance, etc. In addition, there are some disadvantages with the solar collector: (1) flat plate solar collector with direct system in winter will freeze, so it must be empty with water; (2) initial investment cost is relatively high; (3) when the ambient temperature is low, the heat loss is large[7].

B. Vacuum tube solar collector

Vacuum tube solar collector is a type of solar collector which is create a vacuum in the space between absorber plate and transparent cover layer. The common types of vacuum tube solar collector consist of heat pipe type and all glass type. The working principle is that the sun through the glass tube irradiation to the inner tube, the walls of the inner tube absorb heat and transfer this heat to a fluid flowing through the collector.

Vacuum tube solar collector has some advantages, for example: (1) in winter, the water in the tube won't freeze; (2) collector run on high efficiency with the working condition of high temperature (above 100℃); (3) initial investment cost is relatively low compared to flat plate solar collector; (4) high thermal efficiency, insulation performance is good; (5) long service life, and it can be used for all year round. Therefore, this type of collector is widely used in small buildings such as middle and low level market. In addition, there are some disadvantages with the solar collector: (1) poor performance under

pressure, easy damage, easy to fried tube; (2) combining with building performance is poor; (3) easy to scale[8].

C. The development trend of collector

Flat plate solar collector is widely applied in foreign countries, although vacuum tube solar collector is used widely in china, with the construction of multilayer and high-rise buildings, vacuum tube for small bearing, easy to fried tube, not easy combination with buildings and other defects has been unable to adapt to new market demands. However flat plate solar collector receives people's favor gradually and has been increasingly widely used by virtue of its strong bearing capacity, high thermal efficiency, easy combination with buildings and other characteristics.

Ⅲ. THE STRUCTURE OF THE FLAT PLATE SOLAR COLLECTOR

Flat plate solar collector is mainly composed of transparent cover, absorber, insulation, collector shell and flow channel. Concrete structure as shown in figure 1:

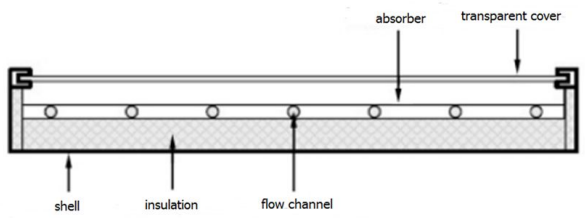

Figure 1. The structure of flat plate solar collector

A. Transparent cover

The transparent cover can make the sun through the cover onto the absorber plate, and be able to prevent the heat through the cover spread out to the ambient, thus it can inhibit the radiation and convection heat loss from the surface of the absorber plate, at the same time it also can protect the absorber plate without dust, snow and rain erosion. Transparent cover with high transmittance and low reflectivity, more common materials mainly include common glass, toughened glass, anti-aging glass and transparent plastic board, etc.

B. Absorber plate

The absorber plate is the main component for absorbing heat from solar beam and transfers this heat to a fluid flowing through the collector. The absorber plate material should have good thermal conductivity, some common materials with this performance as followed: copper, aluminum, copper and aluminum composite, stainless steel. The absorber plate surface with high solar radiation absorption ratio and low emission rate can maximize the absorption of solar energy, and reduce radiation heat loss.

C. Flow channel

Flow uniform distribution on the absorber plate and low temperature water into the channel, absorbing the heat of absorber plate, elevating temperature, hot water due to the smaller density flow upwards, forming a natural circulation, to take away heat.

D. Insulation

At the bottom and all around the flat plate solar collector is covered with insulation, its main role is to minimize the conduction and convection losses to the surroundings. It should have the advantage of low thermal conductivity, strong and not easy to deformation, low price, convenient installation, etc. Commonly used insulation materials are rock wool, expanded perlite, polyurethane, polystyrene, etc.

E. Collector shell

Collector shell consist of a transparent cover, a absorber plate and insulation layer, the shell is required to have certain mechanical strength, firmness, durability, easy processing and low cost etc. Made of steel plate, aluminum plate, stainless steel plate material of the shell is more common.

Ⅳ. THE LATEST RESEARCH PROGRESS

For the flat plate solar collector, the heat convection between the absorber plate and the ambient is the main factor which influences the thermal efficiency, radiation heat transfer accounts for a smaller proportion which can be ignored. However, the main factors influence of heat convection between the absorber and the ambient are as follows: transparent cover, air cavity between the transparent cover and absorber plate, absorber plate, selective coating, etc.

About the air cavity: the natural convection within the air cavity has great effect on the thermal efficiency of collector, how to reduce the natural convection in the air cavity is the main direction of current research. Natural convection within the air cavity can be regarded as a natural convection within a limited space, this type of natural convection changes with the temperature difference of high and low temperature wall and the air cavity thickness. Chen Zeshao and Ge Xinshi et al[9] studied the problem of the air gap between the transparent cover and the absorber plate of flat plate solar collector, and studied the natural convection within air cavity using the transient calorimetric method, put forward the concept of the first and second favorable gap, and analyzed the natural convection heat transfer coefficient with the changed tendency of the air cavity thickness, it has been shown that no matter the temperature difference between the transparent cover and the absorber plate is a constant value or increase gradually, the set of solar collector space is advised to take 4-6cm. Zhang Yanfeng et al[10] analyzed the natural convection within air cavity between transparent cover and the absorber plate of flat plate solar collector, corresponding to the air cavity thickness of difference inclination angle of flat plate solar collector were obtained through experimental verification. Deng Yuechao and Zhao Yaohua et al[11] established a CFD simulation model for the natural convection of the air cavity between the transparent cover and the absorber plate of flat plate solar collector, using this model analyzed the influence factors of air flow and heat transfer within the air cavity, finally it has been found that when the air cavity thickness is 3cm, natural convective heat loss is minimal. Cane et al[12] through

the heat transfer experiments concluded that when the thickness of air cavity is the same, join a cellular device collector can be apparently inhibited natural convection than the ordinary collectors, and achieve the goal of lower collector heat loss. Liu Yake[13] established a separate 3 dimensional numerical model for the air cavity between transparent cover and the absorber plate of flat plate solar collector, and used the FLUENT software simulated the distribution of temperature and speed of the air cavity under the condition of same wall temperature.

About the absorber plate: the absorber plate is the main component for absorbing heat from solar beam and transfers this heat to a fluid flowing through the collector. The absorber plate material should have good thermal conductivity. The thermal efficiency of the collectors is affected by the material and the structure of the absorber plate. A.M. Shariah et al[14] studied the influence of thermal conductivity of absorber plate on the performance of flat plate solar collector using TRNSYS software, the study shows that using aluminum instead of steel plate, the annual solar fraction can increase by 4%-7%, the efficiency factor can increase 12%-19%; but with copper instead of aluminum plate, solar energy fraction and efficiency factor were only increase 1%, 3%. Zhao Jun and Gao Teng et al[15] established a heat transfer model to study the influence of solar collector of absorber plate with different thermal conductivity, thickness, width, emission rate and absorption rate, finally take the most commonly used material copper as an example map the endothermic board structure optimization, which can be used to quickly analysis the thermal performance of solar collector with different sizes and optimize absorber plate design, it has been shown that under the same efficiency factor, through a combination of different changes in the width and thickness of absorber plate, the copper consumption can reduce 47.8%. Zhao Jun and Gao Liuhua et al[16] analyzed the thickness of absorber plate and the uniformity of temperature distribution by using the FLUENT simulation software, it has been concluded that the temperature distribution of absorber plate with the increase of the thickness trends to be uniform, streamline distribution with the increase of thickness trends to be sparse. When the thickness of absorber plate increases to 0.45mm, continue to increase the thickness of the absorber has almost no effect on the temperature distribution and flow field distribution of collector; the absorber plate temperature distribution trends to be uniform with the increase in the mass flow rate. Ni Bei[17] used numerical simulation method to study the influence of collector diameter and tube center distance on heat transfer efficiency under the condition of unsteady heat transfer, it has been found that optimal center distance of 50mm, and in a certain range the larger diameter, the higher efficiency of the collector. Dovic,D Andrassy [18]have tested different 2D and 3D numerical models in order to assess the influence of design and operating parameters, focusing their investigations in considering a parallel flat and corrugated absorber plates of chevron type in order to achieve a better performance. Wei Shengxian et al[19] established the daily shading model and solar radiation model, studied the relationship between the collector array length width ratio and latitude, the daily shaded factors, array area, the amount of solar radiation reaching the collector array, finally it has been concluded that for a particular city, each area of collector array has a optimal ratio of length and width which can make the amount of solar radiation reaching the maximum. They also established the numerical model of the mean effective absorption coefficient of flat plate collectors, studied the relationship between the average annual effective area coefficient and aspect ratio, plate spacing, tilt angle, latitude, it has been shown that the reasonable plate spacing for 4-6cm and recommended reasonable aspect ratio smaller than 2/1, flat plate solar collector used in north latitude 20°, 30°, 40°,50° with the biggest plate spacing were 5.8, 5.4, 4.7, 4.2cm, the corresponding coefficient of average annual effective area were greater than 0.9.

About transparent cover aspect: Improve the performance of flat plate solar collectors cover is the effective way to improve the collector's efficiency. In recent years, with the development and utilization of new materials, the transparent cover plate material has a great development space and there a lot of research has been done on this aspects[20]. Low temperature radiation coated glass (Low-E glass) is a product that on the surface of glass plated with multi-layer metal or other compounds of products, which can reflect more than 80% of the far infrared radiation[21]. The Low-E glass is widely used in glass manufacturing aspects by virtue of its characteristics of high transmittance, low radiation, high temperature resistant and good stability in the sun. Transparent insulation materials (TIM) is a kind of new material in the field of the utilization of solar energy which is attracting more and more people to pay attention to this material with high transmittance, and has good inhibiting effect on the convection heat loss and prevents the infrared radiation. In cold regions, because of the low outdoor temperature, the heat of the flat plate solar collector emitted out by the absorber plate will be increased with the increase of temperature difference, resulting in reduced efficiency of the collector. In order to solve this problem, the ordinary single-layer transparent cover is replaced by double-layer transparent cover for the purpose of blocking the convection loss. In order to further improve the efficiency of the solar collector, inert gases can be filled in laminated glass, argon widely used in such applications with its characteristics: colorless, odorless, tasteless, melting point, boiling point and the critical temperature is very low, does not burn, nor combustion, chemical properties is poor.

About selective coating: The selective heat absorption coating is a selective absorption solar radiation thin film which is covered on the absorber plate, to maximum absorption of solar radiation and convert it into the heat energy, and try to reduce the thermal damage from the heat radiation. At present, the absorber plate mainly used

materials of anodic oxidation, black chrome and "blue film", these materials have good solar absorption ratio and low heat reflection ratio.

As mentioned above, the efficiency of flat plate solar collector has a considerable improvement compared with the previous, but there is still a lot of space to improve. In order to further improve the thermal efficiency of flat plate collector, we can proceed from the following aspects: (1) Research and develop the new transparent cover with a high transmittance and low reflectivity; (2) the technology of absorber plate coating should be further improved; (3) further to study the structure design of air cavity, minimize the natural convection of air layer, and reduce the convection heat loss; (4) improve the thermal insulation capacity of the insulation layer.

Ⅴ. CONCLUSION

Although the vacuum tube solar collector applied more widely on the domestic market, while its market share is gradually reduced for reasons of easy to damage, easy to scale, cleaning difficult, not easy to combine with the building etc. And flat plate solar collector by virtue of its strong bearing capacity, high safety factor, easy combination with buildings and other advantages, receives people's favor gradually and increasingly widely used.

Through the study of the transparent cover, air cavity, absorber plate, and selective coating, the thermal efficiency of flat plate solar collector has been greatly improved. But due to the limitations of structure and heat transfer mechanism on flat plate solar collector, its efficiency is limited for further improvement, in order to get higher efficient solar collectors need to be further studied.

Because different regions have different external conditions such as radiation intensity and the wind speed, so the influence factors will change with the change of regions. Therefore, the impact of different external conditions in various regions still need a large of experimental verification.

REFERENCES

[1] Carlsson B, Persson H, Meir M, Rekstad J. “A total cost perspective on use of polymeric materials in solar collectors-importance of envirmental performance on suitability”. Appl Energy, 2014,125:10-20

[2] Kessentini H, Capdevila R, Castro J, Oliva A, Bouden C. “Three dimensional heat transfer analysis of combined conduction and radiation in honeycomb transparent insulation”. Solar Energy, 2014,105:58-70

[3] Subiantoro A, Ooi KT, “Analytical models for the computation and optimization of single and double glazing flat plate solar collectors with normal and small air gap spacing”. Appl Energy,2013,104:392-9

[4] Liu Guiyong. “Efficiency analysis of vacuum tube collector and flat plate collector”. China Appliance Technology, 2009, 22:50-51

[5] Qie Zhaozhao. “The integrated design method of solar collector and building”. Shanxi Architecture, 2007,33(9):230-231

[6] Lv Shiyan, Wei Sisheng, Xu Guangqiang. “Application of solar collector in building combination”. Energy Saving and Environmental Protection, 2010,8:50-51

[7] Fan Haiyan, Chi Binghznag. “Solar collector and its applicability”. Journal of Qingdao Technological University, 2009,30(3):118-121

[8] Zhu Dongsheng, Xu Ting, Jiang Xiang, Huang Yinsheng, Qi Xiaoling. “Research progress of solar collector”. Battery technology, 2012,36(10):1582-1584

[9] Chen Zeshao, Ge Xinshi. “Theoretical and experimental study of optimal spacing of air interlayer for flat plate solar collector with small convection loss”. Journal of Solar Energy, 1985,6(3):287-296

[10] Zhang Yanfeng, Yu Yitai. “Determination of optimun spacing of air interlayer in flat plate solar collector”. Journal of Hebei institute of Technology,1992,21(2):101-109

[11] Deng Yuechao, Zhao Yaohua, Quan Zhenhua, Wang Lincheng. “Numerical simulation of natural convection heat transfer in a flat plate solar collector air interlayer”. Building Science, 2012,28(10):84-92

[12] Cane RLD, Hollands KGT, Raithby GD, Unny TE. “Free convection heat transfer across inclined honeycomb panels”. Heat Transfer, 1971, 99: 86–91

[13] Liu Yake. “Numerical simulation and analysis of convevtive heat transfer in the air layer of flat plate solar collector”. Xi’an University Of Architecture And Technology, 2011

[14] A.M. Shariah,A. Rousan, Kh.K. Rousan, A.A. Ahmad. “Effect of thermal conductivity of absorber plate on the performance of a solar water heater”. Applied Thermal Engineering.1999, 19 :733-741

[15] Zhao Jun, Gao Teng. “Heat transfer analysis and design optimization of flat plate solar collector”. Tianjin University, 2011

[16] Zhao Jun, Gao Liuhua. “Study on temperature field and flow field distribution in flat plate solar collector”. Tianjin University,2012

[17] Ni Bei, Ding Jun, Yang Qing. “Numerical simulation of flat plate solar collector in DC system”. Energy saving technology, 2011,29(1):20-23,41

[18] Dovic D, Andrassy M. “Numerically assisted analysis of flat and corrugated plate solar collectors thermal performances”. Solar Energy, 2012,86(9):2416-31

[19] Wei Shengxian, Li Ming, Ji Xu, Lin Wenxian, Zheng Shifeng, Li Guoliang, Luo Xi. “The optimization of aspect ratio and plate spacing of flat plate solar collector”. Journal of Agricultural Engineering, 2010,26(11):225-230

[20] Zheng Maoyu, Zhang Hongmin. “Experimental study on the thermal performance of the high efficiency plate solar collector cover”. Harbin Institute of Technology, 2006

[21] G. Leftheriotis, P. Yianoulis. “Characterisation and stability of low-emittance multiple coatings for glazing applications”. Solar Energy Materials & Solar Cells 58 (1999) :185-197

Analysis Of The Displacement Effect Of Temperature To The Curve Beam Bridge

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***Abstract*— The curve beam bridge usually has some deviation because of the curve, dead weight, temperature and other factors. As the temperature plays an important role among those factors during the service period of the bridge, it is necessary to analyze the deviation effect of the curve beam bridge caused by temperature variation. The internal force and the radial displacement of a bridge are analyzed under different condition of temperature, and compared with the influence of dead weight, shrinkage and creep; the results indicate that the temperature is the primary factor affecting the deviation of the curve beam bridge.**

***Index Terms*— system temperature; temperature gradient; deviation; curve beam bridge**

I INTRODUCTION

The developments and applications of the curve beam bridge are very fast all over the world because of its merits, such as beautiful appearance, less construction area, wide range of application[2-3]. It makes the curve beam bridge become the indispensable bridge style, and widely used in urban grade separation, highway bridge and the ramp. But the shortcomings of this kind of bridge are increasingly apparent with the widely use[4], first of all, and the most obvious, is the deviation of the beam body. So, it is urgent to figure out the cause of the emergence of deviation , and then find out the countermeasures.

We all know that there are lots of bridge problems are caused by the action of temperature[5-6], especially the curved bridges. The bridge will have a radial displacement with the increase of temperature[7], it can't be fully recovered by itself after the temperature went down, and the displacement will accumulate to be an obvious displacement with time grows.

We already knew that the temperature and the live load are the major roles to the curved bridge by reading literatures[8,9]. In order to analyze the influence of temperature, we chose an existing bridge crossed the Zhu Xi River in Chongqing, the approach bridges are located in a plane curve of 180m, the span is 25m + 2×28m. Used finite element software of Midas/FEA, the structure finite element model is shown in fig. 1.

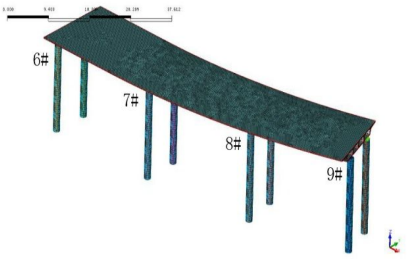

Figure 1. Structure finite element model

II THE EFFECT OF TEMPERATURE GRADIENT

Most of the bridges are outdoors, and suffering from the impact of a variety of natural environments. The temperature influence to the section will change with the depth of the concrete because of the lower heat transfer coefficient[7]. It makes the distribution of the temperature status is nonlinear.

when the sun warms the southern side, the northern side of the bridge will not get warmed by the sun immediately.The top plate and the webs (face the sunshine) will change a lot after the sun radiation, but the back variation is small, while the heat bilges cold and shrink nature of the concrete material means that the box girder will have the change in fig. 2.

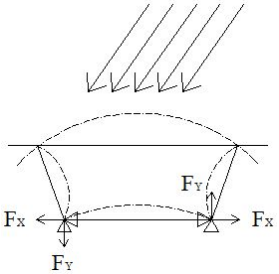

Figure 2. The box girder deformation to the sunshine temperature

III THE EFFECT OF SYSTEM TEMPERATURE

The temperature difference of system is the influence of seasonal temperature difference to the concrete girder bridge, that's why the system temperature changes slowly with the four seasons, it determines that we had better make the temperature to be a mean value. The result of the change of system temperature to the box

girder is the shrink or the expand of the arc segment, it means that the radius of curvature will change but the center angle is constant. The result of the system temperature change in the structure of box girder is shown in fig. 3.

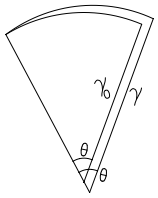

Figure 3. Deformation of the box girder to the action of system temperature

IV ANALYSIS METHOD

In our research, we considered three places of the box girder: the top plate, outside of the box and inside; analsised the deformation of 13 cross profiles between the 6# and 9# piers of the curve bridge under the change of system temperature,the radial displacement result is shown in Table 1.

And then we analsised radial displacement of the same cross profiles of the bridge under three values of temperature gradient, the radial displacement result is shown in Table 2.

TABLE I. THE RADIAL DISPLACEMENT ON DIFFERENT SECTION UNDER THE SAME TEMERATURE (UNIT:MM)

Heating position	Pier6	L/4	L/2	3L/4	Pier7	L/4	L/2	3L/4	Pier8	L/4	L/2	3L/4	Pier9
Top plate	4.2	4.6	4.7	4.9	5.2	5.5	6.1	5.4	5.1	4.8	4.5	4	3.8
Outside	-7.9	-5.1	-3.5	-0.4	2.7	3.5	4.5	2.8	2.2	-0.5	-3.1	-4.9	-7.5
Inside	7.8	5.2	3.2	0.2	-2.5	-3.2	-4.1	-2.9	-2.4	0.4	3	5.2	7.5

TABLE II. THE RADIAL DISPLACEMENT UNDER DIFFERENT TEMERATURE (UNIT:MM)

Temperature variation	Pier6	L/4	L/2	3L/4	Pier7	L/4	L/2	3L/4	Pier8	L/4	L/2	3L/4	Pier9
15℃	1.8	1.5	1.1	0.9	0.2	-0.3	-0.6	-0.4	0.3	0.5	1	1.4	1.7
25℃	2.7	2.3	1.5	0.8	0.1	-0.4	-0.9	-0.3	0.2	1	1.7	2.4	2.6
35℃	3.6	2.9	1.8	1.2	0.4	-0.7	-1.6	-0.6	0.3	1.4	1.9	2.8	3.5

As the Table 1 shown to us, the inner side of the box girder has the more obvious displacement compared to the outside of the box, the displacement of the side span is almost 10mm, but still relatively small compared with the top plate. We can also find out that the higher system temperature gradient, the bigger radial displacement from the Table 2, it can be applied to all the position of the cross profiles, and the radial displacement will change from the place of the arc segment, the closer the less displacement.

In order to compare the influence of the temperature of the structure with the other factors, we analyze the bridge under the follow conditions in the table 3, and got the bending moment and radial displacement as showed in table 4 and 5.

TABLE III.DIFFERENT WORKING CONDITIONS

Working condition	Detail
1	Dead weight
2	Live load
3	Shrinkage
4	Creep
5	System temperature
6	Temperature gradient

TABLE IV. BENDING MOMENT OF THE SECTIONS UNDER DIFFERENT WORKING CONDITION(UNIT:KN)

Section	Working condition					
	1	2	3	4	5	6
Pier6	0	0	0	-288.98	0	0
L/2	6654.14	3329.35	-250.09	-3388.55	0.07	500.19
Pier7	-22313.6	-25638.5	-456.76	-4653.29	1.01	1004.86
L/2	13090.83	9766.04	-55.24	14232.26	0.13	817.72
Pier8	-19425.7	-22750.5	-500.23	-4412.27	1.22	1121.12
L/2	6324.19	2999.4	-283.24	-4001.11	0.1	621.44
Pier9	0	0	0	-355.13	0	0

TABLE V. THE RADIAL DISPLACEMENT UNDER DIFFERENT WORKING CONDITION (UNIT:MM)

Section	Working condition					
	1	2	3	4	5	6
Pier6	2.2	4.9	1.1	1.3	4.2	3.6
L/2	1.8	5.4	0.6	0.8	4.7	1.8
Pier7	0.9	5.2	0.1	0.1	5.2	0.4
L/2	0.6	4.2	0.4	0.4	6.1	-1.6
Pier8	0.9	4.1	0.1	0.1	5.1	0.3
L/2	1.8	3.9	0.7	0.8	4.5	1.9
Pier9	2.2	2.7	1.2	1.2	3.8	3.5

As is shown in the table, first of all, the displacement of the bridge under the dead weight is very small, the biggest one was only 2.2mm, and happened at the end of the bridge beam; The horizontal displacement at the beam end and the centre for the side span was 4.9mm and 5.4mm under the live load, and the reverse of the side span was larger too; The shrinkage and creep made a smaller radial displacement but a bigger vertical deflection; surprisingly, the biggest radial displacement caused by the system temperature reached 6.1mm, and happened in the middle of the second span. All the result

indicated that the first important influence factor to the curve beam bridge is the system temperature, and then followed the live load.

CONCLUSIONS

In traditional cognition, the dead weight, the shrinkage and creep will not cause the obvious displacement, and the change of the deviation will be recovered after eliminating those loads. Our studies have shown that the traditional cognition is can be used in the straight line bridge in most times, however ,it can't be applied in the curve beam bridge. The dead weight, shrinkage and creep, prestressing etc. will cause the deviation to the outside of the curve. It is necessary to find out measures to control the deviation of the curve beam bridge.

The purpose of this study about the curve girder bridge temperature field could have a certain theoretical value and practical significance, and may ensure safety of curve bridge in operation process.

REFERENCES

[1]. [AASHTO,2005] "AASHTO LRFD Bridge Design Specifications". *American Association of State Highway and Transportation Officials*, Washington(DC); 2005.

[2]. H W YE, D J LIU. "Deviation Rectifying Study of Horizontally Curved Steel Box Girder Bridge", *The Eighth International Conference of Chinese Logistics and Transportation Professionals Logistic*s. ASCE. 2008, 2559-2564.

[3]. Y D Fu, John T. DeWolf. "Effect of Differential Temperature on a Curved Post-Tensioned Concrete Bridge". *Advances in Structural Engineering*. Vol. 7 No. 5 2004,385-398.

[4]. By S. Kaci. "Experimental Study of Mechanical Behavior of Composite Cables for Prestress". *Journal of Engineering Mechanics*, 1995,4,709-716.

[5]. X LEI, H W JIANG. "Research in Effective Temperature Difference of Concrete Box Girder Bridge".

[6]. J S YE, J LIN, P S QIAN, "Observation and research on temperature distribution in concrete box girders". *Journal of Southeast University Natural Science Edition*, Vol 32(5), 2002, pp.788-793.(in Chinese)

[7]. J. Suzuki, Y. Ohba, Y. Uchikawa, et al. "Monitoring temperatures on a real box-girder bridge and energy budget analysis for basic information on bridge cooling and surface freezing", *Journal of Bridge Engineering*, Vol 12(1), 2007, pp.45-52.

[8]. A. Norris, M. Saafi, P. Romine, "Temperature and moisture monitoring in concrete structures using embedded nanotechnology/ microelectromechanical systems(MEMS) sensors", *Construction and Building Materials*, Vol 22(2) , 2008, pp. 111-120.

[9]. M F LIU, X B ZHANG. "Temperature Distribution and Discharge Modeling of a Semiconductor Bridge". *IEEE Transactions on Plasma Science*, VOL. 40, NO. 1, January 2012,16-21.

Statistical Power Analysis for Construct Validity

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***Abstract*— Confirmatory factor analysis method is usually used in psychological surveys to evaluate the construct validity. But most of the researchers have been wasting their resources (e.g. effort, time, money) without power analysis at the beginning of their studies. The main purposes of this study are to analyze the statistical power, to estimate sample size for the confirmatory factor analysis model and to maximize the utility of the sources owned by the researchers. Monte Carlo Simulation is adopted to explore the power of the five-factor model. According to the result, the power is changed under different conditions. We found that the model has low power when the RMSEA value is closed to the alternative hypothesis' RMSEA. That is, the lower RMSEA of model does not necessarily have high power. The change of power is very complex, because it is subject to a number of factors that are different sample size, different alternative hypothesis, different estimator and different model.**

***Index Terms*— Power, Confirmatory Factor Analysis, Sample Size, Monte Carlo, Construct Validity**

I. INTRODUCTION

Construct validity has been as one of the important evaluations for potential structure of the scale. It is commonly examined with confirmatory factor analysis that is the measurement part of structural equation model (SEM). If the assumed model can fit the data, in theory, the latent factor structure of the scale can represent the psychological traits that the subjects. That is, the scale has good construct validity[1]. Because there are many goodness of fit statistics to determine that the assumed model is good or bad, actually this method has a high degree of subjectivity. In addition, even if the model fit is good, it does not represent the real situation because this test may have only the low power[2]. In null hypothesis significance test (NHST), the null hypothesis of no effect is often rejected when the sample size is very large, and researchers consider that the alternative hypotheses had a significant effect. The fit indexes of SEM may also like this. No matter the p value how small, we must make a type II error (β). Statistical power is the real description of the quality of the statistical test [3]. The researchers can calculate the sample size appropriately for the study hypothesis with the special statistical power, they can save their resources (e.g. time, energy and money) and ensure that research resources are fully utilized[4].

A. Power in NHST

In the behavioral and social sciences, the null hypothesis (H_0) often refers to the concerning issues that they may have no effect, but the alternative hypothesis (H_1) is that the effect size (ES) is really existed.

Statistical principles are as follows:

$H_0 : ES = 0$; $H_1 : ES \neq 0$

Comparing $p(data \mid H_0 is\ true)$ with

$\alpha = p(reject\ H_0 \mid H_0\ is\ true)$ ($type\ I\ error$);

$test\ statistics = f(N) \times ES$;

$\beta = p(not\ reject\ H_0 \mid H_0\ is\ false), (this\ is\ type\ II\ error)$;

$1-\beta = power = (reject\ H_0 \mid H_0\ is\ false)$;

$f(N)$ is a statistic related to sample size (N). ES shows the disagree between the data and null hypothesis (H_0).The following table displays the logic of NHST [3].

TABLE I.
THE LOGIC OF *NHST*

	What is true in the population	
	H_0 is really true	H_0 is really false
Results declare not significant (Don't reject H_0)	Correct Conclusion $(1-\alpha)$	Type II error (β)
(Reject H_0)	Type I error (α)	Correct Conclusion $(power = 1-\beta)$

B. Power in SEM

In the framework for SEM, as long as there is not enough evidence to reject the null model, it will consider accepting the assumed model due to the well goodness-fit-index. If our sample data is poor and may reject the null hypothesis, then the probability that we might make Type I error will increase. In contrast, we will get a high likelihood of type II error[5]. The concept of statistical power is defined as the probability of rejecting the null hypothesis given that the null hypothesis is false[3].

The null hypothesis in the context of SEM is defined by the specification of fixed and free elements in relevant parameter matrices of the model equations. This researchers' hypothesis may reflect the putative direct and/or indirect effects among the latent variables. The null hypothesis is assessed by forming a discrepancy function ($F = f(S-\Sigma)$) between the model-implied set of matrix (Σ) and the sample matrix (S) . The parameters

of the proposed model are estimated by minimizing the discrepancy between the S and the Σ implied by the model. Various discrepancy functions can be formed depending on the particular minimization algorithm being used (e.g. generalized least squares), but the goal remains the same-namely to derive a test statistic that has a known distribution, and then compare the obtained value of the test statistic against tabled values in order to render a decision vis-a-vis the null hypothesis[6].

The power of SEM is different from the traditional NHST. That is very complicated. Because the assessment of model and parameters refer to many fit indexes. Each fixed parameter in the model is potentially false and each can take on, in principle, an infinite number of alternative values. Thus, each fixed parameter needs to be evaluated one at a time. That is extremely complex and unrealistic.

There are two main types of power in SEM. One is based on the model parameters [7, 8].The other is based on the goodness-fit-index[1, 5, 7]. Generally speaking, the construct validity is described by the degree that the data fits our interesting model, so we choose the second method of power analysis using the goodness-fit-index that is the root-mean-square-error-of-approximation (RMSEA). According to Kim and M.B.S. method, we have chosen four values as the null hypothesis for observing the change of power. That is, the H_0 may be 0.00 (perfect fit), 0.03, 0.05 (close fit) or 0.08 (moderate fit).

In SEM, a not significant test statistic of overall fit is desired because the researcher typically does not want to reject a hypothesized model. However, this result can be due to lack of power. For example, a small sample size can guarantee low power. A not significant result in SEM will lead to an acceptance of a null hypothesis and may lead to publication. In other statistical methods a lack of power will result in demonstrating no effect and therefore it will not lead to publication. Therefore, power is an even more important issue in SEM than in other statistical methods.

This paper examines the relation among fit indexes, power, discrepancy function and sample size in SEM for evaluating the quality of construct validity. The two main existing methods of computing power have estimated by specifying an alternative hypothesis or alternative fit, but we chose the Kim and M.B.S method. These methods cannot be implemented easily and reliably. Our purpose is only the variety of power with considering different factors. At the same time, we can compute the sample size for our investment on a certain level of power. The different factors on power and sample size estimates are discussed.

II. METHOD

Monte Carlo simulations are growing in popularity, also known as statistical simulation and random sampling. It is a stochastic simulation method, based on mathematical statistics and probability theory and implemented in the computer. Monte Carlo method can generate random numbers (pseudo-random number) to address the research questions associated with the probability model and obtain the approximate solution. This is the idea of Monte Carlo analysis[9].

To the Paxton et al.'s point of Monte Carlo experiments, we adopted a nine-step procedure. The steps were conceptualized as occurring in three stages: research design, simulation implement, summaries[10].

A. The First Stage: Research Design

In this stage, five steps had been created.

Step (1): Research questions.

We want to know the power how to change under the different conditions (e.g. different sample sizes, estimators, observed items and alternative hypothesis).

Step (2): The selection of representative model.

The chosen model is first-order five factors CFA model. The observed items can be varied each factor. Generally, the psychometric researchers expected that the low correlation among the latent factors, high loadings between factors and the observed variables. The measurement model has five factors, each of which may have three, five, eight or ten continuous factor indicators.

Step (3): Design Experiment.

We just want to the change of power with following factors. The latent factors is continuous data and obeyed the normal distribution, no missing. The sample size is from 100 to 500 at intervals of 100. The estimator are weighted least squares (WLS, this is asymptotically distribution free discrepancy functions), generalized least squares (GLS) and maximum likelihood (ML)[1, 11, 12].

TABLE II.
THE COMPARISON OF OF THREE DISCREPANCY FUNCTIONS

Discrepancy function	W derived as	Equation
WLS	Asymptotic covariance matrix	$F_{WLS}=\frac{1}{2}tr\left\{\left[(S-\Sigma)W^{-1}\right]^2\right\}$
GLS	Function of elements of S	$F_{GLS}=\frac{1}{2}tr\left[\left(I-S^{-1}\Sigma\right)^2\right]$
ML	Function of elements of Σ	$F_{ML}=\log\lvert\Sigma\rvert-\log\lvert S\Sigma^{-1}\rvert+tr\left(S\Sigma^{-1}\right)-p$

The number of observed variables are three, five, eight or ten, respectively. The power of model is calculated by the method of Kim and M.B.S using the *RMSEA* index. This index is treated as the alternative hypothesis and acts as a important role of *ES* . However, according to the method of M.B.S, the null hypothesis has different values and we have chosen four numbers. Respectively, those are 0.00, 0.03, 0.05 and 0.08. The Alpha is fixed at 0.05. In summary, we consider the power with the 180 (5*3*4*3) different factors.

Step (4): The Set of Parameters.

Data are generated using the following parameter values. The factor loadings are 0.8. The residual variances of the factor indicators are 0.36. Factor variances are fixed to one to set the metric of the factors. The factor correlation is 0.25. All factor loadings are free. These population values are chosen so that the variances

of the factor indicators are one, which makes the parameter values more easily interpretable. That is advised by Muthén and Muthén[8].

Step (5): Choosing Software.

Monte Carlo simulation is performed with the ML estimator in Mlpus7.0. The CFA with GLS and WLS estimator is implemented in the same program [1, 8]. The power is computed in the R 2.15.2 and the code is provided by Preacher et al. [13].

B. The Second Stage: Simulation Implement.

Step (6): Executing the simulations.

Now we can get the raw data that was generated in Mplus with the target model designed and the values of the parameters determined. Note that the change to the code needed for every sample and estimator.

Step (7): File Storage.

At last there were 20 (5*4, equal to the different types sample size times the total number of model) raw data files that would be analyzed in CFA with the different estimators. The data of model with different items was stored in a new folder.

Step (8): Verification.

In every step of the programming, we focus on the change of the code, such as the new sample size, the new estimator of CFA and the new data filename. Specifically, despite some data may be not converged using different experiment conditions, we still kept them in the analysis and might be find something that were usually ignored. This is our purpose that the stability of estimator is found by mutual comparison under different conditions.

III. RESULTS

The Third Stage: Summarizing Results. This is also Step (9).

Completion of the above-mentioned 8 steps, it indicates that Monte Carlo simulation have implemented thoroughly. We can calculate the power each RMSEA using the Preacher's R-code. At last, we have summarized those power values in the following table 2.

First, we found that there are many spaces in the WLS column. This is not what we intentionally do not fill, but there is no value to write. Because the model can not converge with the WLS estimator in the same condition. This phenomenon shows that the WLS estimator may require a higher quality data compared to the ML and GLS methods in the same model. In addition, the stability of the WLS' convergence is getting worse with more and more complex model. There is a little difference in power using GLS and ML estimators under the same conditions. With the increase in the sample size and the complexity of the model, the power will be more close to 1.

Second, because of the different test reference standards (null hypothesis), the change of the power shows that it is low in the center and high at each end. This is very interesting. It is very different from our usual understanding. Not the model fitting better, the higher power. Because its trend is not monotonic.

At last, we have found that the power is stabilized and little change. Therefore, when we make a scale for psychological trials, the number of observed variables for each latent factor should not be too many or too few. This result indicates that about eight items for every factor is appropriate relatively.

IV. CONCLUSION

Monte Carlo method havs been used to explore the assumption of statistical theory. There have been many recent calls to use Monte Carlo method as a tool to improve applications of quantitative methods in substantive research[8, 10, 14, 15]. The main purpose of this study is to demonstrate how Monte Carlo method can be used to estimate the power of the SEM within different conditions. This can be used to evaluate the construct validity of the questionnaire. However, the power of SEM is extremely complex as a function of number of observed variables, degrees of freedom, the RMSEA of null hypothesis, different estimators and sample size. According to the property of Monte Carlo method, the RMSEA statistics behave differently[16]. The power would be affected greatly these factors of our experiments. We recommend that the scales should include each factor of eight items in order to permit a high statistical power of the SEM. The construct validity may be good.

Primary limitation of this study is to consider only a class method of calculating the power of SEM. That is Kim and M.B.S. method using the RMSEA. We do not consider another goodness-fit-index (e.g. CFI, Steiger's γ and McDonald's fit index)[5]. Finally, in this study our main concern is only a particular SEM with five latent continuous factors, normal distribution and no missing data, which the breadth of research results subjects to certain limitations.

TABLE III.
Power in Different Conditions

Number of observed variables		3 items			5 items			8 items			10 items		
Sample Size (N)	RMSEA(H_0)	WLS	GLS	ML	WLS	GLS	ML	WLS	GLS	ML	WLS	GLS	ML
100	0.00	----	0.134	0.114	----	0.308	0.308	----	1.000	0.969	----	1.000	1.000
	0.03	----	0.053	0.064	----	0.245	0.065	----	0.487	0.598	----	0.656	0.969
	0.05	----	0.217	0.247	----	0.817	0.413	----	0.996	0.182	----	1.000	0.074
	0.08	----	0.851	0.873	----	1.000	0.999	----	1.000	1.000	----	1.000	1.000
200	0.00	0.999	0.211	0.088	1.000	0.591	0.131	----	1.000	0.437	----	1.000	0.785

	0.03	0.985	0.079	0.180	1.000	0.591	0.392	----	0.935	0.514	----	0.991	0.466
	0.05	0.731	0.552	0.746	0.992	0.999	0.996	----	1.000	1.000	----	1.000	1.000
	0.08	0.180	0.999	1.000	0.380	1.000	1.000	----	1.000	1.000	----	1.000	1.000
300	0.00	0.848	0.138	0.087	----	0.078	0.098	----	1.000	0.247	----	1.000	0.400
	0.03	0.307	0.245	0.331	----	0.813	0.776	----	0.999	0.978	----	1.000	0.998
	0.05	0.265	0.934	0.963	----	1.000	1.000	----	1.000	1.000	----	1.000	1.000
	0.08	1.000	1.000	1.000	----	1.000	1.000	----	1.000	1.000	----	1.000	1.000
400	0.00	0.801	0.255	0.077	1.000	0.975	0.090	----	1.000	0.153	----	1.000	0.246
	0.03	0.125	0.257	0.531	1.000	0.975	0.951	----	1.000	1.000	----	1.000	1.000
	0.05	0.698	0.981	0.998	1.000	1.000	1.000	----	1.000	1.000	----	1.000	1.000
	0.08	1.000	1.000	1.000	1.000	1.000	1.000	----	1.000	1.000	----	1.000	1.000
500	0.00	0.331	0.059	0.762	1.000	0.088	0.762	----	1.000	0.121	----	1.000	0.191
	0.03	0.328	0.738	0.694	0.997	0.993	0.995	----	1.000	1.000	----	1.000	1.000
	0.05	0.997	1.000	1.000	0.331	1.000	1.000	----	1.000	1.000	----	1.000	1.000
	0.08	1.000	1.000	1.000	1.000	1.000	1.000	----	1.000	1.000	----	1.000	1.000

REFERENCES

[1] J.C. Wang, X.Q. Wang, *"Structural equation modeling: Application using Mplus"*. China: Higher Education Press, 2012.

[2] J. Miles, "A framework for power analysis using a structural equation moldelling procedure". *BMC Medical Research Methodology*, 2003. 3(1): p. 1-11.

[3] Cohen, B.H. and R.B. Lea, "Essentials of statistics for the social and behavioral sciences". New Jersey: John Wiley & Sons, 2004.

[4] Myers, N.D., S. Ahn, and Y. Jin, *"*Sample size and power estimates for a confirmatory factor analytic model in exercise and sport: A Monte Carlo approach". *Research Quarterly for Exerclse and Sport*, 2011. 82(3): p. 412-423.

[5] Kim, K.H., *"*The relation among fit indexes, power, and sample size in structural equation modeling". *Structural Equation Modeling*, 2005. 12(3): p. 368-390.

[6] Kaplan, D., *"*Statistical power in structural equation models". *http://www2.gsu.edu/~mkteer/power.html*, 1996.

[7] MacCallum, R.C., M.W. Browne, and H.M. Sugawara, *"*Power analysis and determination of sample size for covariance structure modeling". *Psychological Methods*, 1996. 1(2): p. 130-149.

[8] Muthén, L.K. and B.Q. Muthén, *"*How to use a Monte Carlo study to decide on sample size and determine power". *Structural Equation Modeling*, 2002. 9(4): p. 599-620.

[9] Robert, C.P. and G. Casella, *"Introducing Monte Carlo methods with R*". New York: Springer, 2009.

[10] Paxton, P., et al., *"*Monte Carlo experiments: Design and implementation". *Structural Equation Modeling*, 2001. 8(2): p. 287-312.

[11] M.W. Browne, *"*Asymptotically distribution-free methods for the analysis of covariance-structures". *British Journal of Mathematical & Statistical Psychology*, 1984. 37(May): p. 62-83.

[12] K.G. Jöreskog, *"*Some contributions to maximum likelihood factor analysis". *Psychometrika,* 1967. 32(4): p. 443-482.

[13] K.J. Preacher, D.L. Coffman, *"*Computing power and minimum sample size for RMSEA [Computer softerware] ". *Available from http://quantpsy,org/*, 2006.

[14] S.E. Maxwell, K. Kelley, and J.R. Rausch, *"*Sample size planning for statistical power and accuracy in parameter estimation". *Annual Review of Psychology.* 2008. 59: p. 537-63.

[15] F. Thoemmes, D. MacKinnon, and M.R. Reiser, *"*Power analysis for complex mediational designs using Monte Carlo methods". *Structural Equation Modeling* 2010. 17(3): p. 510-534.

[16] L.T. Hu, P.M. Bentler, *"*Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives". *Structural Equation Modeling,* 1999. 6(1): p. 1-55.

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Identification and improving biocontrol effect of strain PG-7 by genetic modification with chitinase gene

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***Abstract*— Previous study has determined biocontrol strain PG-7 could inhibit Alternaria alternata f. sp. Mali which caused apple early defoliation disease. In this study, strain PG-7 was identified as Bacillus substilis firstly. In order to enhance its inhibitory activity, a 6.5kb DNA fragment containing chitinase gene from PUG1965 was inserted into vector pBE2 to construct recombination plasmids which was called PBE2-chib. A new recombined strain named PG-7-chib was formed by transferring the recombination plasmids into PG-7. The PCR identification of chitinase gene and chitin plate culture confirmed that chitinase gene was transferred successfully into the wild strain PG-7. The original chitinase activity of PG-7-chib was 4.66 U/mL. Compared to PG-7, PG-7-chib was found to increase 56.4% antagonist activity against Alternaria alternata f. sp. Mali**

***Index Terms*— Bacillus subsitlis; Chitinase ; Alternaria alternata f. sp. Mali; Transfer; Biocontrol**

I. INTRODUCTION

Apple early defoliation disease, caused by *Alternaria alternata f. sp. Mali*, is one of the most important diseases on the apple fruit in China[1].The disease was characterized by brown blotches on the leaves that are often surrounded by a dark margin and slightly sunken spots in fruit[2]. Recently, a high incidence of apple early defoliation disease is gradually becoming a major problem in the fruit production industry, due to an increase in planting of varieties with good quality[3].Biological control is a non-toxic, safe, effective, and economical process for kiwifruit production system[3,4]. *Bacillus* is a dominant biocontrol agent that commonly applied to control fruit and vegetable diseases [5-7]. Chitin is a molecule composed by the insoluble linear polymer β-1-4-N-acetylglucosamine (GlcNAc) and is cell walls of pathogenetic fungi. It could be hydrolyzed by chitinase which is encoded by chitinase gene[8-10].The biocontrol ability of antagonistic bacteria could be enhanced by inserting chitinase gene and construct gene recombination[11]. In this study, a new recombined strain named PG-7-chib was formed by transferring the recombination plasmids combined with chitinase gene chib into *Bacillus substilis* PG-7[12]. After testing chitinase activity and antagonistic activity against *Alternaria alternata f. sp. Mali*, the recombined strain showed stronger ability than wild strain and it could be potential agent in controlling apple early defoliation disease.

II. MATERIALS AND METHODS

A. strain and plasmids

The strain PG-7, which couldn't digest the chitin, was obtained from the College of Life Sciences, Northwest University, Xi'an, China. Plasmids was shown in table1.

B. Enzymes

Both *Sal* I restriction endonuclease and T4 DNA ligase were obtained from Takara company

Table 1 strain and plasmid

strain or plasmid	characteristic	source
PG-7	Couldn't digest chitin	Northwest University
E.coli DH 5α	Preparation of competent cells	Fourth Military Medical University
PUC 1965	Chitinase activity	Fourth Military Medical University
pBE2	E. coli - B. subtilis shuttle plasmid	Fourth Military Medical University

C. Morphological and biochemical characteristics

Visual observations of both morphological and microscopic characteristics of colonies of the test bacteria were made using light microscopy. Gram staining was carried out according to standard microbiological procedures. Spore formation was determined by malachite green staining of cells. After the putatively antagonistic bacterial strain was inoculated onto plates by streaking, it was incubated at 37 ℃ for 24 h. Then the colony morphology, texture, border features, color, and optical properties were recorded.

Catalase and oxidase activity assays, saccharide or spirits fermentation experiments, a Voges-Proskauer (VP) test, an amylohydrolysis assay, a casein hydrolysis assay, a utilization of citrate test, a nitrate deoxidizing test, a salt endurance test, growth ability on NA plates (pH 5.7), formation of H_2S and indole, and a cellulose decompose test were all carried out according to standard microorganism experimental procedures. All experiments mentioned above were repeated three times.

D. Preparation of recombinant plasmid and competent cell

Plasmid PUC1965 was a 6.5Kb DNA fragment containing the chitinase gene chib was inserted into PUC19 vector to construct a new plasmid PUC1965. The 6.5Kb DNA fragment with chitinase gene was cut from PUC 1965 by *Sal* I restriction endonuclease firstly, and then was recovered by 1% agarose gel electrophoresis. Using the same method mentioned above, the *E.coli-Bacillus sp* shuttle plasmid PBE2 was cut and recovered. After that, both the two recovered products were connected by ligase and then were transformed into *E. coli DH 5α* competent cells. After being cultured in the chitin medium at 30 ℃ for 36h, the transformant containing a recombinant plasmid was selected out and could produce hydrolysis circle. The recombinant plasmid was named as PBE2-chib

E. Preparation of electroporation cell and its transformation by electric shock[13]

The strain PG-7 was inoculated into LB liquid medium. After being cultured in Shake flask at 30℃ for 20h, the strain PG-7 was inoculated into 100ml LB liquid medium in accordance with the ratio of 1:10 and was cultured at 30℃ for 3h. Then the strain culture medium was placed in the ice for 30min and centrifuged at 3500 r/min, 4 ℃ . The sediment contained strain PG-7 was collected and was washed twice by precooling ultrapure water. After being washed twice by electric shock buffer, the strain PG-7 was suspended into 1.0 mL of shock buffer. Each 100μL distributed strain was added into 5-10μL constructed plasmid DNA respectively. After being placed for 3min, the mixture was transferred into the electroporation cup and was taken electric shock. At last, the electric shock fluid was added into 800μL LB media at 30℃ for 45min recovery training, then it was spread onto the plates containing chitin and cultivated at 30℃ for 12h. After the transformant was selected, the coincidence of the target gene band was verified by PCR.

F. Comparison of antagonistic activity of wild strain and engineering bacteria

The antagonistic activity of strain were tested by using plate confrontation method. As the indicator bacteria, the pathogen *Alternaria alternata f. sp. Mali* was inoculated onto the center of PDA plate by using the point inoculation. After been cultured for 2d, when the colony diameter was about 1-1.5cm,the strain PG-7 and PG-7-chib were inoculated onto the PDA plate by using the point inoculation. The distance between the stain and pathogen was 2.5cm.The PDA plate which only inoculated pathogen was taken as control. After been cultured at 28 ℃ for 3-5d, the growth condition of pathogen was observed and the width of inhibition zone was record. The inhibition ratio was calculated by the formula:

Inhibition ratio= [1-(expansion radius between the pathogen and inhibition zone/expansion radius of control pathogen] ×100%

Inhibition ratio= [1-(expansion radius of pathogen with the antagonistic bacteria inoculation/expansion radius of control pathogen] ×100%

G. The determination of strain growth curve

Both the wild strain PG-7 and the engineering bacteria PG-7-chib were cultured in LB medium and grow curve was determined as previous report[14].

H. Chitinase activity determination[15,16]

The wild strain PG-7 and the engineering bacteria PG-7-chib were respectively inoculated into chitin liquid medium with the inoculation amount of 1%.After being cultured for 48h,the culture liquid was centrifuged at 12000 r/m , 4℃ . The obtained supernatant was the test sample. The samples were concentrated by using

freeze-drying and polyethylene glycol. The chitinase activity was determinated by DNS colorimetry method[16,17].The sample which was inactivated by 100℃ high temperature was taken as control.

The enzyme activity units is defined as the amount of enzyme protein which is needed by hydrolysis of chitin and producing of 1μmol reducing sugar

III. RESULT AND DISCUSSION

A. Phenotypic characterization of strain PG-7

The morphology of individual cells and colonies of strain PG-7 was observed. Cells were gram-positive rods, occurring singly or in pairs, forming oval spores (at mid-cell) in enlarged cysts (1.1 × 0.9 μm). Colonies were dry, folded, and opaque, with an irregular diffused edge.

B. Physiological and biochemical characterization

PG-7 was strictly aerobic, capable of growing on nutrient broth (pH 5.7), with salt tolerances of 2, 5, 7, and 10 %, could ferment a variety of carbohydrate compounds including glucose (only acid produced) and mannose, but did not produce indole or H_2S. The strain gave positive reactions in tests for starch and casein hydrolysis, gelatin liquefaction, VP test (pH 7.83), citrate utilization, catalase and oxidase and nitrite reduction. Combined the result mentioned above, the strain PG-7was identified as species of *Bacillius substilis*

C. Construction of recombinant plasmid

The constructed recombinant plasmid pBE2-chib contained a 6.5kb DNA fragment with chitinase gene which obtained from pUC1965.The establishment process was shown in Fig 1. After transforming into competent cell *E. coli DH 5α*, the colonies were transferred onto the chitin plates .After they were

cultured for 2d, the hydrolysis circle plates around the colonies could be observed obviously. The results shown above all indicated that chitinase gene had been transformed into the competent cell *E. coli DH 5α* and expressed successfully.

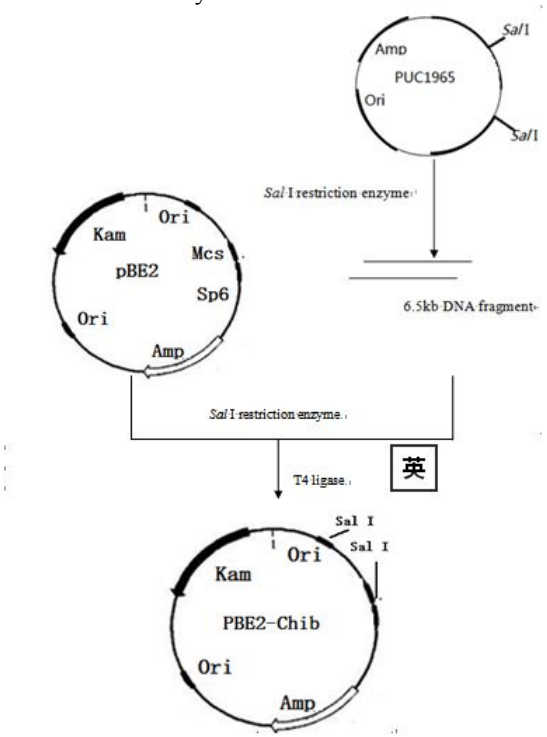

Fig1 The construction of recombined plasmid PBE2-Chib

D. Electric shock and transformation

The strain PG-7 was given Electric shock on the condition of 1400 V, 200 Ω. In order to verified the target gene band, PCR amplification was done. Both the engineering bacteria PG-7-Chib which contained chitinase gene and the wild strain PG-7 were taken as the PCR templates respectively. A pair of primers, which was prepared according to the chitinase gene sequence, was shown as follows: SN:5'GGAATTCGATGTCCACACGTAAAGCCG3', ASN: 5'GGAATTCGATGTCCACACGTAAAGCCGT 3'

The primers were synthesized by Sangon Biotech (Shanghai) Co. Ltd. The PCR result was shown in Fig.2.As was shown in Fig.2, there could be seen a clear electrophoretic band which is about 1.5kb in the lanes 2.The size of the electrophoretic band was consistent with the expected chitinase gene band, moreover, there wasn't other band .All mentioned above showed that the electroporation was successfully.

E. Antagonistic effects of the PG-7 and PG-7-chib against pathogen Alternaria alternata f. sp. Mali

The antagonistic effects of the PG-7 and PG-7-chib against pathogen *Alternaria alternata f. sp. Mali* were compared and the results were shown in table 2.The antagonistic effects of **engineering** bacteria PG-7-chib was remarkably stronger than wild strain PG-7.Compared to PG-7, The inhibition rate of PG-7-chib increased 56.4%

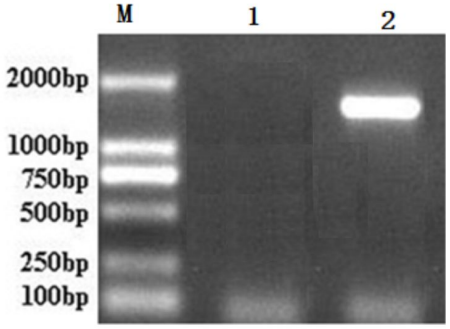

Fig 2 PCR identification of Chitinase gene

Lanes: 1, DNA Marker in base pairs of D2000; Lane2, wild strain PG7; Lane3, engineering bacteria PG-7-chib

Table 2 Antagonistic activity of PG7 and PG7-Chib

Strain	Inhibition distance(mm)	Inhibition rate(%)
PG-7	13.6±0.6	46.8
PG-7-Chib	19.8±1.2	73.6

F. Growth curve of strain PG-7 and PG-7-Chib

The growth curve of wild strain PG-7 and engineering bacteria PG-7 chit was shown in Fig.3.As was shown in the figure, the growth curve of PG-7chit was basically consistent with PG-7. From this, we could know the transformation of chitinase gene didn't affect the bacteria's growth.

G. *Chitinase activity determination*

The chitinase activity of wild strain PG-7 and the engineering bacteria PG-7-chib were determined by DNS calorimetry. The results were shown in the table 3. As was shown in the table3, after being transformed by the chitinase gene, the PG-7-chib exhibited higher chitinase activity than PG-7.

Ⅳ. CONCLUSION

As was shown in the results, with the successfully chitinase gene transformation, the antagonistic activity of the recipient strain PG-7-chib against pathogen *Alternaria alternata f. sp. Mali* was significantly improved. After chitinase gene was transformed into PG-7, the chitinase activity of original crude enzyme solution of the engineering strain PG-7-chib reached 4.66U/mL. Meanwhile, as the engineering strain PG-7-chib also had a stable antibacterial effect, it could be an effective biocontrol agent against *Alternaria alternata f. sp. Mali* and would be used the sebsequenced field trials.

V. ACKNOWLEDGEMENTS

This work was financially supported by Agricultural Science and Technology Achievements Transformation Fund Project (2012GB2G000451) and Youth Scientific Research Projects in Henan Institute of Education(20100103)

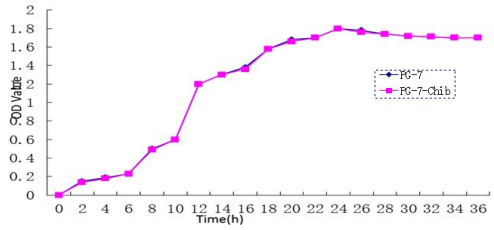

Fig3.The growth curve of PG-7 and PG-7-Chib

REFERENCE

[1] Li, Y.; Hirst, P.M.; Wan, Y.; Liu, Y.; Zhou, Q.; Gao, H.; Guo, Y.; Zhao, Z.; Wang, L.; Han, M. Resistance to marssonina coronaria and alternaria alternata apple pathotype in the major apple cultivars and rootstocks used in china. *HortScience* 2012, *47*, 1241-1244.

[2] Harteveld, D.O.; Akinsanmi, O.A.; Drenth, A. Pathogenic variation of alternaria species associated with leaf blotch and fruit spot of apple in australia. *European Journal of Plant Pathology* 2014, *139*, 789-799.

[3] Li, Y.; Aldwinckle, H.S.; Sutton, T.; Tsuge, T.; Kang, G.; Cong, P.-H.; Cheng, Z.-M. Interactions of apple and the alternaria alternata apple pathotype. *Critical Reviews in Plant Sciences* 2013, *32*, 141-150.

[4] Diaz, R.; Manrique, V.; Hibbard, K.; Fox, A.; Roda, A.; Gandolfo, D.; Mckay, F.; Medal, J.; Hight, S.; Overholt, W. Successful biological control of tropical soda apple (solanales: Solanaceae) in florida: A review of key program components. *Florida Entomologist* 2014, *97*, 179-190.

[5] Chen, Y.; Yan, F.; Chai, Y.; Liu, H.; Kolter, R.; Losick, R.; Guo, J.h. Biocontrol of tomato wilt disease by bacillus subtilis isolates from natural environments depends on conserved genes mediating biofilm formation. *Environmental microbiology* 2013, *15*, 848-864.

[6] Li, Y.; Han, L.-R.; Zhang, Y.; Fu, X.; Chen, X.; Zhang, L.; Mei, R.; Wang, Q. Biological control of apple ring rot on fruit by bacillus amyloliquefaciens 9001. *The plant pathology journal* 2013, *29*, 168.

[7] Ju, R.; Zhao, Y.; Li, J.; Jiang, H.; Liu, P.; Yang, T.; Bao, Z.; Zhou, B.; Zhou, X.; Liu, X. Identification and evaluation of a potential biocontrol agent, bacillus subtilis, against fusarium sp. In apple seedlings. *Annals of Microbiology* 2014, *64*, 377-383.

[8] Banani, H.; Spadaro, D.; Zhang, D.; Matic, S.; Garibaldi, A.; Gullino, M.L. Postharvest application of a novel chitinase cloned from metschnikowia fructicola and overexpressed in pichia pastoris to control brown rot of peaches. *International Journal of Food Microbiology* 2015.

[9] Beier, S.; Mohit, V.; Ettema, T.J.; Östman, Ö.; Tranvik, L.J.; Bertilsson, S. Pronounced seasonal dynamics of freshwater chitinase genes and chitin processing. *Environmental microbiology* 2012, *14*, 2467-2479.

[10] Gruber, S.; Kubicek, C.P.; Seidl-Seiboth, V. Differential regulation of orthologous chitinase genes in mycoparasitic trichoderma species. *Applied and environmental microbiology* 2011, *77*, 7217-7226.

[11] Malmierca, M.; Cardoza, R.; Alexander, N.; McCormick, S.; Hermosa, R.; Monte, E.; Gutiérrez, S. Involvement of trichoderma trichothecenes in the biocontrol activity and induction of plant defense-related genes. *Applied and environmental microbiology* 2012, *78*, 4856-4868.

[12] Gutiérrez-Román, M.I.; Dunn, M.F.; Tinoco-Valencia, R.; Holguín-Meléndez, F.; Huerta-Palacios, G.; Guillén-Navarro, K. Potentiation of the synergistic activities of chitinases chia, chib and chic from serratia marcescens cffsur-b2 by chitobiase (chb) and chitin binding protein (cbp). *World Journal of Microbiology and Biotechnology* 2014, *30*, 33-42.

[13] Janjua, S.; Younis, S.; Deeba, F.; Naqvi, S.S. High efficiency DNA transformation protocol for escherichia coli using combination of physico-chemical methods. *International Journal of Agriculture and Biology* 2014, *16*, 132-138.

[14] Monon, J. The growth of bacterial cultures. *Selected Papers in Molecular Biology by Jacques Monod* 2012, 139.

[15] Ferrari, A.R.; Gaber, Y.; Fraaije, M.W. A fast, sensitive and easy colorimetric assay for chitinase and cellulase activity detection. *Biotechnology for biofuels* 2014, *7*, 1-8.

[16] Wu, Q.; Bai, L.; Liu, W.; Li, Y.; Lu, C.; Li, Y.; Fu, K.; Yu, C.; Chen, J. Construction of a a01 transformant with a gene from p1 and evaluation of its biocontrol activity against. *The Journal of Microbiology* 2013, *2*, 166-173.

[17] Kang, O.L.; Ghani, M.; Hassan, O.; Rahmati, S.; Ramli, N. Novel agaro-oligosaccharide production through enzymatic hydrolysis: Physicochemical properties and antioxidant activities. *Food Hydrocolloids* 2014, *42*, 304-308.

Application Status and Functional Analysis of Library Computer Management System

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***Abstract*—Up to now, with the rapid development of modern computer science and technology, original library management system can no longer meet the requirement of increasingly modernized library book management. Under this context, the library computer management system basic on computer science has undertaken the important tasks of library management. Meanwhile, with increasing concerns of China on the extent of computer management, more capitals will start to flow to the library computer management system. In view of this situation, this paper will concretely introduce the system construction of library management and flow management of books, and specially address the problems of computer management reconstruction and workflow design of computer management, library book system management and library daily consumables consumption, inventory statistics and purchase budget management in the library management flow, analyze and study the functional structure of current library computer management system, and provide reference and suggestion to the development of library computer management system.**

***Index Terms*—library, computer management system, application status, function exploration and analysis**

I. Application Status of Library Computer Management System

A. An analysis on application of library computer management system

To carry out the design and study of library computer management system, the first step is the analysis and study on the application of library computer management system. During the study, it is necessary to evaluate the development technical route and strategy of library computer system. Meanwhile, it is also required to analyze and evaluate the internal and external environment factors in the application of library computer management system, find out the defects in existing library computer management system and make analysis and study on the application of library computer management system[1-3].

Firstly, economic applicability analysis is made on the application of library computer management system. During the process of analysis, feasibility analysis is made by F analysis. F check analysis . During this process, consideration is mainly given to the fundamental configuration required by library computer management system and the potential expenses involved in subsequent system maintenance.

Secondly, carry out the technical analysis on application of library computer management system. During the analysis and study, chi-square test is adopted to verify. Substitute it into chi-square test formula: , in which n=a+b+c+d is sample size. Meanwhile, during the analysis, it should be aware that most library management systems are basic on B/S model and run in Microsoft visual studio integrated development environment. During the design, development and application of computer management system, many cases are available for references and it can completely meet the practical demands of library system without any technical difficulty.

At last, carry out the analysis on the operation and application of library computer management system. Normal distribution test method is adopted in analysis and study. Normal distribution analysis: . In general situations, library system is basic on B/S model structure and the management staffs of library and readers only need to complete some fundamental operations of library system from their own computers. Meanwhile, this system is equipped with a perfect self-defense function and can be used safely. It has higher operational performance and can be perfectly introduced by library to greatly improve the management efficiency.

B. Application demand analysis of library computer management system

During the application and study of library computer management system, it is necessary to sufficiently combine the practical demands of library management process. In this paper, the fundamental objectives to complete the management of library computer system lie in the following 3 targets: firstly, computer management reconstruction and work flow design of management items and processes of library; secondly, unified coding and inventory (batch) management of library books; thirdly, library consumable usage, inventory statistics and purchase budget management. Therefore, during the design of library computer management system, the following 3 aspects should be tightly involved[4,5].

II. Exploration and Analysis on Library Computer Management System

A. Exploration and analysis on overall architecture function of library computer management system

During the application of library computer management system, the first step is to complete the exploration into the overall function of library computer management system. In general situations, overall architecture of library computer management system includes fundamental system presentation layer, business logic layer and database layer, which can improve the management efficiency of library during performance[6,7].

During the design process of presentation layer in library computer management system, to complete the computer management transformation and workflow design of management flow in book management item, DIV+CSS technology is usually adopted to optimize the design of data form in presentation layer. The integrated development of presentation layer of system is made by the Microsoft Visual Studio 2008. Education information is updated by corresponding editor to guarantee library management items can be transformed to fluent computer management data, improve the overall expressive force of library computer management system. To be specific, overall architecture functions of library computer management system are shown in the fig. 1:

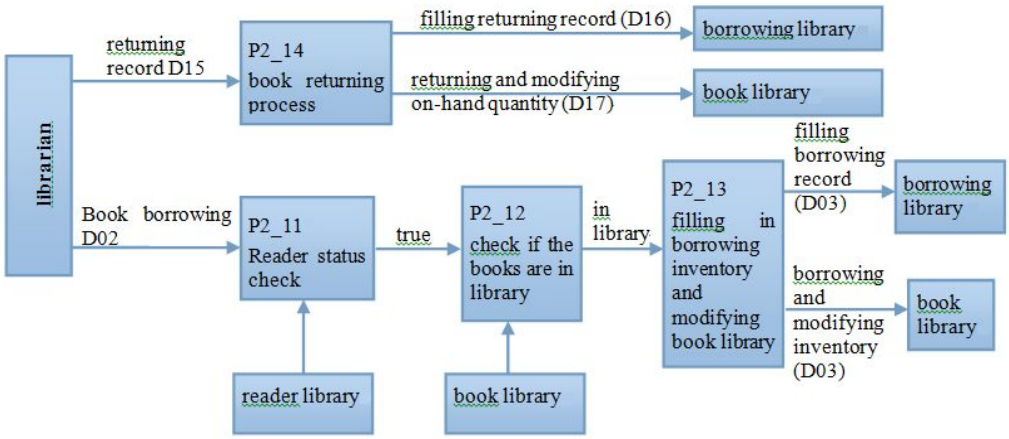

Figure 1. Overall architecture diagram of library computer management system.

During the functional analysis on the logic layer of library computer management system, to complete the design process of books management and daily consumable usage in books management, it is required to fit the specific library management items to library computer management system during the construction process of logic function in library management business. ADO.NET is used to build data access to visit the information of book management consumables, library consumables, library inventory statistics and library book purchase budget, which is stored in PC. C# language is adopted to open corresponding data document information and visit the data information. The main objective to perfect the function of business logic layer is to complete the status authentication of administrator for data information. Only the administrators, who have passed access registration, can have the authority to modify information data. Comparatively, by the design on business logic layer, the system can display the data information of library administrators from different layers according to the authority of library administrator accounts.

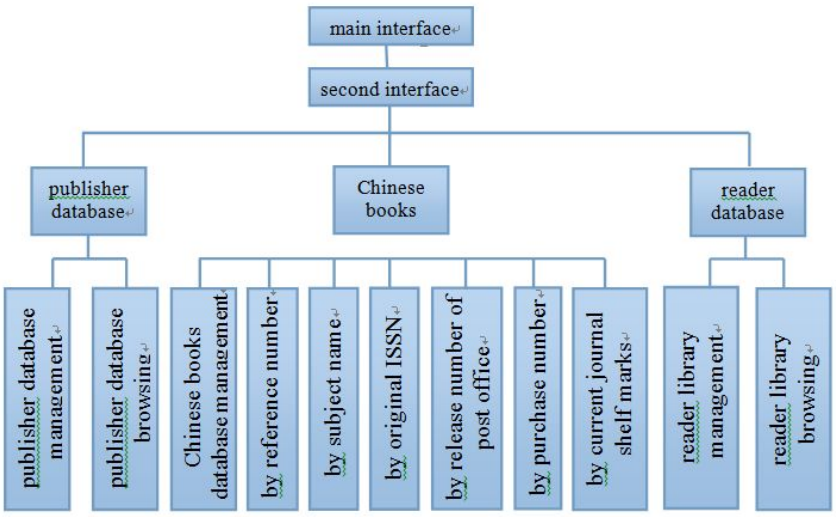

Figure 2. Structure diagram of logic function of library computer management system.

During the design of database layer, to complete the effective control on various data information in library computer management system (including book information, library facility information and book code information), and carry out storage management on the information of administrators (including library administrators and library system), it is required to constantly enrich the storage scope of database layer for the convenience of invoking the information in any time.

In conclusion, it can be seen that in the overall architecture design of library computer management system, system presentation layer, business logic layer and database layer supplements each other to address the function exertion of computer management system, library equipment and books management and library management consumable usage in the management flow of library management.

B. Exploration and analysis on function module of library computer management system

During the process to optimize the application of function module of library computer management system, structured method is adopted to fulfill this task. Library information treatment is achieved by designing the properties of external modules of library computer management system. During this process, various functional modules in library information system must be improved in function and each library management sub-system supplements each other to complete the module design of library management system. The process of perfecting library computer management system is shown in fig. 3.

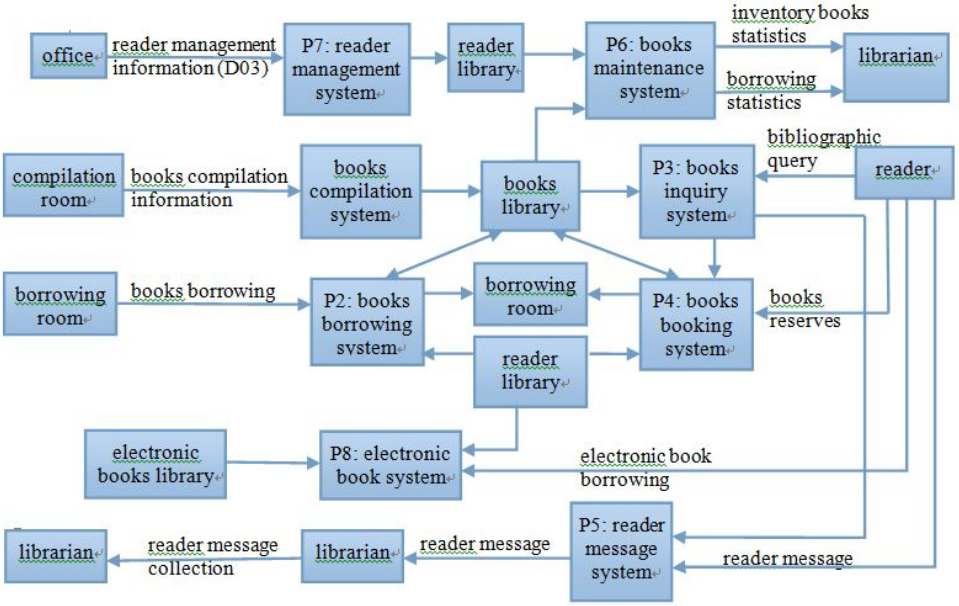

Figure 3. Functional module structure of library computer management system.

During the application of library computer management system, the librarians and readers access the library computer management system by web browser. In a webpage, these functional modules are shown to the teachers and students of library in different webpage modules. To effectively improve the safety and maneuverability of function module design of library computer management system, there is the classification of librarian, library staff and reader during the design. Function modules are designed by the liability and authority of these 3 roles to provide different authority management scopes for different personnel. For example, librarian can be provided the authority of books information management, usage of consumables, books inventory statistics and purchase budget management, and reader reservation. Users cannot are kept from the authority beyond their grade.

C. Logic function module of library computer management system

The function exertion of logic module of library computer management system is mainly fulfilled by prototyping of computer system. During the construction, it aims to complete the design of logic module of library computer management system with minimum resources according to the requirement of library computer management system software. Meanwhile, during the creation of an executable logic control system inside library computer management system, actual requirements of logic function are fully exerted. Meanwhile, on the basics of this logic system of library computer management system, logic system of library computer management system can be further decorated and additional logic function of demands is added according to the specific requirements of librarian. For example, the unified coding management and usage of consumables of books, which is concentrated by this paper, is added to the logic system of library computer management system in subsequent steps. Generally, logic management of library computer management system includes the following 3 points: first, administrator information management of library; second, reservation logic management in the usage of library; third, logic information management of various books[8-10].

Input: record the concrete information of new books. During the input, must-fill and optional information must be separately separated and given necessary remarks. During the usage of library computer management system, Rapid Prototyping is adopted for design to complete the design of logic system and input process of data with as few resources as possible.

Output: if the output of information of newly-imported books is a failure, user should pay attention to the incoming system of books according to the tips provided by library computer management system. If the treatment is successful, the system will provide evident display.

Processing logic: according to the role information of librarian, confirm the conditions of library equipment management and complete the inputting operation of book information according to inputted data.

D. Objective function design of library computer management

Objective function of library computer management is associated with the development of system. During the objective function design of library computer management, developers should give full consideration to the margin of system design and screen the book information of system, and confirm the basic properties of various information data in library information system.

During the design of object-oriented library computer management system, classification and screening should be performed according to different objects and properties. In generally situations, objects to be classified include entity information (mainly refer to important real book information which must be stored by library computer management system on long-term basis), control information (mainly refer to the information of book articles in the logic module management of library computer management system). During the application of library computer management system, it can start with the demand of library computer management system and list required data list.

III. CONCLUSION

In conclusion, during the application status analysis and functional exploration of library computer management system, user can efficiently complete library books management statistics, unified coding of library consumables through the analysis of function modules to effectively improve library management efficiency.

REFERENCES

[1] S. M. Wang, “Conception of module library and data base management system for finite element analysis,” *Computers and Structures,* vol. 32, pp. 1073-1083, 1989.

[2] K. J. Satao, “Information system for library management. A systems study and design,” *Modelling, Measurement & Control D: Manufacturing, Management, Human & Socio-Economic Problems*, vol. 9, pp. 39-53, 1994.

[3] Z. Q. Wu, Q. G. Pu, and N. Mastorakis, “The system parameter fusion principle and its application to optimizing an integrated system for library management,” *WSEAS Transactions on Systems*, vol. 4, pp. 1368-1375, August 2005.

[4] Vasupongayya and Sangsuree, “Open source library management system software: A review,” *World Academy of Science, Engineering and Technology*, vol. 77, pp. 973-978, May 2011.

[5] F. H. Wang, “Application of computer information technology in library information management system,” *WIT Transactions on Information and Communication Technologies*, vol. 49, pp. 879-884, 2014.

[6] H. C. Yu and C. S. Indushobha, “Factors influencing students' use of a library Web portal: Applying course-integrated information literacy instruction as an intervention,” The Internet and Higher Education, Vol. 26, Pp. 42-55, July 2015.

[7] P. Namkee, R. Raul, L. Seungyoon and E. C. Jae, “User acceptance of a digital library system in developing countries: An application of the Technology Acceptance Model,” International Journal of Information Management, vol. 29, pp. 196-209, June 2009.

[8] S. S. Mary and R. P. Gary, “Application of systems analysis to depository library decision making regarding the use of new technology,” Government Information Quarterly, vol. 1, pp. 285-307, 1984.

[9] J. Hanbo, “An investigation of user perceptions and behavioral intentions towards the e-library,” Library Collections, Acquisitions, and Technical Services, vol. 35, pp. 45-60, 2011.

[10] S. Adrian, H. Jason and L. Ickjai, “Mobile augmented reality based context-aware library management system,” Expert Systems with Applications, Vol. 41, pp. 2174-2185, April 2014.

Risk research of exhibition and conference in internet

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***Abstract*—In recent years, the exhibition and conference in internet has become the new economic growth point. However, there are a lot of security risks in Online exhibition compared with the traditional exhibition, This article analyses the risk from four aspects between exhibition and conference in internet and Traditional convention.**

***Index Terms*- exhibition and conference in internet; risk analysis; Service quality**

A lot of Internet users arise with the rapid development of Internet technology, they need video conference system and Video display system with remote, real-time, fast and efficient, they take part in conference and display in internet increasingly.

Exhibition and conference in internet is display in internet using Internet technology, exhibition and conference in internet is known as the never ending exhibition and conference because of the limits of the breakthrough in time and space. Exhibition and conference in internet includes exhibition in internet,conference in internet and video conferencing, etc.

In recent years the total number in some exhibition of some developed countries in the world is declined, especially information industry exhibitors and visitors because the information technology industry more use of network technology on the Internet for business negotiation, communication, network service, online exhibition booming.

I SECURITY OF EXHIBITION AND CONFERENCE IN INTERNET

The implementation of exhibition and conference in internet rely on modern information technology, computer network information has serious vulnerability on every link because of the globality, openness, diffusivity, and constant features, it is vulnerable to be attacked by hackers , many date occurred.

Interference, missing, missing, or even artificial leak, tampering, stealing, pretending, abusing and damaging , a lot of threate come from network.

Security risk of exhibition site information system is derived from the social environment, technical environment vulnerability and the threat of physical deterioration of natural environment. Social environment refers to all kinds of social organizations and personnel.

Technology environment refers to the technical factors of exhibition site information system, including: hardware, software, network structure, local area network (LAN), information collection, information processing, information transmission, information storage, security management and technical safety management, etc. Physical environment refers to come from the physical basis support ability and the change of natural environment.

A Social environment threat

Social environment threat is mainly the threat of competitors, social environment and personal, specific attack means mainly include: internal spying and damage, unauthorized access, censored, forgery, repeat, denial, interrupt and destroy, etc. It has considerable harm.

B Not maturity of technology environment

Technology environment vulnerability is derived from the exhibition of information system technology and management. Include: the security of the network equipment, the security of the operating system, protocol software, weakness of security monitoring system, the low resistance to virus and hacker attacks, the security of the application service, etc.

C physical deterioration of natural environment.

Physical deterioration of the natural environment online exhibition information system refers to the physical basis of support ability decline or disappear, including power supply or interrupt, voltage fluctuation, static or the influence of strong magnetic field, as well as force majeure such as natural disaster

II THE THREAT FROM THE AUDIENCE

Since the online exhibition is conducting on the Internet, which requires to attract netizens. Therefore it is the first problem to solve how to attract netizens .

A Network specialization degree is poor

At present, there is a gap of technology on the online exhibition to developed regions, many network platform are not be able to provide online exhibition, can not carry out online exhibition site. It limits the increase in online exhibition to the higher level of development, makes the online exhibition is still stay in propaganda stage. Network technology can only roughly at the present stage in China to meet the needs of the online exhibition, It cannot bright online exhibition into more sophisticated, more professional level. So it can lead to the development of online exhibition in wide range, but not more professional development.

B Service quality is low

Online exhibition in China lack of a complete system of service, online service consciousness is low, less additional services, commitment does not conform to the reality of the situation in the process of service, lacks the

necessary guidance and requirements for the degree and quality of the service personnel in the process of the service, etc. Online exhibition service problems seriously affected the enthusiasm of the exhibitors and visitors, it will affect the brand value and image of the exhibition.

C Web design without innovation

The appearance features of the online exhibition directly affect the online exhibition theme style and number of customers. But most of the website design style fixed in recent years, some can be no thematic website directly. At the same time, the domestic online exhibition site copy foreign advanced exhibition national site, there is no ability to innovate.

D Network propaganda is smaller

Online exhibition Depends on exhibitors support for online exhibition and publicity from the unknown to the household. Online exhibition publicity is not enough in China, however, do needs to strength in the key link improve propaganda network system. Due to inadequate of the propaganda audience has a one-sided understanding to the online exhibition, it restricts the development of online exhibition.

III THE INTEGRITY OF ONLINE EXHIBITION

The online exhibition is a hot topic of exhibition economy in recent years. However, most of the network show its function mainly locating in online display, another important function, online trading has developed slowly. this kind of situation and integrity problem has important contact.

A Lack of laws and regulations

At present, the development of the entire online exhibition market is still in a state of spontaneous and lack of necessary laws and regulations of supervision. Enterprise trades in the online exhibition without any warranty, neither the government's credibility as a guarantee nor any legal means to safeguard, it will lead to enterprises dare not to participate in the online exhibition.

B Industry regulation is lax

China has no unified domestic convention in online exhibition and exhibition management department has not a "chapter" in online exhibition management system, the expansion of the scope increase difficulty in the online exhibition management., the supervision of the online exhibition is to be loosened with this reason and lead to the lack of effective management, false trade will increase on the online exhibition, enterprise increase risks in online transactions.

C Lack of integrity education online exhibition

Integrity management of online exhibition is always the important problem of convention and exhibition, often main body make a cheat and conceal consumer to the maximization of self-interest, which restricts the development of online exhibition. Integrity education of online exhibition in our country is difficult to form a unified system, It is difficult to achieve the same effect between the government and practitioners, It influences the development of the online exhibition trustworthiness education.

IV NO GOAL OF NETWORK MARKETING

The effect of the development in online exhibition has close relationship with marketing, using a variety of means to continuously strengthen exhibition marketing is helpful to accelerate the development of the online exhibition. But there are still many problems in online exhibition marketing in reality, so you need to continue to improve.

A The blindness of marketing

By the bondage of traditional exhibition and conference and exhibition marketing, online marketing is pursuit the public taste, while ignoring the personalized demand. Therefore it leads to different to each online exhibition marketing , audience will also is no creativity and dull without market research marketing ,it causes net exhibition enterprise can not able to accurately grasp the taste.

B no marketing innovation

Now most of online marketing use a template, it is not fully considering the characteristics of the place. in innovative new ways such online exhibition mode is not any vitality, the end result is not into mediocrity but the death, this is the problems of online marketing, it is typical of marketing no innovation, the result is very obvious. it is can't lack in any place to innovate as the inexhaustible driving force.

C Lack of draw lessons from foreign advanced experience marketing

Due to the different between the traditional marketing way domestic to foreign marketing way, some of the convention and exhibition companies unable think domestic foreign marketing, online marketing also takes to the domestic exhibition marketing in order to keep costs low ,thus it leads to our net exhibition enterprises continuously in a marketing mode, and no advanced exhibition countries experience for reference.Net exhibition marketing mode in our country are always a backwater.

REFERENCE

[1] Wang qi-ji *Exhibition Project Management* [M]. Bei jing：China Business Press，2004.

[2] Bai si-jun *Modern Project Management*[M]. Beijing：Machinery Industry Press，2004. 32

[3] Liu da-ke,Wang qi-jing *Introduction to exhibition activities* [M]. Beijing：Tsinghua University Press.2004.

[4] Luyou-jie,Lujia-yi *Project Ri sk Management*[M] . Beijing ： Tsinghua University Press.2000

[5] Gu meng-di, Lei peng . *Risk Management*[M] . Beijing ： Tsinghua University Press.2005.

[6] 2010 Shanghai World Expo (Volume I, Volume II, Volume III). Shanghai World Expo 2010 Bid Committees.2002.1

[7] Wu zhong， Xu bo. “Risk in the Shanghai World Expo” [J]. International Business Studies，2007

[8] Robert K Wysocki. Little Robert. *Baker. Effective project management*[M]. 2002

[9] Kathy. Project risk management. Market Management.2002

Algorithm of 3D Geometric Data Compression

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***Abstract*—Triangle mesh and octree structure which used to describe three-dimensional,It broadly used in the three-dimensional modeling,3D collision detection , 3D data compression and so on. In this paper,we analysis and comparison of the triangle mesh compression of single resolution compression and multi-resolution compression two methods, comparison of 3D surface and volume data representation compression metho d ,improve a classic non-progressive compression algorithm Edgebreaker algorithm.**

***Index Terms*--ingle resolution compression; multi-resolution compression; data compression**

I. INTRODUCTION

The original data collecting by three-dimensional laser scanning technology is called the point cloud data, which are discrete massive data sets without distribution pattern a pattern. So it is necessary to do some processing on these data, establish three-dimensional data model and do efficient data compression on three-dimensional data based on data model, in order to make three-dimensional data transmission in network easily, so that all users can have access to the network and using the three-dimensional data. Three-dimensional data compression is based on two ways of three-dimensional data representation: surface-based representation and volume-based representation. Volume notation usually adopts octree structure model, and node data consist of the spatial coordinates and characteristics.Table 1 is based on two representations of three-dimensional data compression advantages and disadvantages of contrast.

TABLE I
3D surface and volume data representation compression method comparison table

3D data expresse	expressed / lossless	compressi on ratio	applications
Surface	lossless	less	virtual reality, entertainment
volumetric	expressed	high	GIS, medical hotspot

II. SINGLE RESOLUTION COMPRESSION

Because of hardware and software support for the surface-based representation , the triangle mesh compression research has mainly divided into two directions: the single resolution compression and multi-resolution compression. In the existing single resolution compression methods, Michael Deering [1] based on common triangular mesh geometry compression, Stefan Gumhold's [2] the triangle mesh compression algorithms and real-time connection between Gabriel Taubin [3] Based topology geometry compression algorithm surgery are more representative. In the existing multi-resolution compression research methods, in which Stefan Gumhold[4] of compression of discrete multi-resolution models, Gabriel Taubin's[5] progressive forest split algorithms are fairly representative. Table 2 is based on two representations of single resolution compression.

TABLE II
two representations of single resolution compression method comparison table

3D model	(bits)	compression ratio	
		triangle mesh	Based connection
tricerato ps	179,704	5.8/1	7.4/1
galleon	155,064	8.2/1	11.2/1
viper	1,698,116	8.6/1	11.6/1
cherry	958,160	9.2/1	12.0/1
insect	8,383,788	7.2/1	11.4/1

Edgebreaker mesh traversal algorithm is based on the principle of regional growth: the process of navigating the grid should always maintain an edge formed by a directional boundary, the boundary of the mesh into parts and not traverse some have traversed, then each traversal a polygon, the output of the polygon and the boundary of a topological relations operations (character), and the portion of the polygon classified encoded traversal specific process is as follows: first select any one of the border triangle formed initially, and then select any one side of current edge Edgebreaker algorithm uses five operators C, L, E, R and S records topological triangle with the current border, where, C represents the third vertex topology is not on the border; L and R represent a third boundary vertices In addition to the current and the current triangle on the outer side there is an edge (e) on the boundary, L and R, respectively, in different directions in the current edge e; the use of S the graph divided into two parts, and the need to use additional offset or other operations recording branching information; E represents three sides of the triangle are on the boundary is shown in FIG. 1 C, L, E, R, and S.

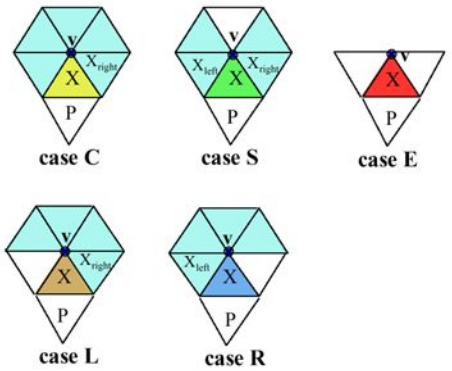

Figure 1 3D surface and volume data representation compression method comparison table

III.OCTREE MODEL

The octree model is a tree data structure to describe three-dimensional space, and it can be seen the promotion of quadtree method in three-dimensional space. A three-dimensional array of voxels represents an improved physical methods. Octree is the decomposition of three-dimensional shape of, it carried an external cube shape's division into eight smaller cubes from front, left, up and down directions, shown in Figure 2. if the small cube unit is full or empty, it indicates that the cube is completely in the form or not in form, then it stops decomposition; physical possession of some small cubes need to be further decomposed into eight sub-cubes, until all elements of small cubes are full or empty, or decomposed to a predetermined decomposition accuracy (similar to resolution of three-dimensional object). According to Storage structure, octree are divided into pointer octree and linear octree.

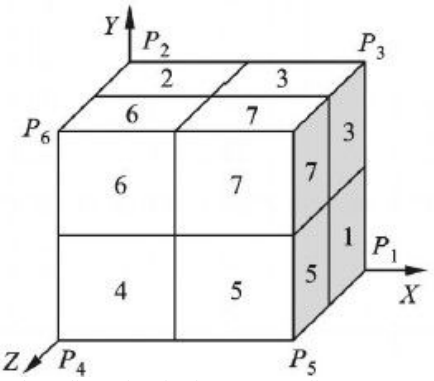

Figure 2.Three dimensional cube corresponding to octree node

The pointer octree represents each node in the tree by recording nine fields. One field is used to describe the characteristics of the node (full, empty, partially occupied), the rest of the eight fields are used as a store of its eight sub-point node pointer. The pointer octree is with some defects, and the biggest problem is that the pointer takes up a lot of space. Assume that each pointer use two bytes, description node use a byte, then amount of storage of the pointer is to be 94% of the total amount of storage. Thus, although it is easy to use this storage method, it can not be applied to three-dimensional data compression.

The linear octree advantage is that it saves only the leaf nodes, and each leaf node only needs two fields to store for storage attribute and spatial location in each field. In the application it will encode each octree leaf node, each octree's coded value is unique, which can be identified by the path from the root to leaves; moreover, this value also determines the octree leaf node position in the integer coordinate system, which we call Morton codes, and each code by Morton digit consists of R octal numbers, and R is the maximum number of octree decomposition. The linear octree saves a lot of storage space, the consequences are causing lower node query efficiency, because when octree structure changes, storage nodes have to be reordered, which makes linear octree in practical applications subject to many restrictions. For this we established linear structure and multi-index, so the query efficiency and operational efficiency in the application process octree nodes are greatly improved.

IV. FURTHER COMPRESSION IN OCTREE MODEL

Morton code's directly reduction substantially reduces octree resolution and the accuracy of the data. It is mainly by substituting the upper leaf nodes to the root node of the plurality of data compression, when the distribution of denser point cloud data, this method is of high efficiency. For a large point cloud data, abandoning certain details' influence on the accuracy of the impact of the image data is limited, but it can greatly reduce the length of the Morton code, reducing storage space and improving the efficiency of data processing.

Morton optimized code can be further reduced, the current article on the lowest resolution Morton get further compression, the compression algorithm idea is as follows: First, get through all the leaf nodes, simply leave a leaf node to the same the root, with same the root of the remaining leaves we take an additional one byte node information to reflect the status bits. In Figure 3, if the leaf nodes of the Morton code 4,5,7 are respectively 11BDEB64,11BDEB65,11BDEB67, we can only keep coding leaf node 4, and the addition of a status bit use 10,110,000 to represent up to nearly 3 times compression, the best case can be made nearly seven times of the compression efficiency.

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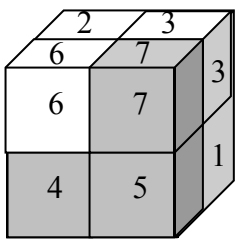

Figure 3. cloud node of octree

V. CONCLUSIONS

This paper focuses on the 3D point cloud data using linear octree spatial and Triangle mesh data structure, and Morton coding optimization and further compression algorithms are discussed.

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REFERENCES

[1] Deering M. Geometry compression. In: Computer Graphics Proceedings, Annual Conference Series. New York: ACM SIGGRAPH, ACM Press, 1995. 13-20

[2] Stefan Gumhold, Wolfgany Stroβer. Real time compression of triangle mesh connectivity. In: Computer Graphics Proceedings, Annual Conference Series. New York: ACM SIGGRAPH, ACM Press, 1998. 133-140

[3] Taubin G, Rossignac J. Geometry compression through topological surgery. ACM Transactions on Graphics, 1998, 17(2): 84-115

[4] Stefan Gumhold, Reinhard Klein. Compression of discrete multiresolution models. Tech Rep: WSI-98-1. WSI-GRIS, 1998

[5] Taubin G, Andre Gueziec, William Horn et al. Progressive forest split compression. In: Computer Graphics Proceedings, Annual Conference Series. New York: ACM SIGGRAPH, ACM Press, 1998. 123-132

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