ISSN : 0974 - 7435 Volume 10 Issue 18

2014

BioTechnology

An Indian Journal

FULL PAPER

BTAIJ, 10(18), 2014 [10749-10754]

Problems and resolutions in the application of computer technology in construction quality management

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ABSTRACT

With the rapid development of information age, computer technology is widely used in many fields. There is no exception of construction. The application of computer technology will improve the construction quality management. However, there is still inadequate systematic research and indistinct management model in the management and application of construction quality. Thus, the application of computer in construction quality management is not as good as imaged. This essay is designed to conduct corresponding research on the impact of computer management model on the construction quality management, and deepen its research combined with the specific construction methods of the two models. Besides, relevant discussion will also be implemented on the defects and corresponding resolutions in the application of computer technology in construction quality management. This research approach will clarify the research process, hoping to lay a solid theoretical foundation to the subsequent exploration works.

KEYWORDS

Computer technology; Construction; Quality management; Inadequate application; Resolution improvement.

INTRODUCTION

From the development point of view, computer network technology can meet the current development requirements. With its popularity, computer technology is convenient and helpful to people's works and lives. The application of computer technology is also prevalent in construction quality management, but the exploration efforts can't satisfy the requirements of current construction development. Combined with the principle knowledge modeling based on ontology and the construction and formal representation of body, this essay analyses the specific problems in the application and summarizes the resolutions. This clarifies the research process and lays a solid theoretical foundation to the subsequent exploration works.

PRINCIPLE KNOWLEDGE MODELING BASED ON ONTOLOGY

Analysis of knowledge modeling of construction quality management

In the management of construction quality, standardization refers to the adequate and rational utilization of construction tools and resources, so as to efficiently guarantee the construction quality. Principles are reflected in the structure of chapter, purpose and hierarchy, making the modeling has strong organization function (See TABLE 1)[1]. Seeing from the quality acceptance of construction foundation, it is expressed in characters or relevant pictures, which aims to restrict the project management objects, making it to be the fundamental condition and methods. However, principle knowledge is reflected in two aspects. First, contextual information and principle restriction. Contextual information mainly prescribe the external conditions of the documents, while principle has a wider range, including geometric range, basic characteristics of the material, application form of construction and response mechanical parameters.

TABLE 1 : Quality acceptance of foundation construction

No.	Method of forming holes		Permissible variation of pile diameter (mm)	Permissible variation of verticality (%)	Permissible variation of pile position (mm)	
					Border piles of a grouped piles foundation, and those of a single-row foundation containing 1~3 pile(s) that are vertical to the center line	Intermediate piles of a grouped piles foundation and, those of a strip foundation containing that are vertical to the center line
1	Mud encasing pile	D≤1000mm	±50	＜1	D/6, and not exceed 100	D/4, and not exceed 150
		D≥1000mm	±50		100+0.01H	150+0.01H
2	Sleeve poreforming pile	D≤1500mm	-20	＜1	70	150
		D＞500mm			100	150
3	Dry poreforming pile		-20	＜1	70	150
4	Manual digging pile	Concrete encasing	±50	＜0.5	20	150
		Concrete encasing	±50	＜1	100	200

Principle knowledge modeling based on ontology

Ontology is formalized conceptual model in construction quality management. It is shared in quality management system. The relationship is clarified between clear definitions a specific concept. This enables the ontology have corresponding semantic meanings. Meanwhile, rational concept hierarchy and effective logical reasoning process will provide support to the construction of model and cope with the specific defects. There are many research and plentiful references on construction management worldwide. The integration of ontology in researches enables the model to express the contextual information effectively making it a part of the intangible knowledge. The intangible knowledge is clarified through the application of contextual data model, which will greatly stimulate the retrieval of project information. Seeing from the contextual characteristics of construction quality monitoring, contextual object model can satisfy the detection and monitoring on construction quality. Besides, it will have clearer restriction on principles, so as to achieve comprehensive management in information management.

In research and discussion, this essay fully exploits and explores the contextual information depicted by ontology through the above methods. Thus ontology construction can be applied in quality monitoring and construction process. Many factors, like relevant concepts, specific characteristics of ontology and the inner relationship between ontologies, are involved in the process. The available principles can be further marked to enable the principle to express semantically, so as to build a corresponding mark corpus. This would simultaneously reduce the management pressure between different dimensions and

diminish the retrieval space making the standard ontology to be marked, which includes several dimensions, like nation, local, industry, management. In this way the organization process would be unitized and rationized. On the other hand, the inner relationship between different marks can influence each other, making the semantic meaning between principles have positive influence on parallel retrieval.

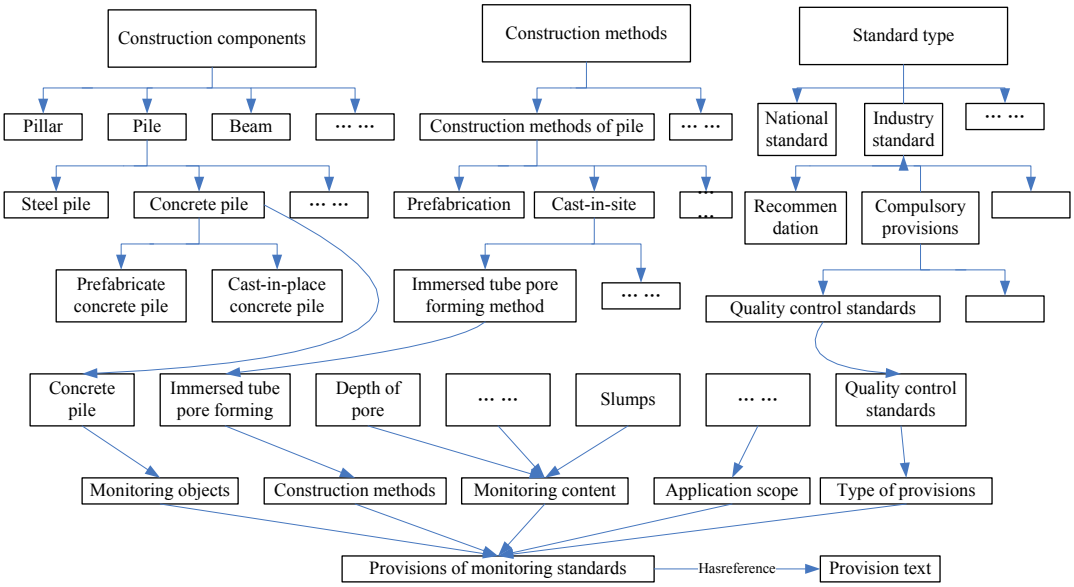

Figure 1 : Semantic modeling of principle based on ontology

The framework of semantic modeling of principle can be seen from the above figure.(See Figure 1) Then, relevant knowledge points can be analyzed and integrated, monitoring objects can be clarified, and construction methods and contextual information can be obtained. These messages can be marked through the concepts and corresponding relationships. For example, in the semantic marking of principles in concrete pile quality testing regulations, the marking information mainly comes from the concepts of ontology or the practical examples on the ontology. Relevant information can be got through marking, combining with the collection of corresponding semantic relationship between fringe and ontology; the semantic marking information can be saved in the format of RDF.

CONSTRUCTION AND FORMAL REPRESENTATION OF ONTOLOGY

As to the construction process of computer construction quality management system, the construction of ontology is an essential part[3]. Construction quality management system involves a vast amount of fields, so the references are the foundation at the scientific construction of the system. Relevant quality criteria should be an important reference, and the relevant concept and specific terminologies should be collected in the quality criteria. With the help of relevant professionals, the concept and terminologies can be complemented and refined, so as to form a corresponding concept and terminology bank. Through this, the basic framework can be scientifically built further perfected in the establishment of ontology. The attribute can be depicted through formalized methods, thus clarifying the specific relationship between the concepts and adequately expressing the restriction and practical examples. However, in the process of any construction quality management, the information is the specific representation of ontology in this field. The corresponding discussion takes foundation construction as example to illustrate the construction of ontology.

Locating of construction foundation

After the conformation of construction area, study of available terminology and relevant achievements, quality management documents, like foundation construction quality acceptance, should be semantically marked correspondingly. Also, the specific logical relationship between them should be established and referred as the main concept in the construction process to represent its importance.

The relationship between categories, category and level

As an essential part of the ontology construction, category is the core of the project. Its main effect is to give summary to the concepts in the field. The hierarchical relationship between categories is the specific characterization of the necessary connection. Category can be defined from its concept, as is shown in Figure 2.

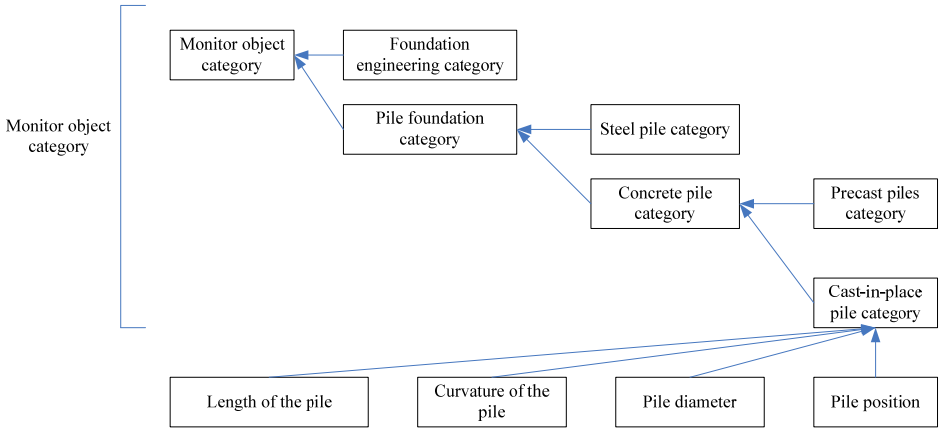

Figure 2 : Ontology hierarchy structure of management objects

The ontology of management should be confirmed through the construction object and classified according to relevant terminology. Subclasses are established by level adhering to the principle of top-down.

Definition of relationship, setting of attributes

However, as to concept, besides the parent class subclass relationship, there is relevant parallel relationship, including two categories: exclusive relationship and synonymous relationship. The relationship has corresponding definition given by specific semantic meanings. For instance, (x, y) refers to the complete different attribute between X and Y in exclusive relationship. However, no common individual is appeared here. From the relationship, the attribute of the two categories can be seen and the relational value can be restricted effectively. Ontology category of construction method can be seen through Figure 3.

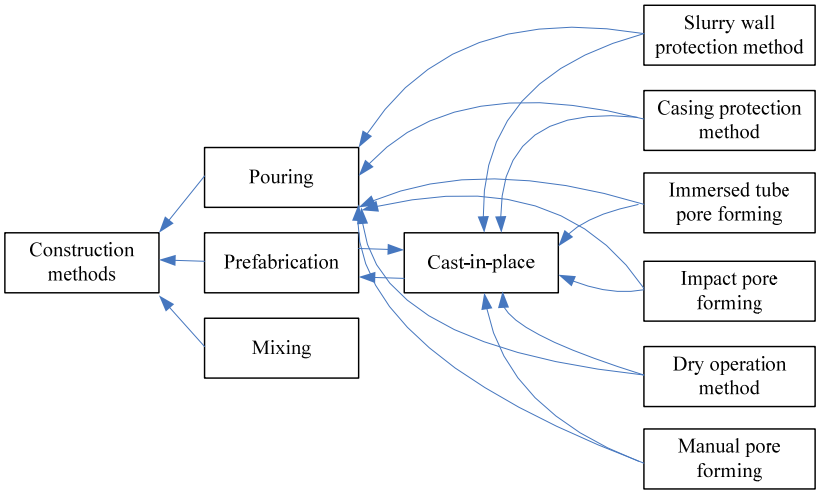

Figure 3 : Ontology category of construction method

Formalized representation of ontology

In the construction of ontology, its categories are defined correspondingly, and its levels are also divided to clarify its attributes. Then in the application of its system, the language should be adequately transformed, which is the key point of description and marking in ontology language. As an recommended semantics in the model construction, the expression of OWL should fully illustrate the logical relationships, so as to formalized the ontology language. However, the saving of ontology text is expressed in OWL format. For example, the ontology storage fragment contains parent class subclass, exclusive and synonymous semantic relationship, expressing the exclusive relationship in owl: disjoint with, in the utilization process of the document.

System network architecture

The range of quality monitoring management system is comparatively wider, so as to monitor and manage the daily business and make the management process move towards scientification and internetization. For instance, the manager can rationally authorize and allocate the operation permission. Thus, the management system would give automatic verification

tips to complete the monitoring task as required. In the process the technical document will update the interface constantly, enabling the faulty report to be updated to the Internet timely, so as to make the inquiry process proceed smoothly and effectively. The function and architecture of GCJC system network is shown as Figure 4.

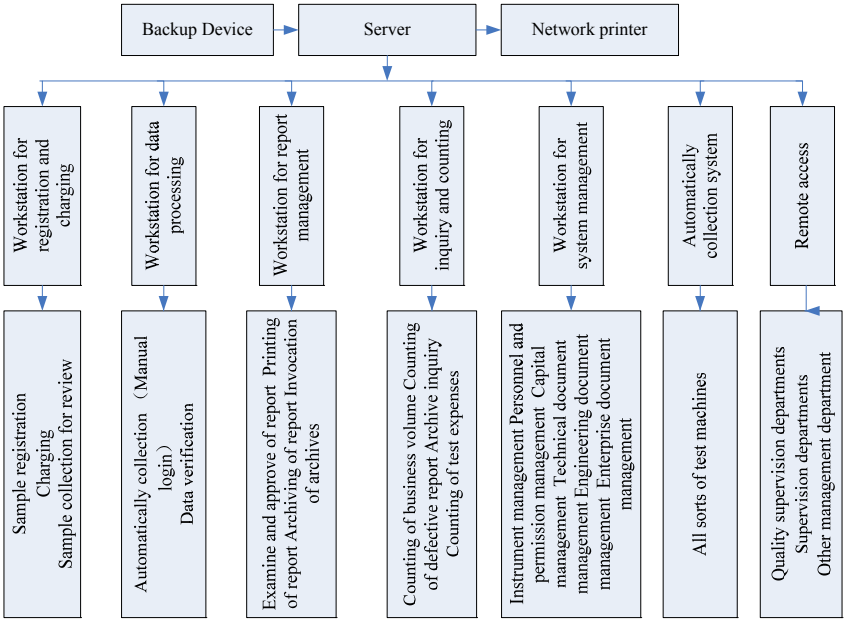

Figure 4 : Function and architecture of GCJC system network

RESOLUTIONS

Control of constructors

For the efficient management of constructors, the construction quality management system can be applied to formalize the constructors' working process through centralized scheduling. Therefore, the construction methods can be planned comprehensively. This would have a positive impact on the construction project, and guarantee the construction quality at the same time. The comprehensiveness of the system can be reflected in this respect. Besides the construction process and the whole objective of the construction can be clarified to lay a solid foundation for the scientific and Internet development of the whole construction.

4.2 Control of the construction material

The control of the construction material is reflected in the strict check of the choice of the material and the effective analysis on the material. Construction quality management system plays an important role in this aspect. Through the scientific detection of the material by the system, the material can be selected to meet the national quality standards, and the detection report will be uploaded to the Internet. Thus, the selection process would be more scientific, so as to improve the construction quality.

Control of the construction instruments

The effective management of the construction instruments is the prerequisite of the smooth construction. The management process should apply to the Internet management gradually. The construction instruments should be managed and allocated through construction quality management system. Therefore, the construction direction is clarified, clearly reflecting the emphasized point to meet the fundamental development requirement of modern construction.

Control of construction technology

Construction technology, or construction method, is the essential to ensure the construction meet the national standard. The construction quality management system should be applied in this process to analyze the specific data of construction technology. Moreover, effective research should be conducted on the concept and relationship of construction ontology and construction technology. Thus, the practicable plan can be reached to lay a solid information foundation for the improvement of construction quality. At the same time, it also reflects the comprehensiveness of construction quality management system in the management of every aspects of the construction, so as to ensure the construction quality would meet the requirements.

CONCLUSION

This essay conducts relevant research and discussion on the application of computer technology in the construction quality management, analyzes the specific deficiencies, and them give corresponding resolutions. Through researches on the

construction approaches and methods of the two models, the essay deepens the study on the establishment and formal representation of ontology, making the application of the model clearer and simpler. Combines with the inevitable deficiency of computer technology in the construction quality management, it gives effective summary and analysis on resolutions, so as to sweep away the obstacles in application.

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