STUDY ON AGING AND DAMAGE EVALUATION SYSTEM OF SEEPAGE CONTROL CANAL WITH CONCRETE

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Abstract: Based on knowing clearly about the goal and principle of the system development, the paper formulated its basic methods and tools as well as the environment of development, studied the structure and the operation procedure of the system. The system also established the database and the evaluation system of the aging and damage situation of seepage control canal with concrete, and therefore improved the evaluation quality and efficiency. It also will play a positive role in maintaining and transforming canals, and raising the efficiency of water-distribution.

Keywords: seepage control canal with concrete；aging and damage；evaluation system

1.   INTRODUCTION

Seepage control canals with concrete which were important parts of building in irrigation district, had played an outstanding role in saving water, seepage control, anti-scour, fixing canals and distributing water safely. However, after long using and various factors influencing, these seepage control canals with concrete would inevitably be damaged and cannot work normally. Currently, the study of the evaluation system of the aging and damage situation mainly concentrated on those buildings like: pumping

stations, sluices, dams and aqueducts, but paid less attention to the aging and damage situation of seepage control canals with concrete which had been widely used (Jian Gong, 2001; Li Anguo, 2000; Xu Yunxiu et at., 2004; Zhang Haiyan et at., 2004). Therefore, it was necessary to evaluate the aging and damage situation of seepage control canals with concrete through reasonable evaluation systems, as well as to get scientific evaluation conclusions which would greatly support the further transformations.

2. THE MAJOR AIM AND PRINCIPLES OF THE SYSTEM DEVELOPMENT

2.1 The major aim of the system development

(1)By establishing the database of the aging and damage situation of seepage control canals with concrete, the basic information about the aging and damage would be inputted, searched, maintained and exported.

(2)The results of investigation about seepage control canal with concrete will be stored, and the aging and damage situations would be evaluated. Moreover all of these information will be searched and exported by Visual Foxpro software.

2.2 The principle of system development

(1)Practicability. After analyzing all demands in detail and grasping the practicable needs of clients, a complete and useful evaluation software and detailed and reliable materials will be submitted to them. What's more, it designed a rolling development that once some new problems happened in practical using; it would communicate with the clients and take their reasonable suggestions, to perfect the functions of the system.

(2)Reliability. It is essential for the system to work stably and accurately during evaluation. As a result, it has to consider fully about its reliability when designing the structures and functions. By using some mature theories and techniques to analyze the probable uncommon conditions, it can make the corresponding solutions, debug the system's trouble, and avoid the unknown disruptions.

(3)Advance. It should try best to keep the top level of softwares and hardwares, user interface preferences, system operation mechanisms, service processing methods and so on. Especially, when selecting the softwares and hardwares of system, it should not only think about the development

limitation, the current management, the practical level and the economic factors, but also leave some space for the further developments.

3.   THE BASIC METHODS OF SYSTEM DEVELOPMENT

The system tries to use the object-oriented technique to develop. The methods of the object-oriented system, which based on the objects, utilized the specific softwares to transform directly from object descriptions to software structures. This approach which shortened the developing cycle and resolved the complicated process of many transfer maps from analyses and designs to software module structures, had surpassed many other ways and been considered as one of the most potential and promising methods in reality.

The object-oriented system development had the following merits, compared with the traditional system development:

(1)All aging and damage present situations were sealed by object form, which would make the system organizations and structures good and clear, but not been saved in the complex relational forms；

(2)The system took the object as the foundation and eliminated the concept of stratification；

(3)The structure of object-oriented, such as "general-special" structure and "the whole-part" structure, enabled the system development to directly define and process complex aging and damage conditions；

(4)According to the thought of the object-oriented's late binding, users may define their needed data type and the space operating procedure based on the existing abstract data types and the spatial operations, which would enhance its exploitability and extensibility；

(5)Based on the icon object-oriented user interface, it was advantageous for the user to operate and use.

Therefore, the softwares which used the object-oriented method were easy to revise, compared with the traditional methods. The procedure was more reliable, maintainable, reusable, suitable and the intelligible. Certainly, the object-oriented system development also had some problems which still needed to be further studied, for example, the hardware limitation which the big object operations still suffered, the object independent question, and so on.

4.   SYSTEM DEVELOPMENT TOOL AND THE DEVELOPMENT ENVIRONMENTS

4.1   Development tool

Visual FoxPro, a kind of relational database management system, which was promoted by Microsoft Corporation, was selected for system development tool. It used the object-oriented programming thought and the visual operating procedure, which had many characteristics, such as the friendly user interfaces, the sophisticated technology of object-oriented programme, the fast establishment of application programme, the simple database operation, the timely updating of former editions, etc.

Visual FoxPro 7.0, as the database system development software, had many new characteristics compared with the former edition: true object-oriented programming ； providing many visual programming objects including toolbar, grid, three dimensional buttons and so on； giving the better guide tool； helping users easily to complete the work, etc.

4.2   Development environments

The system development environment was the Windows XP Chinese operating system, and the object-oriented data manipulation environment in VFP. It formed a completed set of database and analysis product, which can rapidly provide solutions for the various services, the data warehouse and the evaluation model in current as well as the next generation. Its unique characteristics, such as usability, reliability and advanced, ensure the excellent development environment for the system opening.

This system development used the pattern of Visual FoxPro, and the overall system used the medium and small scale database management system of Visual FoxPro for storing data. The platform of the system development was the programming language provided by VFP. Fig.1 was the integrative overall of the system.
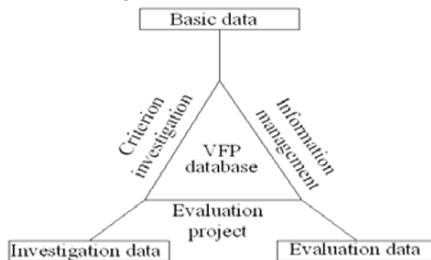
Fig.1: Integrative overall of the system

5. SYSTEM COMPOSITION STRUCTURES AND OPERATION PROCESS

5.1 Request of system

According to the related requests and the investigations, the system should renew, maintain, research and evaluate the basic information of the seepage control canals with concrete, and enable the engineering data and the evaluation results to show in the form of images directly.

The system should have two functions, evaluating the aging and damage of seepage control canals with concrete and querying information. The system composition should be with organization and modulation, have the relative independence, and be convenient to use, maintain and renew, meanwhile different parts can relate mutually and combine organically.

5.2 System composition

The aging and damage evaluation system of seepage control canals with concrete had a man-machine contact interface, a database and a model repository. The database provided the basic data for the aging evaluation, including the basic document data about channels, the data from investigations, and the final outcome of computation. The model repository was the evaluation and the computation parts of the system, also was the core of the entire software, which had the rational distribution in structure. It would enable the database and the model repository, the evaluation and analysis of channel project aging and damage to separate and unify organically (Hong XiaoLin et al., 2007). Fig.2 showed the composition schema of the system.
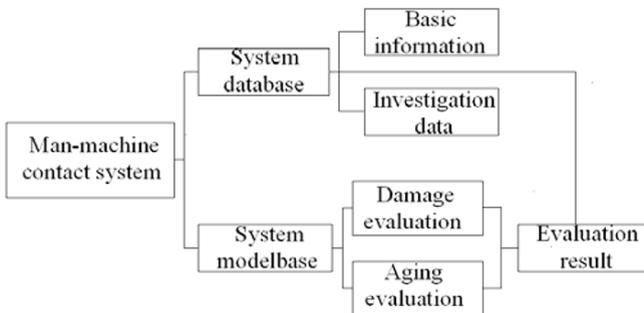

Fig.2: System composition schematic drawing

5.3   System operation procedure

After the objectively investigating of seepage control canals with concrete according to the requirements, the date from investigations will be input and store in the system. Then it used the established evaluation model of aging of concrete channel to evaluate (Hong Xiaolin et at., 2001; Liu Baiqing et at., 1998; Xu Yunxiu et at., 2004; Zhang Zhijun et at., 1998), drew the evaluation conclusions, and gave the processing advises. The system detailed operation procedure showed in Fig.3.
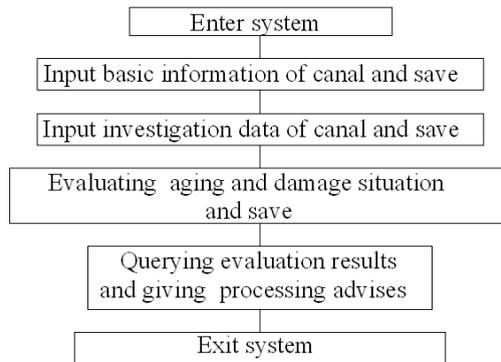

Fig.3: System operation flow chart

6.   SYSTEM IMPLEMENTATIONS

6.1   Maintenance of the information database of the seepage control canals with concrete

Information database maintenance mainly referred to revise, add and delete the existing database.

The revised and the added information included the name of the concrete channel, the construction time, the capacity of designing capacity, the shape of cross section, the construction methods, the related sizes, etc. (SL18-2004). Information of doubtless mistake or impractical information should be deleted from the database permanently. In the database, the character information was mainly used to locate and distinguish the seepage control canals with concrete, while the digital information was mainly used to help to evaluate the aging and damage situation of the seepage control canals with concrete.

6.2 Implementation of the evaluating system of aging and damage of the seepage control canals with concrete

The evaluation may follow the steps below:

(1) Inputting the basic document of the channel. The basic document database of concrete channels was first opened, inputting the channel's name. The querying database was clicked to find whether this channel had been recorded. It would go to the next step if existing; otherwise it must store the data of this channel.

(2) Investigating the aging and damage situation of the seepage control canals with concrete. In accordance with the evaluation requirements, the conditions about surface destructions, cracks, dislocations, cappings, seams, expansion joints, etc., should be investigated, then some related examination tables be written down truthfully.

(3) Inputting above investigation data. In the examination tables, the correspondence aging and damage situation information should be inputted. After checking, clicking to preserve and calculate.

(4) Querying, browsing and printing the evaluation results. After evaluating, the results can be queried, searched and printed when needed.

7. CONCLUSIONS

This paper described the general goals and the principles of the system development, which took the software VFP, a kind of related database, as the system development tool, and used the object-oriented system method for development. The paper also established the information database and evaluation system of aging and damage, which contained the man-machine contact interface, the database and the model repository. Thus, it can evaluate the damage conditions of the concrete channels efficiently and accurately based on it. In addition, the rationality of the evaluation model would influence the final conclusions remarkably, so the model should be studied further.

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