FUZZY BASED CONDITION ASSESSMENT MODEL PROTOTYPE OF MIDDLE AND SMALL-SIZE BUILDINGS

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ABSTRACT: The safety diagnosis of buildings is very important for continuous maintenance of them. However, the current safety and precision safety diagnosis in maintenance have focused on inspecting the first and second grade facilities. Considering that middle and small-size buildings except for the first and second account for 99.2% of whole buildings, the safety diagnosis of middle and small-size buildings should be needed for extended duration of whole buildings.

This study attempts to identify problems on the system of safety and precision safety diagnosis and to develop the safety diagnosis model available for middle and small-size buildings.

So we suggest the improvement direction that can be applied to existing condition assessment item to middle and small-size buildings by reviewing current evaluation method and conducting surveys. Based on these findings, we revise the As-Is Model using fuzzy theory, develop the To-Be Model and suggest the prototype in order to easily evaluate.

If the findings of this study are applied to practices, safety and precision safety diagnosis of buildings except for the first-second will be performed efficiently. In the next study, the condition assessment should be performed using the To-Be Model and the validity of model should be established. Also, the findings should be applied to other buildings such as rebar structure.

Keywords: *Middle and Small-Size Buildings, Safety Diagnosis, Fuzzy, Condition Assessment*

1. Introduction

Safety inspection is very important in order to promote longevity of a building. 「Guidelines for Safety Inspection & Complete Safety Diagnosis of Structures(Hereinafter referred to as 'guidelines')」 appoint necessary matters related to procedures and methods for execution of safety inspection and complete safety diagnosis of structures, and specify compulsory safety inspection and completely safety diagnosis to be executed on 1st/2nd grade facilities. 1st/2nd grade buildings take up 0.8% of all buildings in Korea, whereas no term or methods or procedures of safety diagnosis are not specifically specified for the remaining 99.2% of the buildings in Korea.

The purpose of this research, based on the condition evaluation system of middle and small-size buildings proposed in precedent researches, is to apply the fuzzy concept to develop a prototype computing system..

2. Developing Condition Evaluation Prototype

2.1 Condition Evaluation Model

Procedures for evaluation of the condition evaluation model are as follows.

1) Stage 1: Basic Project Information Input

2) Stage 2: Evaluating Condition (Performance Condition of Safety Evaluation)

3) Stage 3: Evaluating Condition (Measuring Condition of Chloride Content)

4) Stage 4: Evaluating Condition (Condition of Concrete Carbonatization Test)

5) Stage 5: Evaluating Concrete Strength, Crack, Rebar

Corrosion and Surface Deterioration

6) Stage 6: Calculating Condition Evaluation Grade

7) Stage 7: Evaluating Slope, Displacement and Modification

8) Stage 8: Synthetic Evaluation

Figure 1 represents the flow chart of this model.

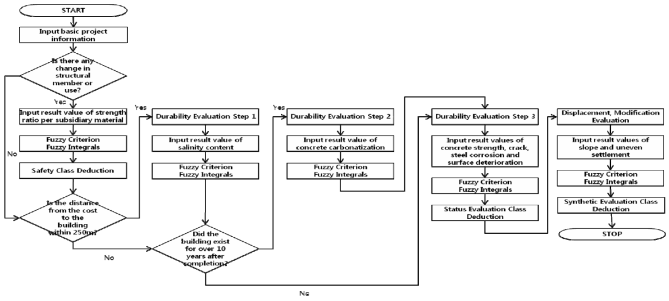

Fig. 1 Flow Chart of Condition Evaluation

2.2 Synthetic Evaluation Program Prototype

In this paragraph, in compliance with the condition evaluation system of middle and small-size buildings developed in this research, the prototype of synthetic evaluation program was proposed.

Figure 2 shows the initial screen of synthetic evaluation program for middle and small-size building. When basic information and evaluation information of the subject building for observation are loaded and evaluating condition is selected, input screen for durability item should appear. As shown in Figure 3, the condition is 1) over 10 years of progress after completion, 2) distance from the coast to the building, and condition evaluation item should be differently realized depending on the check condition.

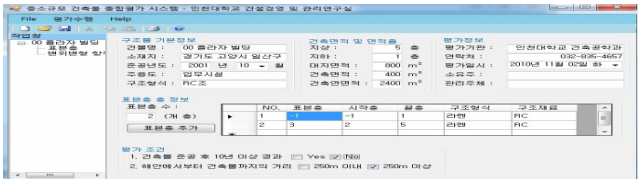

Fig. 2 Initial screen of synthetic evaluation program, Ex(1)

Fig. 3 Condition Evaluation item Screen, Ex(1)

3. Conclusion

Observing the current condition of complete safety diagnosis in stages of the current building maintenance, execution standards for safety inspection and complete safety diagnosis are indiscriminately set and applied without flexibility, and thus safety inspection and complete safety diagnosis are limited to 1st/2nd grade structures. The purpose of this research, based on the condition evaluation system of middle and small-size buildings proposed in precedent researches, is to apply the fuzzy concept to develop a prototype computing system.

The improved model and the prototype proposed in this research are capable of expanding the scope of research, but also the current safety diagnosis system which is limited to 1st/2nd grade structures, into middle and small-size structures.

In future researches, on the basis of the prototype proposed in this research, manufacturing of condition evaluation program and case applications shall be performed, and it is expected that researches to expand/apply them into other buildings such as Steel-frame structures will be in need.

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