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A Research on a Construction Method of Application in Design Level Based on Characteristics on Inter-class Communication

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1 Introduction

Progress of functional expansion and additional demand to applications cause problems that againsts modification method of sourcecode.

A method using refactoring helps us to modify progress of expansion and additional demand. However, there are some cases that a method using refactoring can't apply it because of . We must apply new technologies to the application. In such cases, we cannot employ this method.

In this paper, the goal of this research is to propose a new technique supporting a function expansion and additional demand which cooperate with new technology. To propose a new technique, it creates 2 aims as follows:

- 1.It minimize the part which changed of legacy system.
- 2.It minimize the number which created new classes.

2 Proposing reconstruction supporting method

In this research, Construction method of application in design level based on construction rules. Construction rules are created as follow:

(1)It pays attention to the inter-class communication in system. The messages which communicate inter-class are changed by a function expansion or additional demand. We adopted three kinds of values with which we measure the characteristics of inter-class communications:

- Style: Relationship and multiplicity among message sender and receiver (one to one / one to many, synchronous / asynchronous)
- Amount: Total amount of data included in a messages achieving a communication
- Frequency: Frequency of messages during a communication

(2)It analyzes system service which based on inter-class communication. It creates improvement method which effects on one of three kinds of inter-class communication from analysis and it is assumed reconstruction rule. To inspect reconstruction rules, it tried applyig another system which has same domain and reconstructed it. (4)It compared between result which reconstruction and comapring object and fixed reconstruction rules. Rule is applied to system which executed more precisely. (4-1)Extracted from substance of a function expansion or additional demand. (4-2)Select reconstruction rule effect to a function expansion or additional demand. Adapting reconstruction is correspondent to a function expansion or additional demand easily.

3 Construction rules

To create Restructuring Rule, we analyzed inter-communication in `HotelRoomReservationManagementSystem`. As a result, we created three kinds of restructuring rule as follows.

- R1 : Delegation of roles in heavy classes(Frequency)

- R2: Reconstruction of dependency in classes which achieves consistent operations(Style)
- R3 : Elimination of boundary mismatch in classes and message (Amount)

R1 is delegated role which has one class to a new class. new class executes a role which gave from one class. R1 can decrease frequency of message between class.

R2 is a rule that one class depend on other class. To dependence between one class and other class, can decrease frequency of message. Also master class can control all messages which send to slave classes.

R3 can be solved elimination of boundary mismatch in classes. Preparing the data which need to one message, it can be deleted the data which unnecessary for the object.

We executed the experiment thought restructuring rules were applied to the system, and researched influence of a additional demand.

4 Evaluation of experiment with Reconstruction rules

We added Cancellation-Function to `HotelRoomReservation-ManagementSystem`. Cancellation-Function has 2 kinds of Database Operations as follow:

- (1)One Operation changes `ReserveRecord` to `CancelRecord`, and it adds `CancelDatabase` (Function of Cancel-Record Registration:SA1).
- (2)Another Operation executed searching `CancelRecord` from `CancelDatabase` and checks these data whether can be registered as a new `ReserveRecord`. (Function of Searching Available Cancel-Record:SA2).

We executed the experiment as follows:

- (1)`RoomReservationManagementSystem(SB)` added Cancellation-Function without restructuring rule(SA1, SA2). Then we analyze changing part in SA1, SA2 from SB.
- (2)R1, R2, R3 applied to SB.(SB+R1, SB+R2, SB+R3)
- (3)SB+R1, SB+R2, SB+R3 added Cancellation-Function (SA1+R1/SA2+R1, SA1+R2/SA2+R2, SA1+R3/SA2+R3).
- (4)Comparing the result of SA1/SA2 to the result of

SA1+R1/SA2+R1, SA1+R2/SA2+R2, SA1+R3/SA2+R3 and evaluation effort to each rules.

5 Evaluation Result

The result of doing the evaluation of comparing is shown advantage, disadvantage, improvement.

- advantage

R1:Result of comparing SA1 and SA1+R1, R1 can be reduced one message in SA1+R1. Result of comparing SA2 and SA2+R1, R1 can be reduced three messages inSA2+R1. SA2+R1 also reduced 4 methods which modified in inter-class.

R2:Result of comparing SA2 and SA2+R2, R2 can be reduced two messages in SA2+R2.

R3:Result of comparing SA2 and SA2+R3, R3 can be resolved elimination of boundary mismatch in SA2+R3.

- disadvantage

R1:Result of comparing SA1 and SA1+R1, R1 can be increased one class and one method which created in SA1+R1. Result of comparing SA2 and SA2+R1, R1 can be increased one class and one method which created in SA2+R1.

R2:Result of comparing SA2 and SA2+R2, R2 couldn't decrease the part where an exsisting changed class.

R3:Result of comparing SA2 and SA2+R3, R3 couldn't decrease the part where an exsisting changed class.

- improvement

R1:Because only one preprocessed message exists, the effect of R1 is not achieved in SA1+R1. It should be applied to R1 if preprocessed messages exists more than 2 messages. SA2+R1 is gave the same improvement.

6 Summary

In this research, we proposed a construction method of application in design level using restructuring rule, and we created three kind of restructuring rules. Result of executing application experiment of three kind of restructuring rules, R1 can be decreased the part where should be changed in system. This method allows us to add progress of functional expansion and additional demand to applications easily.

In future, we will try another experiment and improve restructuring rules more better.