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ABSTRACT

This study was undertaken in view of the need and significance of Exception Faults’ Testing for Fault Tolerant Software. Consequently, a review of related literature on Exception Faults, Software Testing Techniques and Techniques for Fault Tolerance was undertaken. It was clearly revealed that the available testing techniques without any roadmap do not fulfill the needs for testing exception faults for fault tolerant software. However, it appeared feasible to design and develop Exception Faults Testing Framework (EFTF) by integrating results from different testing methods for testing exception faults.

The current research is quasi-experimental in nature with three components. The first major component referred to as the Development of the conceptual framework, which has been accomplished through literature survey, gathering opinion from experts, validation and review. The second component of the study, i.e. development of EFTF framework has been accomplished through several phases including review of literature, consultations and review.

EFTF comprises of Premises, Framework Process based on three phases, and an implementation example to demonstrate its use in testing for fault tolerance. The framework, after an expert review from the industry, has been implemented on different small projects as well as two live industrial projects for the purpose of validation. Finally the evaluation of effectiveness of framework has been accomplished through several phases including procurement of sample projects, experimentation and analysis of faults. The experiment was designed to be a three-phased tryout was carried out through the administration of ‘test suite generation’, ‘test results’ and fault analysis so that level of fault tolerance could be found out.

Testing on whole, as revealed feedback of the experts, has positive attitude towards fault tolerance and highly optimistic about framework. Major finding included development of a prescriptive framework EFTF for testing exceptional faults, organized to facilitate the guidelines on various phases for testing exception faults. However, the typical evaluations of effectiveness of EFTF, generally based on validation, yielded the following results:

- The EFTF in general, facilitates systematic and structured approach to exception faults testing.
- The EFTF is prescriptive in nature therefore, easy to understand and implementation-feasible for the concerned.
- Testers are generally more cautious about the testing environment for exception faults especially.
- Testers appear to have generally a positive attitude towards testing using the framework EFTF.

Moreover, on successful completion of study, the researcher reflects on the following general observations and inferences as follows:

- The notion of testing is embedded in invocation of control flow analysis (CFG) with an algorithm.
- Attempt at exception faults testing attainment need to be characterized around different testing techniques applied after control flow analysis (CFG).
- Minimalist exception faults classification and micro level research results may prove to be highly effective in fault analysis.
- Keys to the success of EFTF are highly dependent on exception faults' analysis and identified classification of levels of fault tolerance.
- The framework EFTF can lead to its own improvement and to be effective for all the types of software.
- Highly positive attitude of tester towards the EFTF reveal their desire for
more frequent use of such frameworks for testing exception faults.