ABSTRACT

Testing aims at identification of defects and an increasing efficiency in identifying defects in the early phases of software development. Testing should start from the initial phases of software development. Testing for safety critical system needs rigorous testing but the challenge lies in avoiding exhaustive testing. When testing for safety critical system there needs to be a complete methodology from verification to validation in ensuring complete safety of the system. When the system is analyzed at each step starting from software requirement specification to the delivery of the system, cost and time incurred on the system development can be reduced drastically.

A methodology is developed with business requirement specification by developing a component model. The model is simulated for finite state machine with timed automata and Petri Net which are two different ways of representing the model. UPPAAL and CPN are automated tools which are used to develop the system. It deals with application building and testing the application by specifying the methodologies automatically.

Testing the application with automated tools reduces the cost of development. A component model which is simulated with automated tools is checked for safety and reachability properties using temporal logic. Model checking of system identifies the early detection of faults which avoids creeping of faults into other phases. The design generated develops a sequence diagram which represents the sequence of messages which are similar to representing a function in programming. Test cases are developed
from sequence diagram which is used for analyzing the system in terms of transition and code coverage. The faults are mutated into the system to analyze the effectiveness of the system.

The coverage gives a quantitative analysis of how effective the system is in identifying defects in terms of behavior and coding. The model of Timed Automata and Petri Net is analyzed with coverage percentage which presents a significant outcome of Petri Net having an edge over timed automata in transition coverage and code coverage. The model is analyzed with existing test case generation algorithm and tools and found that the proposed methodology is efficient in terms of higher transition and code coverage.