Dissertation

Test Generation Using Event Sequence Graphs

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Abstract

Software testing is a widely used method in practice for quality assurance. But the required test inputs are still not systematically generated in an efficient manner, and testing becomes an uncontrollable process and therefore unusable. The reasons are missing models from the design or a present informal specification so that adequate test inputs cannot be derived systematically. This drawback can be solved by the present approach with the help of an graph model called Event Sequence Graph (ESG) which has been introduced by F. Belli. An ESG is a simple albeit powerful formalism for capturing the behavior of a variety of interactive systems that include real-time, embedded systems, and graphical user interfaces. A collection of ESGs is proposed as a model of an interactive system. This collection is used for the generation of tests to check for the correctness of system behavior in the presence of expected and unexpected input event sequences. The proposed test generation algorithm (supported by specifically developed tools) is customizable in the sense that it allows a tester to generate test sequences based on an evaluation of their cost of execution and the benefit derived. Two case studies assess the fault detection effectiveness of the approach considering also statecharts to extend the approach. Moreover, a comprehensive example is to demonstrate the power of ESGs in modeling and risk analysis.