Chapter 16
Tools and Techniques for Model Based Testing

Swapan Bhattacharya
National Institute of Technology, Durgapur, India

Ananya Kanjilal
B. P. Poddar Institute of Management & Technology, Kolkata, India

Sabnam Sengupta
B. P. Poddar Institute of Management & Technology, Kolkata, India

ABSTRACT

Software testing has gained immense importance in the present competitive world of developing software more quickly, more efficiently and more accurately. Testing activity is carried out throughout the lifecycle of software development and not only towards the end of development. Time and effort required to correct errors, detected later is much more compared to those, which are detected earlier. This has direct impact on costs and has led to a splurge of research activities in this domain. Model-based testing has recently gained attention with the popularization of modeling itself. It refers to testing and test case generation based on a model that describes the behavior of the system. The OMG initiative MDA has revolutionized the way models would be used for software development. There are a number of modeling techniques in use today—some have formal syntax like Z, VDM while some are semi-formal like UML. We have made a comprehensive summary of a considerable number of research works on Model Based testing. First, the issues, challenges and problems of model based testing have been discussed. Then the different methods developed for testing or test case generation based on the models are summarized. Finally a list of model based testing tools used for testing has been collectively presented.

TOOLS AND TECHNIQUES FOR MODEL BASED TESTING

Software development is a human intensive activity and over the years the need for a disciplined approach for development of better quality and reliable software has led to the evolving field of Software Engineering. The software community continually attempts to develop technologies and methodologies to enable easier, faster and cheaper ways to build high quality software. One of the principal elements of software quality assurance

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is software testing or verification as it represents the ultimate review of specification, design and code generation.

The importance of software testing cannot be overemphasized. The chances of errors creep in right from the very beginning and industries invest huge amount of effort and time to identify and remove them. Since exhaustive testing in most cases is an impractical solution, the need for effective testing strategies becomes important.

Along with traditional testing techniques, model based testing has emerged as a new domain of research and has recently gained attention with the popularization of models in software design and development. Models not only enhance understanding what a product is supposed to do and how its architecture is designed, but enable one to semi-automatically derive test scenarios at an early development stage where coding has not yet finished. There are a number of models in use today, a few of which make good models for testing. Model based testing focuses on verification or testing based on the models that depict the behavior of the system. It helps in assessing and measuring the degree to which a system faithfully implements a given model. Some models have formal syntax and semantics, yet others are semi formal in nature. The need for test automation for reduced costs and higher quality software provides challenging opportunities to researchers to innovate, develop and propose new methodologies for maximizing the efficiency of the testing techniques. Implementation of these methodologies for use as test automation tools is the area of interest of the software industries.

This chapter gives a comprehensive summary about Model based Testing. First, the concept and overview of MBT is described. The benefits offered by MBT are numerous but at the same time there are several issues that need to be handled for efficient use and implementation of MBT techniques. The previous section discusses the benefits and problems of MBT. Next the various methods for test generation developed so far are summarized based on models in one of the five categories—Formal models, State transition based models, Graphical models, UML diagrams and combinatorial models. All the research works are summarized in a tabular format with focus on the model used, testing strategy developed and tool implementation, if any. A comprehensive list of tools that are commercially available is discussed as well as some academic tools. The tools are described along with various other details like manufacturer details, information source and models used. Finally the chapter concludes with identification of possible areas of research in the domain of model based testing.

MODEL BASED TESTING: OVERVIEW

Model Based testing (MBT) is a new and evolving technique for generation of test suite from models that represent a system design or behavior. The paradigm of model-based testing shifts the focus of testing from writing individual test cases to developing a model from which a test suite can be generated automatically. It may be used for all cycles of testing – for unit testing of individual modules, integration testing of some of the modules to verify simple behaviors and overall system testing for verification of the total system behavior as represented by its model. MBT relies on three key technologies – the notation used for data model, test generation algorithm and tools that generate the supporting infrastructure for tests (DACS, 2003), MBT offers considerable promise in reducing the cost of test generation, increasing the effectiveness of the tests, and shortening the testing cycle. Test generation becomes especially effective for systems that are changed frequently, because testers are able to update the data model and then rapidly regenerate a test suite, avoiding tedious and error-prone editing of a suite of hand-crafted tests.
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