Dynamic model for the system testing process

Gábor Stikkel

Software testing process consumes a considerable part of software project resources. This fact motivates research in the field of planning, estimating and tracking testing effort. The modelling approach presented here is based on concepts from dynamical system theory. Several kinds of testing activities can occur during a software development project. Well-known types are unit test, function test system integration test and operational test. Existing dynamic models [1], do not specify the type of the testing activity. However, different failure detection rates (the number of failures found in a time period) can be experienced at unit testing than at system integration testing.

Dynamic models describing testing activities has attracted attention recently [1], [2], [3], [4], [5]. Modelling the software testing process by differential equations also appeared in the work of Cangussu et.al. [2]. Number of residual faults in a software system was used as an internal variable whose behaviour was determined by a second order ordinary differential equation. The model resulted that the number of failures found over calendar time follows an exponential decreasing trend which is not supported by the experience of the author.

Gompertz and Logistic differential equations are applied by Satoh [3], [4] for reliability growth modelling. The proposed models show good fit on real life experience, however do not take into account the type of testing and testing effort. (Same problem arises with the stochastic model sug- gested by Yamada et.al. [5].) Proposed differential equations has different solutions (exponential and S-shaped). It is not explained under which circumstances the models are applicable. This paper aims to solve the previously mentioned problems concerning dynamic modelling of software testing process. The generalization of the model presented in [1] is elaborated and applied on system testing process data of three telecommunication software systems. The new model suits best among the examined approaches. Based on the model a new method for system testing process control is suggested.

References

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