

A Survey on Metamorphic Testing

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Abstract. A test oracle determines whether a test execution reveals a fault, often by comparing the observed program output to the expected output. This is not always practical, for example when a program's input-output relation is complex and difficult to capture formally. *Metamorphic testing* provides an alternative, where correctness is not determined by checking an individual concrete output, but by applying a transformation to a test input and observing how the program output “morphs” into a different one as a result. Since the introduction of such *metamorphic relations* in 1998, many contributions on metamorphic testing have been made, and the technique has seen successful applications in a variety of domains, ranging from web services to computer graphics. This article provides a comprehensive survey on metamorphic testing: It summarises the research results and application areas, and analyses common practice in empirical studies of metamorphic testing as well as the main open challenges.

Keywords: Metamorphic testing, oracle problem, survey

Reference

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