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Generating Minimal t-wise Covering Test Suites using Constraints

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Generating Minimal t-wise Covering Test Suites using Constraints

Carlos A. Nieto and Martine Ceberio

Software testing is an essential part of software development that seeks quality assurance, reliability, and robustness. Unfortunately, exhaustive testing can be a very expensive, time consuming, and tedious process. With large sets of inputs, exhaustive testing can result in unpractical test suites, of size that grows exponentially with the number of input parameters.

As a way to address this growth, t-wise testing consists in focusing on test suites that only cover the interactions of the t-tuples of input parameters of the system at hand. Adding constraints further restricts the size of the test suite by limiting the possible values of the input parameters.

In this work, we propose and present a deterministic approach to generating minimal t-wise covering test suites with constraints that consistently produces minimum-size test suites while guaranteeing full coverage of t-wise combinations of values of input parameters. This new approach evaluates each test case and populates it with values that cover the most unused t-tuples. It significantly reduces the time and cost of testing software or even of machinery and circuits.

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