Summary of
UTBot Java at the SBST2022 Tool Competition

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UTBot is an automatic white-box test generator designed to streamline the software testing process for Java programs. It tackles this challenge with a unique approach that combines symbolic and concrete execution techniques. Symbolic execution allows UTBot to delve into the theoretical realm of the code. Here, it analyzes all potential paths a program might traverse based on the various inputs it can receive. UTBot achieves this by symbolically representing the program's variables and the constraints that govern them. This essentially creates a map of all possible execution flows the program can take. Concrete execution, on the other hand, brings UTBot back to the world of practical application. In this mode, UTBot runs the program with actual data to observe its real-world behavior and how it interacts with different inputs. By leveraging both symbolic and concrete execution, UTBot aspires to achieve a level of test coverage that surpasses traditional methods.

The core aim of UTBot is to generate test cases that effectively cover as many branches of the code as possible. Traditional test writing often focuses on specific functionalities or scenarios, leaving unexplored corners of the code vulnerable. UTBot addresses this limitation by systematically exploring all potential code execution paths. To achieve this ambitious goal, UTBot utilizes symbolic execution to identify different branches within the code and then employs constraint solving techniques to find input values that trigger each branch. Concrete execution complements this process by providing real-world context and ensuring the generated tests are practical and reflect realistic program behavior. This combined approach sets UTBot apart from traditional testing methods, offering a more methodical and comprehensive solution.

UTBot's effectiveness was put to the test at the SBST 2022 tool competition. This competition served as a valuable validation ground, where UTBot was tasked with generating tests for a predefined set of Java programs. The competition measured how well UTBot could generate tests that effectively covered various branches within the code. UTBot's performance was commendable, achieving third and sixth place for two different versions of the tool. This success demonstrates UTBot's capability as a practical tool for generating effective test cases for Java programs. The positive results from the competition, coupled with ongoing development efforts, suggest that UTBot holds significant promise for the future of software testing. While the document acknowledges limitations encountered during the competition, such as time constraints and bugs in the concrete execution component, these are seen as hurdles to be overcome in UTBot's path towards becoming an even more robust and comprehensive testing solution.