

Automated Fitness Guided Fault Localization

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ABSTRACT

Software fault localization is an essential and expensive process in software correction, which motivates the design of analysis tools that automate this process as much as possible. This paper presents the Fitness Guided Fault Localization (FGFL) system, a novel approach to fault localization that employs an ensemble of software analysis techniques guided by a fitness function to perform automated fault localization. The FGFL system focuses on software for which a fitness function can be derived either from formal specifications or in some other fashion. The system currently employs an ensemble of three fault localization techniques: trace comparison, a basic execution slicebased technique; trend based line suspicion, an enhanced version of the Tarantula technique designed to exploit the fitness function; and runtime fitness monitor, a technique that tracks changes in fitness during the execution of the program. These techniques are described in detail as well as the method for combining the results from the techniques into a unified recommendation for the fault location. Experimental results are presented that demonstrate the applicability of fitness guided fault localization to automate this important phase of software correction in general, and the potential of the FGFL system in particular.