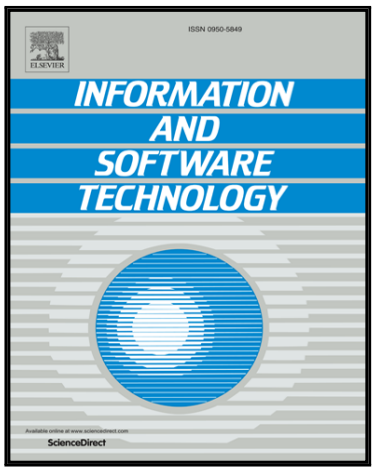

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Contextualizing Spectrum-based Fault Localization

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Abstract

Context: Fault localization is among the most expensive tasks in software development. Spectrum-based fault localization (SFL) techniques seek to pinpoint faulty program elements (e.g., statements), by sorting them only by their suspiciousness scores. Developers tend to fall back on another debugging strategy if they do not find the bug in the first positions of a suspiciousness list.

Objective: In this study, we assess techniques to contextualize code inspection whose goal is two-fold: to provide guidance during fault localization, and to improve the effectiveness of SFL techniques in classifying bugs within the first picks. *Code Hierarchy* (CH) and *Integration Coverage-based Debugging* (ICD) techniques provide a search *roadmap*—a list of methods—that guide the developer toward faults. CH assigns a method with the highest suspiciousness score of its blocks, and ICD captures method call relationships from testing to establish the roadmap. Two new filtering strategies—*Fixed Budget* (FB) and *Level Score* (LS)—are combined with ICD and CH for reducing the amount of blocks to inspect in each method.

Method: We evaluated the effectiveness of ICD, CH, FB, LS, and a suspiciousness block list (BL) on 62 bugs from 7 real programs.

Results: ICD and CH using FB found more faults inspecting less blocks than BL with statistical significance. More than 50% of the faults were found inspecting

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