Bug introduction: a modification of code

When identifying the origin of software bugs, many studies assume that “a bug was introduced by the lines of code that were modified to fix it”. However, this assumption does not always hold and at least in some cases, these modified lines are not responsible for introducing the bug. For example, when the bug was caused by a change in an external API. The lack of empirical evidence makes it impossible to assess how important these cases are and therefore, to which extent the assumption is valid. To advance in this direction, and better understand how bugs “are born”, we propose a model for defining criteria to identify the first snapshot of an evolving software system that exhibits a bug

Vídeo: Bug introduction patterns

Nonetheless, identifying the changes that introduced bugs would enable to (1) discover bug introduction patterns which could be used to develop techniques to avoid changes introducing bugs (Hassan 2009; Hassan and Holt 2005; Kim et al. 2007); (2) identify who was responsible for introducing the bug for the sake of self-learning and peer-assessment (Izquierdo-Cortazar et al. 2011; da Costa et al. 2014; Ell 2013); or (3) understand how long the bug has been present in the code (e. g. , to infer how many released versions have been affected or how effective the project testing/verification strategy is (Rodriguez-Perez et al. 2017; Chen et al. 2014; Weiss et al. 2007))

Developers often fix bugs

During the life of a software product developers often fix bugsFootnote 1 (Pan et al. 2009; Murphy-Hill et al. 2015). Research has shown that developers spend half of their time fixing bugs; while they devote only about 36% to adding features (the rest goes to making code more maintainable) (LaToza et al. 2006). Fixing a bug consists of determining why software is behaving erroneously, and subsequently correcting the part of the component that causes that erroneous behavior (Zeller 2009; Beller et al. 2018; Beller et al. 2015; Ebert et al. 2015). A developer fixing a bug produces a change to the source code, which can be identified unambiguously as the bug-fixing change (BFC). However, identifying what change(s) introduced the bug has proven to be a more difficult task (da Costa et al