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Minimizing Mutant Sets by Equivalence and Subsumption

Authors : Samia Alblwi, Amani Ayad

Abstract : Mutation testing is the art of generating syntactic variations of a base program and checking whether a candidate test suite can identify all the mutants that are not semantically equivalent to the base: this technique is widely used by researchers to select quality test suites. One of the main obstacles to the widespread use of mutation testing is cost: even small pro-grams (a few dozen lines of code) can give rise to a large number of mutants (up to hundreds): this has created an incentive to seek to reduce the number of mutants while preserving their collective effectiveness. Two criteria have been used to reduce the size of mutant sets: equiva-lence, which aims to partition the set of mutants into equivalence classes modulo semantic equivalence, and selecting one representative per class; subsumption, which aims to define a partial ordering among mutants that ranks mutants by effectiveness and seeks to select maximal elements in this ordering. In this paper we analyze these two policies using analytical and em-pirical criteria.

Keywords : mutation testing, mutant sets, mutant equivalence, mutant subsumption, mutant set minimization
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