Master's Thesis Topic: Mutation testing in automatic assessment of programming exercises

Mutation testing is a method to measure quality of test suites. In mutation testing, original tests are executed against multiple slightly modified programs. These modified programs, also know as mutants are typically generated from the original by applying small, well defined mutation operations to the code (e.g. change comparison operators from > to < or =>). Tests should catch these mutants or they are defective.

On the other hand, measuring the quality of tests is getting more and more popular also in the context of automatic grading of students programming exercises. There are empirical data about the benefits of this approach where students are responsible to show the correctness of their own solutions. Likewise, there are tools such as Web-CAT where the automatic assessment of students' programming exercises is based on 1) correctness of the program and 2) quality of their own tests. At the moment this quality of the tests is measured by the code coverage (e.g. line or branch coverage).

In this work, the goal is to investigate how mutation testing can be used in automatic assessment. After your literature survey, Implementation part is likely to integrate mutation testing approach as a plugin to Web-CAT or implement an independent tool that can be used to grade programming exercises by using the mutation testing approach. Evaluation of the work could be based on re-running old submissions to the Web-CAT against both new and old approach. One benefit we hope to see is the ability to give better feedback from the meaningless tests student seem to use just to get good point from the coverage based grading part.

Other related topics from this theme are also possible. Please contact petri.ihantola@tkk.fi if interested.