Teaching Software Quality Assurance by Encouraging Student Contributions to an Open Source Web-based System for the Assessment of Programming Assignments

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Abstract

This work presents a novel and innovative pedagogical approach for teaching software quality assurance in the undergraduate computer science curriculum. The approach is based on students contributing programming problems to an open-source web-based system that is used for student practice and instructor assessment of programming assignments. Tackling open-ended programming problems within WeBWorK requires students to write a code fragment that is checked for semantic correctness. WeBWorK and some of the other latest web-based assessment systems use a mechanism based on unit testing to account for variation in the way in which the same problem can be answered in an accurate manner, making the systems highly appealing for education. Given that WeBWorK is open-source, the teaching approach that we have evolved revolves around students creating their own problem sets for other students to practice with. This requires the students to construct comprehensive unit tests that can assure both the usability and accuracy of their work prior to deployment. The work describes the approach in detail, gives examples of students' work, presents findings from the experience of using this approach in the classroom, and discusses broader lessons for integrating software quality assurance practices and techniques more widely in the computer science curriculum.