Report on proposed tools

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***Abstract*—This write-up presents proposed tools for Software Engineering Lab along with extensive study of existing tools in two areas: estimating release dates of open source software projects by applying machine learning techniques and tool for testing and debugging assignments in haskell. –add ur lines for first tool–. The tool proposed for testing/debugging bucket is an improvement over the existing tool QuickEval wherein we plan to add Direct Automated Random Testing (DART) to the tool.**

***Keywords*—Haskell, unit testing, random testing, coverage based testing.**

I. Introduction

–Tool1 intro here–

The process of evaluating assignments of students is much tedious process than perceived. One always wants the process to be (a) consistent for all solutions submitted (b) be less time consuming. It's also preferable that the teacher should try to evaluate all expressions/paths of the program including corner cases. Lack of testing tools and good debuggers is one of the many reasons why few people use Haskell [1]. The existing tool QuickEval serves the purpose by allowing teachers to generate a test suite that can achieve full coverage of the programs submitted by the students and enable assignment evaluation in less time. Though this being the case, the teacher has to manually generate test cases for uncovered portions of program once the coverage information has been generated. We plan to integrate DART technique, with which we can achieve **automatic** generation of new test input values to direct the execution of program to unexecuted paths, thereby making the tool completely automatic with no or very less user interaction.

The remainder of the write-up is structured as follows: Section II presents existing tools and research in the areas of predicting release dates of Open Source Software Projects. In Section III we propose our idea for release date prediction using machine learning techniques and explain the tentative plan. We then present the past work in the area of testing and debugging Haskell programs in Section IV and provide a comprehensive list of all tools developed till date. Section V discusses how we plan to extend QuickEval and Section VI concludes.

II. Tools survey: Predicting costs/release time of open source software projects

–Your portion here–

III. Proposed Tool: Using Machine learning techniques for predicting release date of software

– Our idea here–

IV. Tools survey: Testing/debugging Haskell programs

A. QuickCheck

QuickCheck is a tool which aids the Haskell Programmer in formulating and testing properties of programs. Properties are described as Haskell functions, and can be automatically tested on random input, but it is also possible to define custom data generators. There are two drawbacks of QuickCheck. First, with random testing it is easy to catch bugs that are highly likely to occur, but it is very difficult to catch bugs that occur very infrequently. Secondly, it's not always possible to define properties that hold for functions to ensure it's correctness. It is worth noting that QuickCheck shows random test case only when the assertion fails to hold for that random test case.

B. Haskell Program Coverage (HPC)

HPC is a tool-kit to record and display Haskell Program Coverage. HPC includes tools that instrument Haskell programs to record program coverage, run instrumented programs, and display information derived. HPC presents coverage information in two forms: highlighting of sources and summary statistics. The drawback of HPC is that it does not provide the feature of random generation of input.

C. HUnit

HUnit is a unit testing framework for Haskell. HUnit is an adaptation of JUnit to Haskell, wherein you can easily create tests, name them, group them into suites, execute them, with the framework checking the results automatically. Tests in HUnit are specified compositionally and assertions are combined to make a test case, and test cases are combined into tests. As mentioned earlier, it's not always possible to specify assertions or properties that hold for functions thus restricting the use of HUnit over all applications.

D. Hat

Hat is a source level tracer for Haskell. Hat gives access to detailed, otherwise invisible information about a computation and helps locating errors in programs. Hat allows you to run

your programs such that it additionally writes a trace to a file. After the program has terminated one can view the trace with a browsing tool. The trace consists of high-level information about the computation and thus can be used for debugging.

V. Proposed Tool: Improvement/ Extension of QuickEval

The proposed usage of QuickEval, though not limited to, was to aid teachers in evaluating assignments. It's a testing tool which helps in understanding the behaviour of a program using random test generation along with user-specified tests. Current version of QuickEval works as follows -

1) The user specifies an option: 'r' - random test generation, 'i' - user specified input.
2) With random test generation, QuickEval generates specified number of random tests for the specified function, the output of evaluating the function over the inputs being shown on the screen.
3) Secondly, it shows the coverage information for the function under the tests that have been run. This is very similar to output shown by HPC.
4) Knowing the unreached or unexecuted parts of the function, the teacher is supposed to enter an appropriate input to make the program execution reach unevaluated part of the program using the option 'i'.

The makers of QuickEval have left the integration of Direct Automatic Random Test Generation (DART) as a proposed extension to the tool. DART is a testing technique used for directed automatic testing of programs. It works in three phases whereby the first two phases have been already implemented in QuickEval. The third and last phase is to achieve automatic generation of new test input values to direct the execution of the program to unexecuted paths. Improving this part will make QuickEval fully automatic and will require no or very less user interaction. This being one of the major proposed improvement in QuickEval, we further plan to automate assignment evaluation such that the evaluation report for all students is saved directly in an excel sheet. The report would clearly specify mistakes made by students and thus function as an auto-grader.

VI. Conclusion

This write-up touched upon the existing tools and research in two areas: estimating release dates for open source software projects using machine learning techniques and testing/ debugging of Haskell programs. –Your part here–. We briefly described four tools for testing/ debugging Haskell programs namely, QuickCheck, HPC, HUnit and Hat. We then discussed their drawbacks and showed how QuickEval overcomes them by combining the features of HPC and QuickCheck. Finally, we explained how the addition of DART technique would reduce the manual work and also proposed few other additions to automate evaluation of assignments.

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