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Finding Predictors of Success in Novice Programmers’ Testing and Editing Behaviors

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Do Techniques For Predicting Intermediate Programmers’ Success Work For Novices? Probably Not!

Background

- The Normalized Programming State Model is promising for predicting the success (grades) of intermediate-level programmers.
- Previous research at the University of Puget Sound, by Ayse Hunt and Professor Brad Richards, found that NPSM was not likely to work with novice programmers.
- They used a large dataset that was anonymized, and there were no grades for the traces.

Research Questions

1. How bad is the Normalized Programming State Model in predicting grades for novice programmers?

2. Can NPSM be adapted to better predict novice programmers’ success?

The Model

- Tracks the correctness of student programs as they are being developed.
- Records percentage of time spent in the states below.

SYNTAX

- YN: Syntax is correct - last test unsuccessful
- NU: Syntax is incorrect - last test unsuccessful

SEMANTICS

- YU: Syntax is correct - last test successful
- NU: Syntax is incorrect - last test successful

The Grading Tool

- Finishing analysis on the previous research required thousands of student programs to be automatically graded.
- We built automated software tests for each program that assigned the program a grade.
- Student code differed in many ways, including method names, class names, variable types, and variable names.
- We developed a tool that automatically rewrote student programs to make them more uniform.

Results

- We used regression to produce grade prediction formulas for the models, based on the percent of time spent in states.
- Compared the predicted grades to the grades produced by the automatic grading tool.
- Preliminary results show that the altered model performs slightly better.
- Neither model did very well at predicting novice grades.

Future Work

- Look into more complex/longer exercises within the repository of novice programs
- Examine subsets of the current data set for trends and/or patterns.
- Look at the accuracy of the prediction formulas in predicting whether students are passing or failing

References


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