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

SaraJane Griffiths
University of Puget Sound

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Background

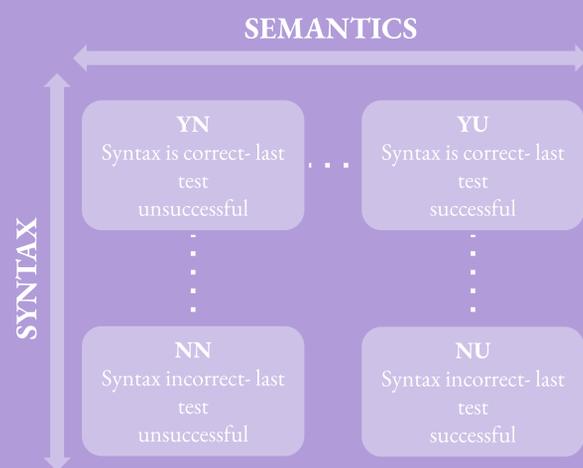
- The Normalized Programming State Model is promising for predicting the success (grades) of intermediate-level programmers.
- Previous research at the University of Puget Sound, by Ayse Hunt and Professor Brad Richards, found that NPSM was not likely to work with novice programmers.
- They used a large 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.



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.

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

SaraJane Griffiths, Professor Brad Richards
sgriffiths@pugetsound.edu,
brichards@pugetsound.edu

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

The Altered Model

- NPSM judges semantic correctness by whether a student's program crashes, but novice code is often not complex enough to crash, even if it is incorrect.
- We hypothesized that if a student tested a piece of their program, then returned to editing that same piece, the program probably didn't work as intended.
- We developed an altered NPSM model that judges semantic correctness based on that behavior pattern.

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

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