Reflective Learning Tool for Beginner Programmers

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Proposal

Motivation

The project's main motivation is to develop a tool for an existing IDE to help beginner programmers improve their coding skills through a reflective process. Beginner students should be able to benefit from the extension and improve their programming ability. Information like completion time, reflective notes and emotions is also relevant to lecturers. Based on a light prototype evaluation with Glasgow University lecturers, we can also conclude that lecturers will potentially benefit from having access to their students' anonymous reflective responses. We hope that moving forward the tool can be used to help develop labs for the betterment of level 1 students' programming journeys.

Aims

The aims can be split into two categories: beginner programmers and lecturers.

The projects main aim is to develop a tool for Jupyter Notebook which allows users (beginner programmers) to save their time spent, update their feelings about a lab, and self-reflective notes as they complete their lab work. The information is saved to a Firebase database and saved in the original working Notebook. Users will be guided to use the reflective parameters (time, feelings, reflective notes) to help develop an action plan for their next lab. This will be done by applying Gibb's reflective cycle at the end of their lab.

The second usability aim is focused on how lecturers can use their students reflective feedback to help improve their labs and get a better understanding of how the students are coping with the material. Lecturers will have access to a summarized view of the students' reflective feedback which has incorporated Llama 2.0's AI services. The lecturers will also be able to access the rest of the user responses in a csv file.

A detailed set of requirements can be found in the project's GitHub repository.

Progress

- Jupyter Notebook tool bar buttons for each functionality are complete.
- Corresponding functionality for each button is working.
- User notes, time and emotions are saved to a Firebase database.
- Users are prompted to reflect at the end of the lab based on the principles laid out in Gibb's reflective cycle.

- Lecturers can generate a summary of the students' responses based on a lab number.
- Lecturers can generate a csv file outlining the reflective input from students based on a lab number.

Problems and risks

Problems

One of the main problems recently was writing to the database; we had to decide wither to do this locally or via the Jupyter server. I have overcome this issue by employing the Magics library and accessing the Firebase database via Python scripts. Functions are called by hiding Notebook cells in the .js files of the extension and executing them when the corresponding tool bar button is pressed.

Further problems arose earlier in the project around the issue of how lecturers could benefit from the tool. We developed a list of questions and possible solutions, creating a light survey for a small group of university lecturers. The feedback was extremely valuable and resulted in some design decisions like what file type the lecturer report should be saved as and helped change some of the wording of the reflective prompts.

Risks

One of the main risks first identified came from an early meeting with Dr Steve Draper. He had warned me not to develop a tool which is just a "gadget" or something that will distract the users. I have been acutely aware of this throughout development and will often garner peer feedback to make sure this risk is minimized.

Looking to the future, I hope to conduct a large user study with Level 1 students. There may be a potential risk that we do not gather enough participants for the study, and I would not be able to conduct a systematic evaluation of the tool. In order to mitigate the possible issue, I have been developing a working relationship with Level 1 lecturers when demonstrating for CS1CT. This may help make recruiting students easier next semester.

Plan

The main aim for next semester is to conduct the evaluation of the tool with a user study of Level 1 students at the University of Glasgow. I hope to start conducting the user study when term resumes in early January and start evaluating the results by mid to late February. This would allow me enough time to complete my final dissertation before the submission on the 22nd of March.