

Final Year Project

Project Plan

AI Tutor for Programming Class (the educational platform)

Group Members:

Kung Tsz Ho	3035176729
Chan Ka Yeung	3035181580
Lor Cheuk Hin	3035185108
Hui Pak Nam	3035185732

Project Background

Nowadays, programming becomes increasingly significant in various industries. Many areas rely on programming to finish different tasks. Therefore, more university students, and even secondary students realize the greater importance of programming and they would like to learn programming. According to a news article of The Seattle Times, the number of computer science students in US is nearly doubled in the recent few years [1]. The number of computer science students grows rapidly. However, there may not be enough teachers for the growing number of students, so some students may not enroll in any programming courses and they have to study by himself. Insufficient teaching resources become a problem in coding education. On the other hand, their diverse academic backgrounds may cause different difficulties in learning programming. It reveals that programming education is not personalized. These problems may result in poor teaching quality.

Besides, although there are several code-learning platforms in the Internet, they may not satisfy and fulfill students' needs. First, those platforms are mainly focused on single-person programming tasks only. In the reality, programming is usually a teamwork or an engineering process rather than a personal task. Doing individual tasks cannot train the cooperative skills, which is necessary in the modern society. Second, those platforms may not give enough support and assistance to students when they encounter problems during the task. Only a few platforms may hard-code some advices or tips for specific tasks. Most students cannot get any sufficient help from the platform. It is also possible that they do not get any hints of the problems, even though they have searched for hours in related discussion forums. Last, online platforms cannot give enough feedback to students after they have finished the task. As a consequence, students get nothing but the completion of tasks in those platforms.

As a result, we would like to develop a platform with some new features so as to better assist students in learning programming. The platform will also focus on cooperative programming, which means that students work together on the same task. Finally, we will implement artificial intelligence (AI) in the platform, which can solve the problems mentioned above without human effort and thus improve teaching efficiency and learning effectiveness.

Project Objective

There are three main objectives in this project. First and foremost, the project helps analyse and track the progress of every learner. It is difficult for learners to know what level they have achieved. This project will allow learners to know what they have completed and what can be improved. Learners can review their performance throughout the learning so that they can select the most suitable learning path for themselves.

Besides, we aim at introducing a more interactive and collaborative way in learning programming. According to the Stack Overflow Developer Survey 2017, self-learning is one of the most common learning method in programming [2]. However, through the learning, sometimes it is beneficial to ask for assistance from a person with more experience on related type of problems. While it is time-consuming for new learners to look for answer on the Internet, it is also difficult for new learner to distinguish which answer is the most suitable solution to their problem. Therefore, our project aims to simulate a real-life helping process. Unlike conventional forums existing in the Internet, both of them have instant responses. It would be more educational to learners as this allows both helper and help seeker get involved in the helping process rather than helper giving answer to seeker directly.

Last but not least, the project can assist teacher's teaching and reduces teachers' workload. Our platform will assist teacher's teaching, especially those with less teaching experience, so that they may use our platform as a teaching tool in one's teaching. Teachers may sometimes find it difficult to offer one-to-one help to all students as it takes much time. Our project will include an AI tutor, which is capable to offer primitive help to student before approaching the teacher. If students have any further questions, teacher may offer help faster based on some analytical statistics of the student on our platform. In addition, teachers may lack detailed information about one's strength and weakness. In our platform, Each student will have an individual profile which record their strength and weakness. Teachers can make use of this function to keep track on the learning progress of students.

Project Methodology

In order to achieve our objective, we would like to build an online coding platform for students to learn programming. There will be self-learning material and online exercises provided by some teachers on our platform. Students can first go through the material and try to finish the exercises. Unlike other normal coding platform, we would include three useful features to make the learning platform more suitable for new learners. In order to achieve that, techniques like big data and data mining will be implemented. The platform would do analysis and provide more information for enhancing student learning.

The first function will be a profile system analysing students' skill based on their submitted work. Every student will have their own profile to record their learning progress and the skills they have learnt. After the student has finished an exercise, the platform will analyse the program and summarize what skills have been used in this program. This can be achieved by some data mining techniques. The platform will then update the student's profile with these information. Students can check what skills they have been used and possessed in their profile.

Secondly, there will be an AI tutor function in the platform. When students encounter difficulties while they are doing a programming exercise, the AI tutor can provide some hints or suggestions to the students so as to help them to finish the exercise. The information given by the AI tutor is based on the analysis on all submitted correct solutions of the same problem. By using method like big data, after the platform has received a significant number of correct solutions, it can analyse and summarize what are the common characteristics of this problem. Based on this analysed information, the AI tutor can suggest students to use a suitable programming skill in a specific problem.

Lastly, there will be a helping function for students to seek help from other users. When the student encounters some complicated or difficult problems, the AI tutor alone may not be able to help the student to finish the task. In such condition, the student can use the helping system to find a matching helper for assistance. The helpers can provide some suggestions to the student after viewing the problem. To match a suitable helper to assist the student, the platform will scan through the profiles of all users and find out the users that possess relevant skills. This can be done by pattern matching between problems and the skills required.

Project Schedule and Milestones

Jul 2017 - Sep 2017	Planning and designing of project
Sep 2017	<ul style="list-style-type: none"> - Research of relevant articles and essays - Preparing Deliverables of Phase 1
1 Oct 2017	Deliverables of Phase 1 <ul style="list-style-type: none"> - Detailed project plan - Project web page
2 - 20 Oct 2017	<ul style="list-style-type: none"> - Server setup - API research
21 Oct - 30 Nov 2017	<ul style="list-style-type: none"> - Analyser development - Platform structure development
1 - 20 Dec 2017	<ul style="list-style-type: none"> - Revision
21 Dec 2017 - 7 Jan 2018	<ul style="list-style-type: none"> - Preparation for presentation
8 - 12 Jan 2018	<ul style="list-style-type: none"> - First presentation
12 - 20 Jan 2018	<ul style="list-style-type: none"> - Preparation for Deliverables of Phase 2 - Summarize progress for demo program
21 Jan 2018	Deliverables of Phase 2 <ul style="list-style-type: none"> - Preliminary implementation - Detailed interim report - Demo program - analyser - Demo platform - with basic function
22 Jan - 28 Feb 2018	<ul style="list-style-type: none"> - AI tutor development - Helping system development
1 - 15 Mar 2018	<ul style="list-style-type: none"> - Platform interface - Assemble core functions in built platform
16 - 30 Mar 2018	<ul style="list-style-type: none"> - Test & debug
1 - 14 Apr 2018	<ul style="list-style-type: none"> - Preparation for final report and presentation
15 Apr 2018	Deliverables of Phase 3 <ul style="list-style-type: none"> - Finalized tested implementation - Final report

16 - 20 Apr 2018	Final presentation
21 Apr - 1 May 2018	Preparing project exhibition
2 May 2018	Project exhibition

Reference:

[1] Katherine Long. (2016, Apr 23). Demand for computer science forces Washington colleges to ramp up [Online]. Available: <https://www.seattletimes.com/seattle-news/education/with-surge-in-computer-science-majors-state-colleges-struggle-to-keep-pace/> [Accessed: 2017, Oct 1]

[2] Stack Overflow. (n.d.). Developer Survey Results 2017 [Online]. Available: <https://insights.stackoverflow.com/survey/2017#overview> [Accessed: 2017, Oct 1]