Code Block Online IDE

CSCI3100 Group 18

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Introduction

1.1 Project Overview

We are going to develop an online integrated development environment(IDE) which allows users to code by draging and dropping different blocks of code to form a program, instead of typing. It is an IDE developed for users without previous experiences in coding to learn the basic of coding.

1.2 Objective

STEM education is being more and more popular all over the world. However, we noticed that using common coding approach to teach programming may not be interesting and easy for young beginners to learn programming. This may hinder the learning progress of them. In order to enhance the learning progress and increase their incentive to learn, we believe a new paradigm should be introduced to replace coding. Inspired by how LEGO® Mindstorms® programs, we believe a visualized drag and drop online programming platform will be more suitable to educational purpose when aiming at these young kids.

We believe it is also an useful tool for rapid prototyping. Startupers without programming knowledge can use this programming IDE to start programming their software and applications with a lower difficulty. We also hope that this online IDE will also let programmers prototype their product at ease using prebuilt function blocks in our online IDE. And this can also increase the reuse rate of code in software.

The Code Block Online IDE shall be a good platform for students to learn the basics of programming and a tool for programmers to rapid prototype their software.

1.3 Expected Customers and Market

We expected teachers, students and programmers will use our service.

STEM education is promoted all over the world. Teachers can use Code Block Online IDE to teach programming in a more visualized way. So that students

can understand the programming logic more easily. A visualized and interactive programming methodology instead of the common text-based codes should also increase students' interests in the lesson, so they will be more focused thus learn better. For students, a visualized programming IDE will lower their learning cost. And our online IDE being more colorful, can also increase their incentive to learn programming with our service.

For programmers, our service will help them reduce their time needed in prototyping their product. We allow uploading written codes to our server and modulize them. And with some other objects and functions written by us, will shorten the time needed to develope a software by using different pre-made parts readily available.

1.4 System Features

The project provides three major features. First, a visualized online integrated code development environment which users can code their own program by dragging different blocks of code into place.

The second feature is an account system which allows users to store their code in our database for reuse. The account system can also classify users into teahcers and students. So that students can submit coding homework through this system.

The third feature is a forum and comment system, which allows programmers to push some useful libraries for others to use. This system will also allow student's code being commented by their teachers, or their classmates. Students can also use this forum to ask teachers questions about their homework directly.

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Background

STEM education became mre and more important since the AI boom. Many countries, including Hong Kong, have added STEM education as a part of their curriculum for kids. Yet, we have noticed that the common coding approach is used to teach students how to code in Hong Kong. However, coding has no pictures, nor much interaction i it. So this might not be attractive to young kids and cause them to have a low incentive and motivation to learn. Therefore we need a new way to program software, so that it is visualized and fun for the kids to use and learn programming from it.

Moreover, computers and smart gadgets is an indivisilbe part of our life now. More and more people devouted themselves into this area to provide different software and applications to enrich our daily life. However, many of these are start-uppers, and they may have a good idea, but they may not be able to express it and actualize it. Therefore, an easier way for people to create a software using public source codes is needed to decrease the cost and ease some of the difficulties of creating softwares.

Therefore, a new platform is needed to help beginners to write their software, and let them learn programming. Our project visualizes source codes into different blocks of code, so that programming beginners can understand the logic and syntax of the language. Programming by using different blocks of code can also allow programmers to use written code to create the software they need at ease. This way will also decrease the cost creating software for start-uppers.

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Specification

3.1 System and Function

The software includes different system which provide functions for users to learn coding and share resources with others.

3.1.1 Visualized Coding Environment

This is the system provides dragging blocks and dropping onto the programming area for user to easily write program.

This system contains the following block:

- ***Variable Block***, which is used to store data with a name given by user. The Variable Block contains the following type:
  - *Alphabet* : only can store one alphabet for each variable.
  - *String* : can store more than one alphabets with declared length of the variable.
  - *Integer* : only can store integer.
  - *Real Number* : can store real number with decimal point.
- ***Operator Blocks***, which is used to do data manupulation, including *assignment, comparison, etc.*
- ***Expression Blocks***, which user can type anything in the Block and it will be directly pasted to the source code.
- ***Logical Blocks***, to do logical operations and control flow statements
  - IF Block, which is a logical block to do logical operations such as AND gate, OR gate and NOT gate. User can also do comparison between two Variable Blocks.
  - ELSE Block, which is an optional block follow the IF Block and this block will only be run when the logical condition in the IF Block is false.

  - Loop Block, which provides looping the blocks inside the Loop Block under a logical condition. This block begin with a IF Block and the blocks inside will starting looping until the condition in the IF Block is false.
  - ...

- ***Input Block***, which is used to get data and store to a suitable Variable Block while the program is running.
- ***Output Block***, which is used to output text or data during program runtime.
- ***Function Block***, which to conclude other Blocks into one big Block. It always appear in pair that one is used to define and other one is used to call itself in the Main Block. It can also define the type of the Function Block like Alphabet, String, Integer and Real Number. User can adapt Variable Block which means when user can call it with passing Variable Block into the Block.
  - Main Block, which is used to run the Blocks inside in the program. It will appear in the programming area automatically. User can also delete it.

3.1.2 Compiler

A compiler will be installed on the server to compile the code written by users. This will be invoked by users when they choose to run the code.

The server will return compile result if error occured in compilation. Else, the executable will be run and the terminal output will be sent to client as result.

3.1.3 Personal Account System

The Personal Account System is a database system provided for users to store the progress, provide identities and share the data with others. There are three types of account, which are teacher, student and regular user account. Different type of account with varying permission enables users to access different function.

This system contains the following functions:

- Account Registration allows the new user to create a new account. The user needs to set a unique username and a password. The user needs to re-type the password again to confirm. The password should have at least 8 characters. If all the inputs are valid, a new account will be created, or otherwise requests correct input from the user.
- Account Login allows user login to the system to access the stored data in the server with permission. This function accepts a username or email address with a password from user input. The inputs will then be verified by comparing it with the data in the server. If the verification success, it logins as the identity presented, or otherwise requests correct input from the user.

- Password Changing is for the user to set a new password. This function needs to perform in the login state. The user needs to enter a new password and a re-type of the new password to confirm the changing. The password requirement is the same as Account Registration.
- Forget Password helps the user to reset the password without the current password. It requires the user to input the registered email address. If the email is registered, an email will be sent to that address. A link will be provided for changing password. The requirement is the same as Password Changing.
- Account Logout is a function for the user to log out from the account. All the permission will be revoked after log out.

3.1.4 Code Checking System

Code checking system is a programming assistant system that helps students to create their very first program. Teachers can provides test cases and corresponding output and this system will help the students to revise their work.

1. Online compiling, which translates source code into a lower level language to create an executable program.
2. Program input, which can be from files or keyboard which interacts with the executable program created.
3. Output checking, which saves the previous output and highlight the differences.

3.1.5 Comment System

Commenting system is providing a function for user to communicate and see what they are feeling in for our product.

There are three parts of the function shown below.

Rating System
The rating system is providing two types of rating for normal users and teachers respectively.

For normal users, the rating system is the part for the user to express their feeling and show their satisfaction with our product or some of the interesting code in the forum.

There are five stars for the rating. The user can click the button of the stars from left to right. After they clicked the button, the star buttons(s) is/are

coloured. The user can click the most left that is the most unsatisfying star, while the most right that is showing the most satisfying.

For teachers, the rating system is the part for the user to grade the marks of assignments.

The grade is shown in numbers instead of stars. The user can just type in the box of the grading system.

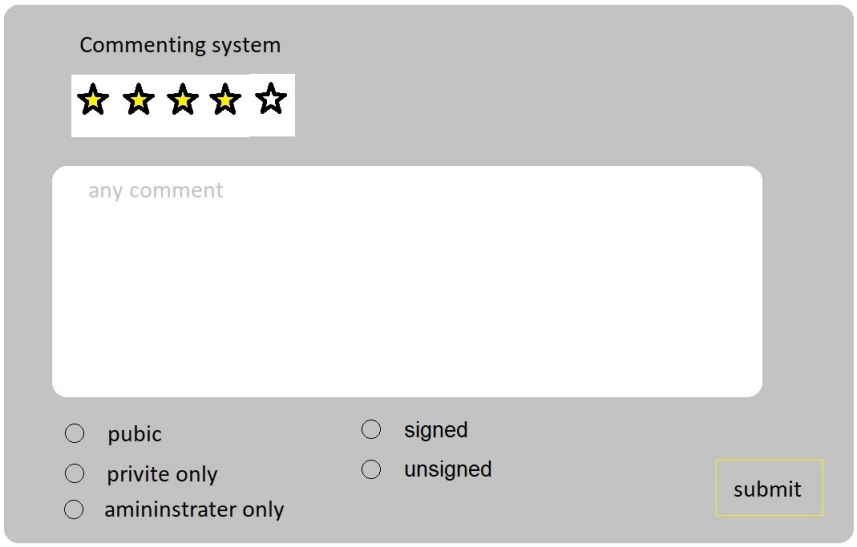
Reply
Reply system is the part for the user to leave a message.

User can leave any comment in comment box which is less than 1000 words.

There are five buttons below.

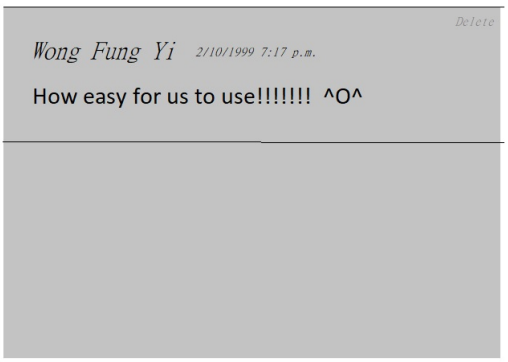
The commenting box that user can click to choose whether showing to the public, private or only for the administrator. the public option is for the user to share their ideas. The private option is for the user to make a remark for there own. The administrator option is for the user to make any suggestions to the system for further development of our product.

Moreover, there are signed or unsigned options on the right hand side of the three options which mentioned. the user can choose to show name or not.



Delete
Deleting system is the part for the user to strike out useless message.

The user can delete the comment by clicking the delete button which is on the right top corner.



3.1.6 Forum System

The forum is providing a function for user to share the idea of their own which is using with the commenting system which includes grade, reply and delete function.

Post
The posting method of the forum, please follow the "commenting system" part. They are the same. The only different of the posting is that it need to type in the title and add the keyword by "#". For example, "#csci3310" or "#looping".

For teahcers, user can post some interesting topic for the student to make a project for just playing or homework which can with a standard output for the student to check the correctness. And also the professor can see the respond of his/her questions with the grading system which graded by the student and make a improvement of the question due to the respond of the student.

For other users, he/she can post the useful code to share. The other can provide a suggestion code of the code or share their point of view in the code.

Search
There is a search function for the user to search for keywords or titles. The results will be ordered using average grades of the posts.

After searching, the user can slide down and click into the corresponding post.

3.2 Database

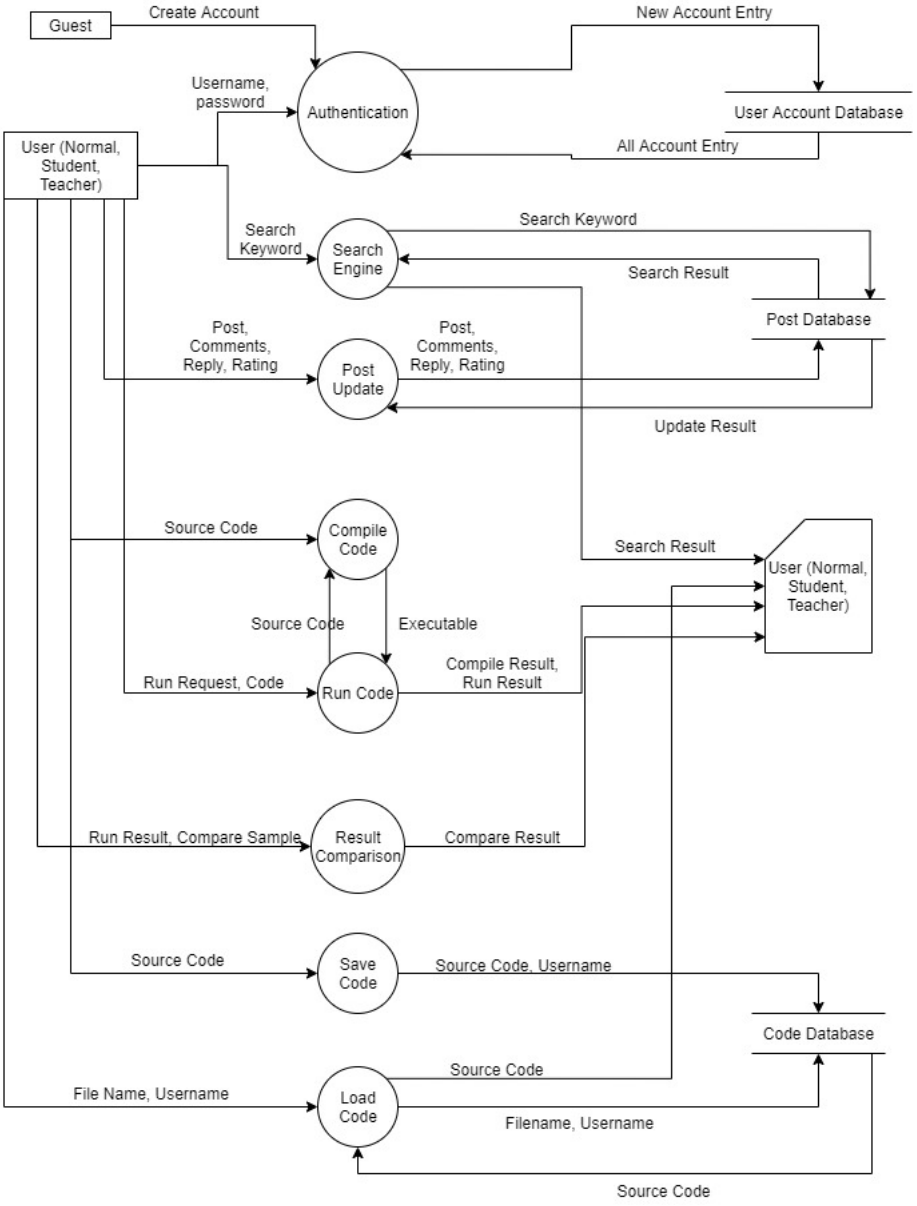
The databases are shown below:

1. User Account Database includes username, account password, account type, extra permission of the account for teachers and student users to access posts only available to the class

2. Code Database includes source code file, author of the code, and permission

3. Post Database includes posts contents (contents, author, reply, source code linkage, permission) and access frequencies of posts

3.3 Data Flow Diagram



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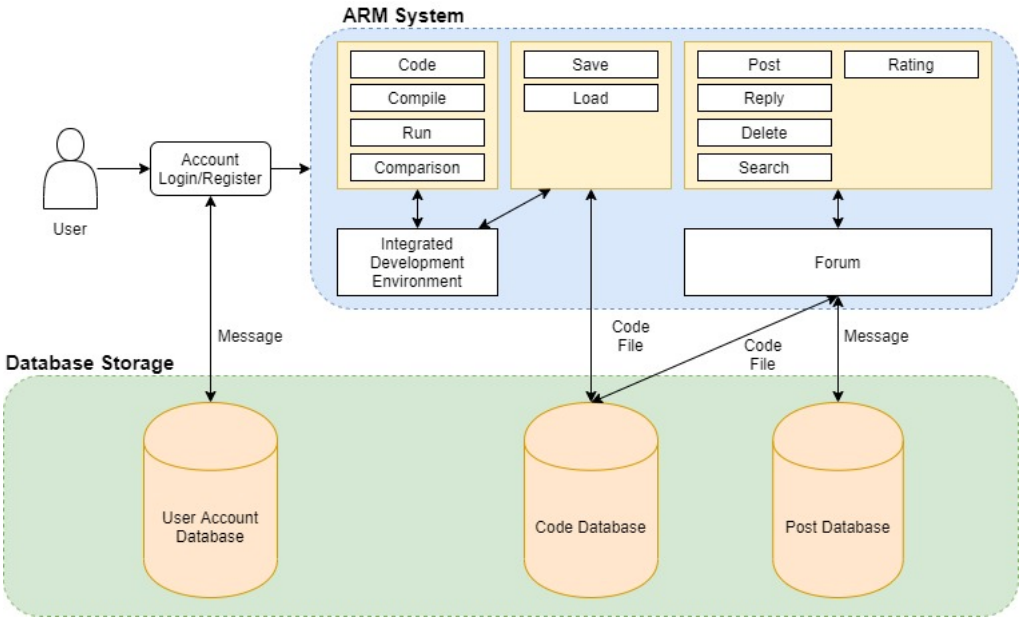
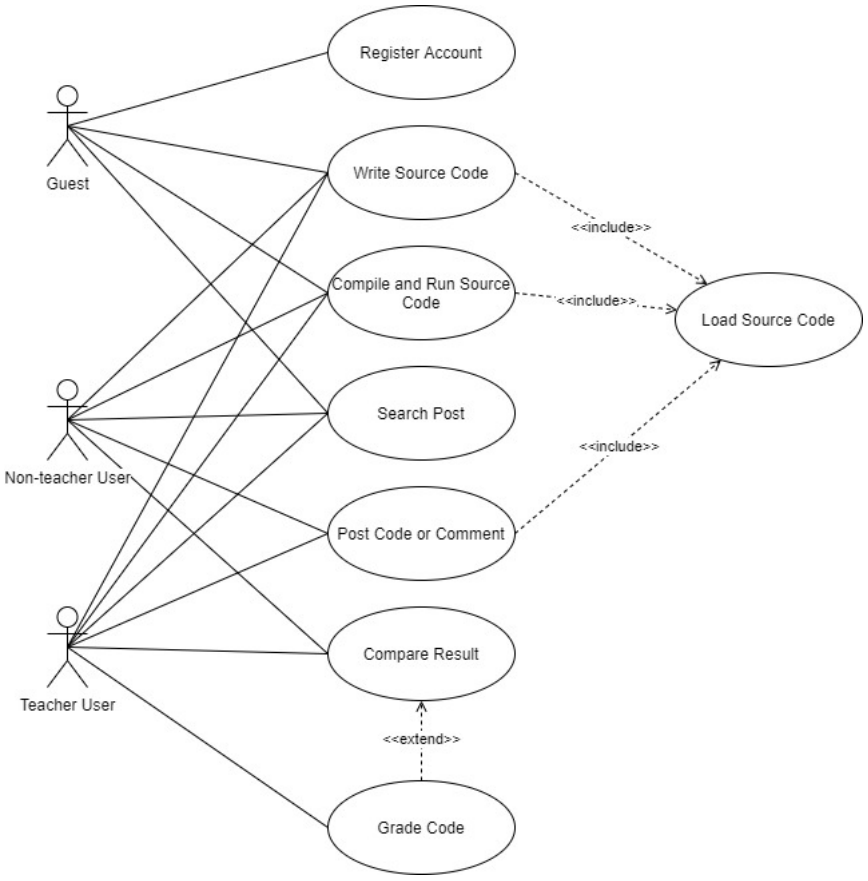
System Architecture

4.1 Architectural Diagram

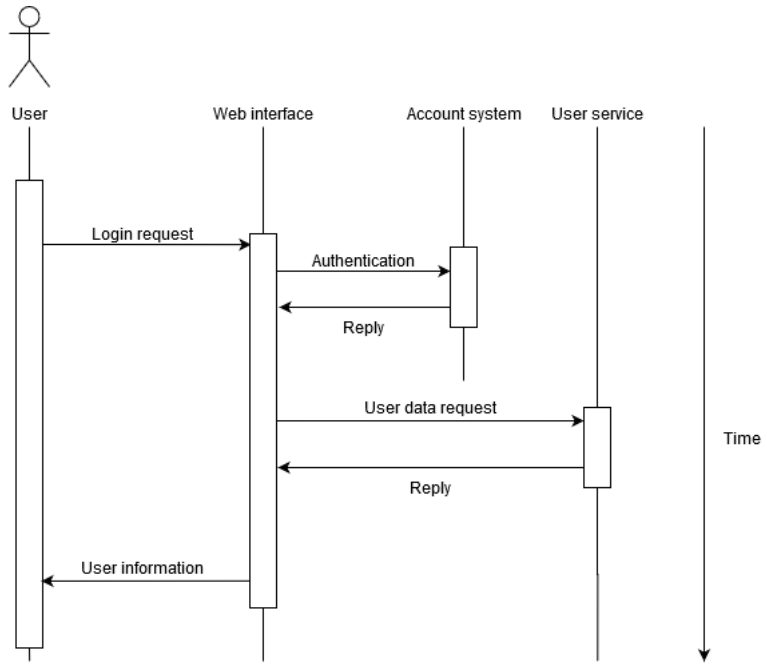


4.2 Use-case Diagram

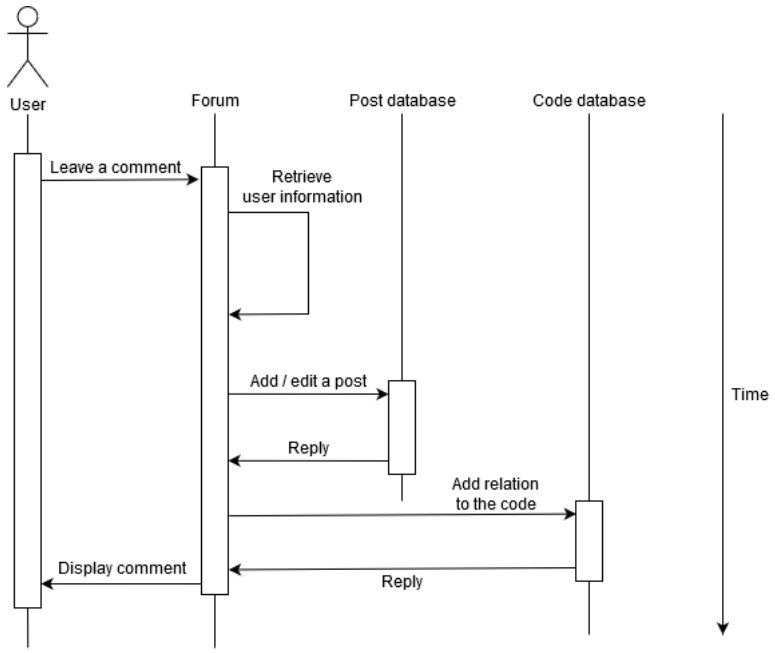


4.3 Sequence Diagram

4.3.1 Login Authentication



4.3.2 Forum



4.4 Class Diagram