

SPL-1 Project Report 2020

**Computerized Adaptive Test System**

SE 305: Software Project Lab I

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**1. Introduction**

This project is about special kind of exam test system which is called computerized adaptive test system. This is one kind of computer administered test which adapts to the candidate's ability in real-time by selecting different questions from the bank in order to provide a more accurate measure of their ability level on a common scale. Basically the students will get questions according to their ability where there will be 50% chance of giving correct answer. I create questions for students of class 10-12 and get their ability based on two algorithms (**Rasch** algorithm and **Monte Carlo** algorithm).Computer will generate questions by these algorithms where next question will arrive according to the response of previous question.

**1.1. Background Study**

Some prior study was needed, to implement this project.

**Computer Adaptive Test System**

I studied computer adaptive test system from Wikipedia. This is a form of [computer-based](https://en.wikipedia.org/wiki/Computer-based_assessment) [test](https://en.wikipedia.org/wiki/Test_(student_assessment)) that adapts to the examinee's ability level. In other words, it is a form of computer-administered test in which the next item or set of items selected to be administered depends on the correctness of the test taker's responses to the most recent items administered. So, I had to study some algorithms to learn this test system such as **Rasch** and **Monte Carlo** algorithm.

**Rasch Algorithm**

There were not enough resources about this Rasch model. Fortunately, I found some on internet where **Estimation of a Rasch model** is used to estimate the parameters of the [Rasch model](https://en.wikipedia.org/wiki/Rasch_model). Various techniques are employed to estimate the parameters from matrices of response data. The most common approaches are types of [**maximum likelihood**](https://en.wikipedia.org/wiki/Maximum_likelihood)estimation, **item response theory**. That’s why I have to learn statistical things and item response theory.

**Monte Carlo**

This is another approach to generate CAT system. I studied about this algorithm on Wikipedia where it states that it uses randomized method on samples to get a best result. It also uses probability distribution to predict student’s response. That’s why I had to learn more about probability distribution.

**Statistics**

Statistic is most important part in this project. I had to learn main basic things of statistics such as dichotomous variables, variance, standard deviation, maximum likelihood, probability distribution etc.

**1.2. Challenges**

There are a number of challenges in implementing a big project for the first time. There are many challenges I have faced to implement this project. There are some of them –

1. Working with header files for the first time

2. Working with multiple source files

3. Statistical learning –

🡪 Implementing Maximum Likelihood method

🡪 Implementing Estimate measure

4. Finding resources as there were not enough

5. Working with files

6. Making lots of MCQ question

7. Synchronizing questions according to difficulty level

8. Partitioning question file

9. Reading and writing on files in c++

10. Generating user manual

**2. Project Overview**

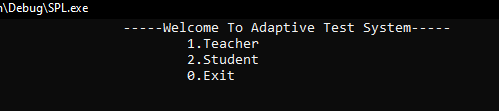
I have divided my whole project into two different parts. They are\_\_

🡪Teacher

1. Create Account
2. Log In

🡪Student

1. Test by Rasch Algorithm
2. Test by Monte Carlo Algorithm



**Creating Account**

Teacher can create account by giving their 5 tuples (username, first name, last name, email id and password).For creating account, it can check whether username is already taken or not.



Figure: Login code

Log In

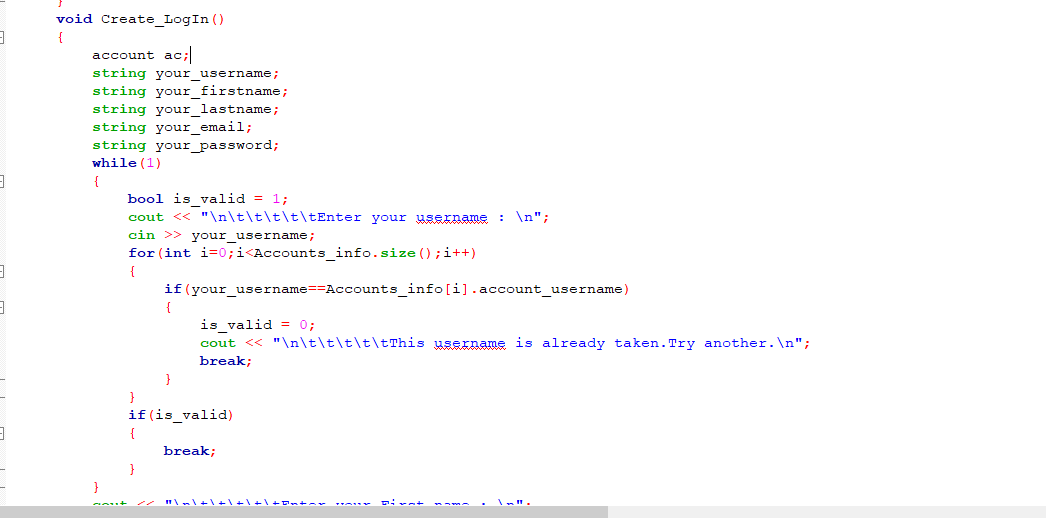
If Teacher already has an account,teacher can log in. Here it can check whether username and password is correct or not.

Figure: Create account code

**Question Synchronizing**

I had to make lots of questions and synchronize them according to their difficulty level. I made a file where questions are attached with solutions and synchronize them to read the file easily.

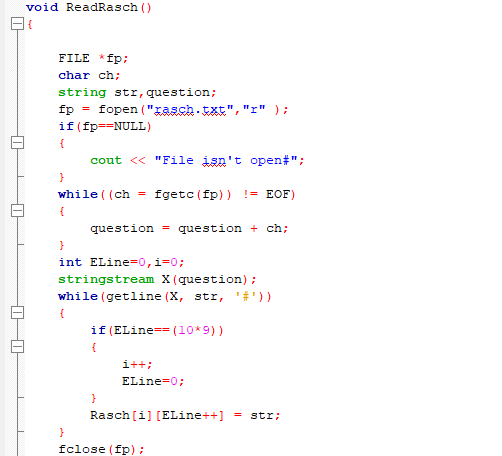


Figure: Synchronizing question file

**Randomizing questions and multiple choices**

Here questions and multiple options are randomized. It will make students aware of study as plagiarism is going to be tough. There is another feature that is skipping the questions at most 3 times.

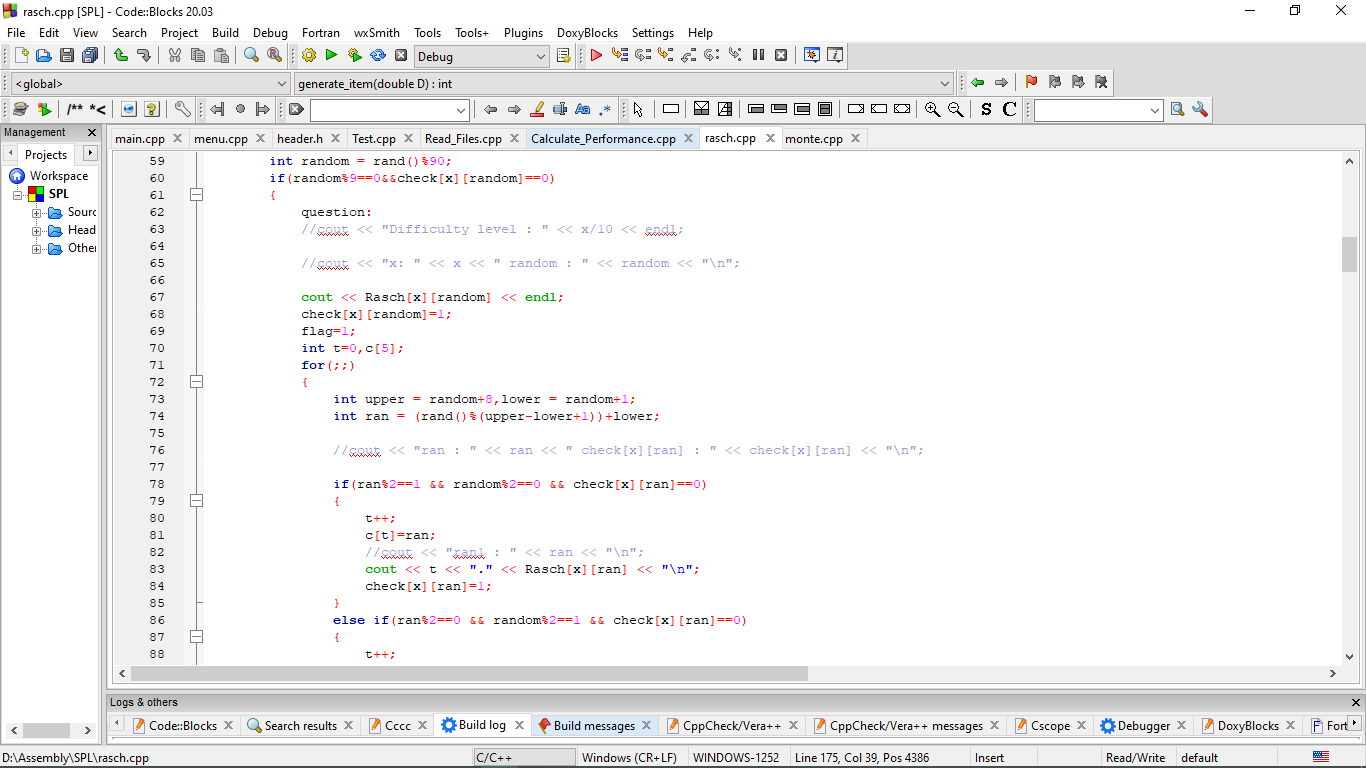


Figure: Randomizing questions and multiple choices

Rasch Algorithm

Monte Carlo Algorithm

**3. User Manual**

**4. Conclusion**

**5. Appendix**

I want to develop this project using machine learning algorithm (Classifier algorithm) to estimate response of the students more accurately in future.

**References**

1.<https://en.wikipedia.org/wiki/Computerized_adaptive_testing>

2.<https://surpass.com/news/2019/computer-adaptive-testing-background-benefits-and-case-study-of-a-large-scale-national-testing-programme/>

3.<https://www.rasch.org/rmt/rmt22g.htm>

4.<https://en.wikipedia.org/wiki/Monte_Carlo_method>

5.<https://www.ncertbooks.guru/>