University of Dhaka

Department of Computer Science and Engineering

Project Report:

Object Oriented Programming Lab(CSE-2112)

Project Name:

School Management Software

Team Members:

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Introduction

The School Management System software is an application which developed for school's administrations management. It is a software developed in Java which is used to store all the school-related records such as student information, teacher information, staff information etc.The informations are stored through a database . The objective of developing such a system was to reduce the errors that create many problems in the manual system where it was very difficult to store the records and access the data. It also provides the facility to generate class routine, display notices, fees collection facilities of a school. There is one type of login for this system and that is the administrator login. The employees can create their own administrator account with their unique employee id provided by the organisation. The whole system is handled by the administrator who has all the rights to edit or modify any school member information. It stores information related to students, staff, and teachers. School Management Software can help a admin of an educational institutions to organise their structure, curriculum, syllabus and communications etc along with some powerful reporting features to keep tabs on all procedures.

Main purpose of the School management software is to make the whole school activities on System. This system will maintain whole processes: Add teachers, add Students, add Departments, control registration processes and this system automatically generates reports. This system was developed to provide a secure, easy to use a reliable system. Overall, it'll make an easier job for the administrator of any organization.

Objective

This project provides us a simple interface for maintenance of a school's information.It can be used by educational institutes to maintain the records of students, teachers, and staff easily with many features. Achieving this objective is difficult using a manual system as the information is scattered, can be redundant and collecting relevant information may be very time consuming. All these problems can be reduced using this project.

The main objective of the project is to provide facilities by reducing paperwork and automating the record generation process in an educational institution. Throughout the project the focus has been on presenting information in an easy and intelligible manner.

Requirement Analysis

School Management Software can be used by education institutes to maintain the records of a school easily. The software also has some features like generating routine, fees collection record, notice management and result management. The main objective of School Management Software is to allow the administrator of any organization to edit and find out the personal details of a student,teachers and staffs and allows them to keep up date Information .It'll also facilitate keeping all the records of students, such as their id, name, class, gender, phone number etc. So all the information of a student to staff will be available in a few seconds. It will also help to generate routine for the all class and also notice management. Also it will help the authorities to store the result from the teacher via an excel file.

Without software, managing and maintaining the above things is a tedious job for any organization.

The software is mainly used for management and maintenance of a school, so the users of the software are mainly the administrators of a school. The administrators will use the software to add or modify data of the school. The students and teachers won't use the software directly. The admin of the software will have the ability to create a new account for the employee of the school with the employee id of the staff. So the office of a school more specifically administrators are the intended users of the School Management Software.

- ***Project Features:***

1. ***Student Section:***

In the student section the information of the students are stored (through a database), which can be added, deleted and modified easily. It helps to store the information of the current students of a school. Users can see all the students or class wise .It'll also facilitate keeping all the records of students, such as their id, name, class, gender, phone number ,alongside pictures. So all the information about a student will be available in a moment. It also provides a total number of students in the school. This feature also has an option to download a complete report with all the information which can be saved as a file (pdf/jpg etc).

2. ***Teacher Section:***

In the teacher section the information of the teachers are stored (through a database), which can be added, deleted and modified

easily. It helps to store the information of the current teachers of a school. It'll also facilitate keeping all the records of teachers, such as their id, name, subject, gender, phone number, alongside pictures. So all the information about a teacher will be available in a moment. It also provides a total number of teachers in the school. This feature also has an option to download a complete report with all the information which can be saved as a file (pdf/jpg etc). The name of the teachers added in this section will be used in the routine section for generating routine for the classes.

3. *Staff Section:*

In the staff section the information of the staff is stored (through a database), which can be added, deleted and modified easily. It helps to store the information of the current staff of a school. It'll also facilitate keeping all the records of staff, such as their id, name, designation, gender, phone number, alongside pictures. This feature also has an option to download a complete report with all informations which can be saved as a file (pdf/jpg etc).

4. *Result Section:*

This section is for result management of school. Users can add, modify and customize the result of the school. In this section results are stored through a database based on the class. The users just need to add a spreadsheet or excel file to update the result of a corresponding class given by the teacher. If an excel file is added in the software, everything in the excel file will first be stored in the database and then it will be shown in the result table instantly. With this feature results can be prepared easily and it will reduce manual proper work and save time. This feature also has an option to

download or print a complete report with all the information which can be saved as a file (pdf/jpg etc).

5. *Notice Section:*

This section is for notice management of school. While adding a notice user has to give a name to the notice and from the interface user has to choose the notice file. This will upload the notice and through the software notice can be updated in the website too. While uploading the notice the software automatically updates the publishing time.

6. *Routine Section:*

This section is for generating the routine. Users have to select the class that they want to make the routine for. After that, users have to select the subject for the specific period of the specific day. After choosing the subject, the software will show the available teachers for that particular subject of that class from the teacher database. After editing the section by clicking on the print button, the routine can be downloaded or printed directly from the software. After that admin can upload the routine in the notice section and it will be published as the notice.

7. *Fee Collection Section:*

In this section a student can be searched with his/her unique id no. After inputting the id, the information of the student will be displayed on the screen alongside the picture. It will also show the fees status (Collected / Unknown). The status can be changed from here and saved by clicking on the update button. And it will update the fees status of the student in the database.

8. *Login and Create Account Section:*

The user can login to this software with their own User-ID and password. If the user-ID and password is correct then the user can enter the software and use it. To create a new account, the system admin has to login with his/her administrator account. Only the system admin has the ability to create new accounts for other users with the employee id, username and password. The Add Account feature is only available in the system administrator's account. Other users haven't any access to this Add Account feature.

9. *Other features:*

With the above major features, there are some other features like adding a picture for the user in the software. There is also a logout and exit button for sign out and close the software. There is an about section with some description of the software. Also there are three sections which show the total number of teachers, students and staff.

System Design

System design is the solution for the creation of a new system.This phase focuses on the detailed implementation of the feasible system. It emphasizes translating design. System design has two phases of development:

- Logical design
- Physical design

Here the logical design is done through data flow and database design. The physical design is followed by physical design or coding.

During the logical design phase the analyst describes inputs (sources), outputs(destinations), databases (data sores) and procedures (data flows) all in a format that meets the user requirements.Physical design produces the working system by defining the design specifications, which specify exactly what the system must do.

1. ***Input and Output Design:***

The input design involves determining the inputs, validating the data, minimizing the data entry and providing a multi-user facility. With the feature users can be able to upload pdf, jpg, xlsx files.Also the direct user inputs are handled in this section. Inaccurate inputs are the most common cause of errors in data processing. Errors entered by the data entry operators can be controlled by input design. All the input data are validated and if any data violates any conditions, the user is warned by a message. If the data satisfies all the conditions, it is transferred to the appropriate tables in the database. In this project the student, teacher and staff details are to be entered for the record purpose. Multiple pages are designed for this purpose which is user friendly and easy to use. The design is done such that users get appropriate messages when exceptions occur.

Computer output is the most important and direct source of information to the user. Output design is a very important phase since the output needs to be in an efficient manner. Efficient and intelligible output design improves the system relationship with the user. Allowing the user to view the sample screen is important because the user is the ultimate judge of the quality of output. The output module has various options. Outputs (such as report, routine, details etc) can be printed and downloaded from the software directly.

2. *Database Design:*

Databases are storehouses of data used in the software systems. The data is stored in tables inside the database. Several tables are created for the manipulation of the data for the system.In the whole project total three databases were used for student teacher and staff information store, result maintenance and routine generating purpose. Here Sqlite and MySQL are used for database management.

3. *System Tools:*

The various system tools that have been used in developing both the front end and the back end of the project.

- **Front End:**

CSS, Jaspersoft, JAVA, JavaFX, Scenebuilder are utilized to implement the front end.

- **Back End:**

The back end is implemented using Sqlite which is used to design the databases.

Class Hierarchy

The class hierarchy of the School Management Software is described below with the UML diagram. The main features of oop inheritance, Encapsulation and polymorphism is properly used in the software. The class hierarchy given below is used for the storing information

for the teachers, students and staffs. The details of the classes in the diagram is given below:

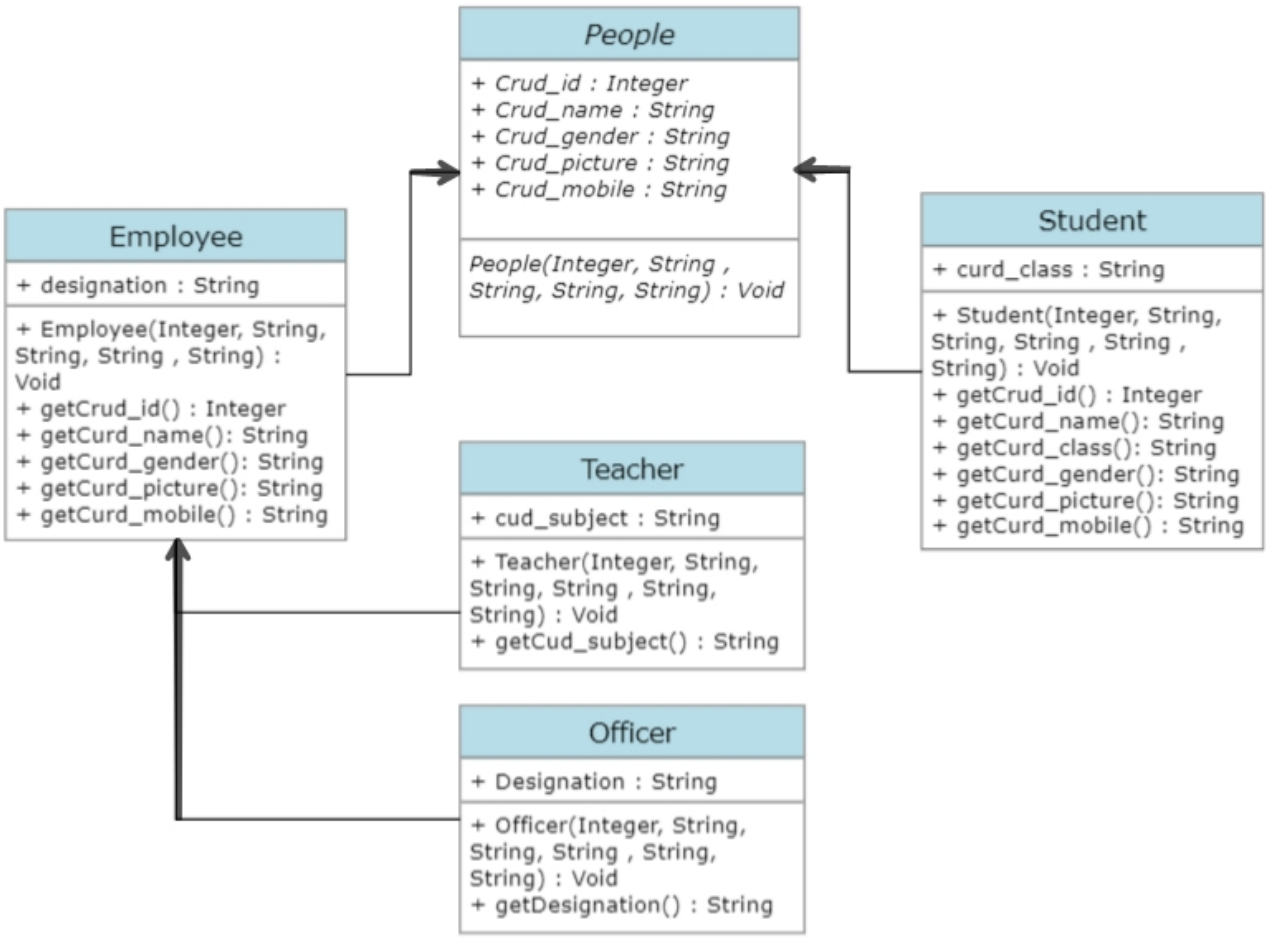


Figure: Class Hierarchy for storing people information

1) *People:*

It's the super class of this hierarchy and an abstract class. As this hierarchy is basically used for storing the information, the common information such as id, name, gender, picture, mobile number and its fields are here in this class. There are also methods to access the field of the class.

1.1) *Student:*

This class is the subclass of the People class. As it inherits the People class, it has the field to store the information of a student's class. It has methods to access its fields. This object of this class is mainly used in the other controller classes.

1.2) *Employee:*

This class is a subclass of People class and super class of two other classes named Teacher and Staff.

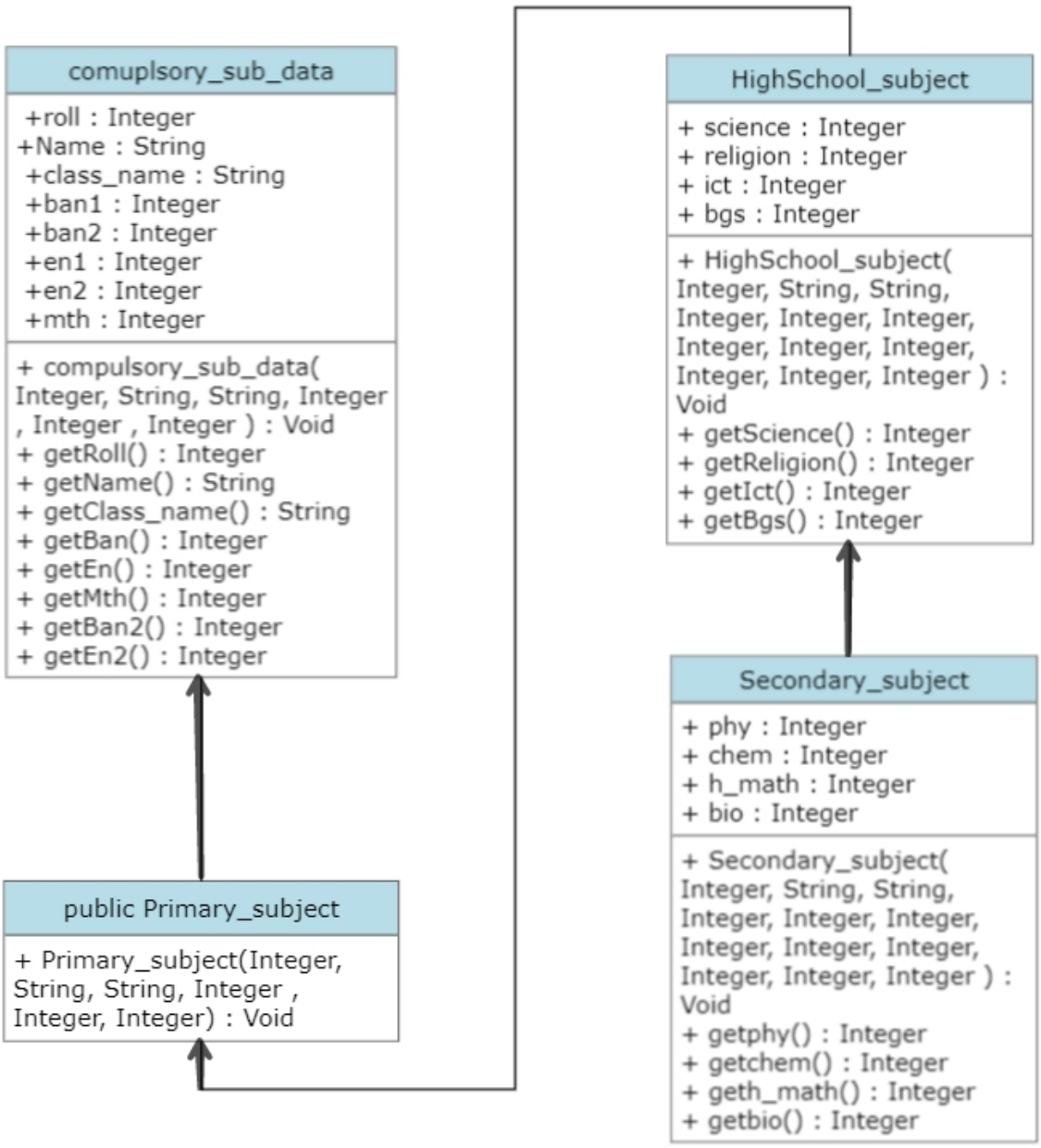
1.2.1) *Teacher:*

This class is the subclass of the Employee class. As it inherits the Employee class, it has the field to store the information of a teacher class. It has methods to access its fields. This object of this class is mainly used in the other controller classes.

1.2.2) *Staff:*

This class is the subclass of the People class. As it inherits the Employee class, it has the field to store the information of the employee and people class. It has methods to access its fields.

The following class hierarchy is for the result section of this software. Here in this hierarchy there are four class that has a linear inheritance relation between them. This hierarchy is described below with a UML diagram:



Class hierarchy for result management

1.) *Compulsory sub data:*

This class is contains the data of a student (name,roll,class etc) and have the field to store the marks of the student for those subjects which are included in all classes of the school.

2.) *Primary subject:*

This class contains the data of the primary classes which are class 1 to 5.

3.) *HighsSchool data:*

This class contains the data of the High School classes which are class 5 to 8. The extra subjects of this curriculum is added in this class.

4.) *SecondarySchool data:*

This class contains the data of the Secondary School classes which are class 8 to 10. The extra subjects of this curriculum is added in this class. This has also sections for the different Science and Commerce group options and different subjects.

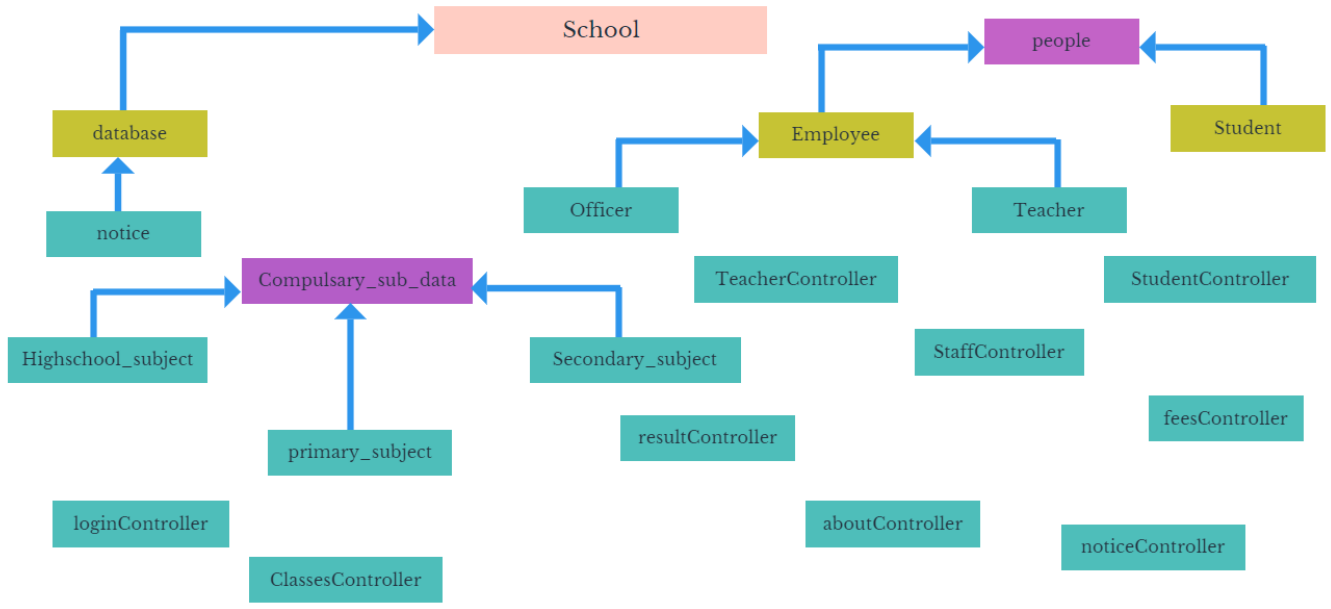


Figure: Complete Class Diagram

Details about the other classes:

StudentController:

StudentController mainly maintains all information related to students of different classes like their id, name,class,mobile,gender picture.There are two combo box for selecting the classes and gender.And all the information are stored in the table view which is also controlled by the StudentController. In the table view, all the data can be sorted by alphabetically or ascending and descending order of their id's.

TeacherController:

TeacherController is as like as StudentController.It maintains the information related to teachers like their id ,name ,subject,gender,mobile picture.Gender and Subject choosing facilities are maintained by the combo box.All the information are stored in the table view which is controlled by the TeacherController.The table view data can be sorted by alphabetically or ascending and descending order of their id's.

StaffController:

It maintains the information related to staffs like their id ,name ,designation,gender,mobile picture.Gender and designation choosing facilities are maintained by the combo box.All the information are stored in the table view which is controlled by the StaffController.The table view data can be sorted by alphabetically or ascending and descending order of their id's.

ResultController:

ResultController is used for showing the result and merging the

excel sheet of the result according to the classes.It also provides the facility to print out the result.The excel sheet is uploaded into the table view which is controlled by the result controller.

loginController::

This controller is used for managing the login and creating a new account section. This class takes data of user input of login data and matches them with the data in the database. Also while creating a new account, this class is also used.

ClassesController:

ClassesController is used to generate a class wise routine and print it.The routine is prepared by using Sqlite and Jaspersoft. In the routine all periods provide 2 combo boxes which are for selecting subject and teacher.If one subject is selected for the time period the teacher combo box will show the name of all the selected subject teacher's names.And these data are maintained by the database.

NoticeController:

NoticeController controls the process to upload a notice and also offers to give the name of the notice which is supposed to be uploaded.The date is automatically generated according to the device's date . Notice can be updated after first uploading .

FeesController:

FeesController processes the fees collection process of the software using a database. This class is used to update the fees status for a corresponding and save the change in database.

Discussion

In the project many javaFX is used for designing and demonstration purposes. In this project many java features are used. These features are described below with explanation.

Lambda Expressions:

Lambda expression is a new and important feature of Java. It provides a clear and concise way to represent one method interface using an expression. It is very useful in the collection library. It helps to iterate, filter and extract data from collections. The Lambda expression is used to provide the implementation of an interface which has a functional interface. It saves a lot of code. In case of lambda expression, we don't need to define the method again for providing the implementation. Here, we just write the implementation code Java lambda expression is treated as a function, so the compiler does not create a .class file.

Anonymous class:

Java anonymous inner class is an inner class without a name and for which only a single object is created. An anonymous inner class can be useful when making an instance of an object with certain "extras" such as overloading methods of a class or interface, without having to actually subclass a class.

Interface:

An interface in Java is a blueprint of a class. It has static constants and abstract methods. The interface in Java is a mechanism to achieve abstraction. There can be only abstract methods in the

Java interface, not method bodies. It is used to achieve abstraction and multiple inheritance in Java.

Encapsulation:

Encapsulation is defined as the wrapping up of data under a single unit. It is the mechanism that binds together code and the data it manipulates. Another way to think about encapsulation is that it is a protective shield that prevents the data from being accessed by the code outside this shield.

Polymorphism:

Polymorphism is a concept of object-oriented programming that allows us to perform a single action in different forms. It is an OOP design that empowers classes with various functionalities to execute or share a common interface. The helpfulness of polymorphism is that code written in various classes has no impact on which class it has a place in since they are utilized similarly.

Function overriding:

If subclass (child class) has the same method as declared in the parent class, it is known as method overriding in Java. In other words, If a subclass provides the specific implementation of the method that has been declared by one of its parent class, it is known as method overriding.

Function overloading:

If a class has multiple methods having same name but different in parameters, it is known as Method Overloading.

Collection framework:

The Collection in Java is a framework that provides an architecture to store and manipulate the group of objects. Java Collections can achieve all the operations that you perform on a data such as searching, sorting, insertion, manipulation, and deletion. Java Collection means a single unit of objects. Java Collection framework provides many interfaces (Set, List, Queue, Deque) and classes (ArrayList, Vector, LinkedList, PriorityQueue, HashSet, LinkedHashSet, TreeSet).

Abstraction:

Abstraction is the quality of dealing with ideas rather than events.A class which contains the abstract keyword in its declaration is known as abstract class.If a class has at least one abstract method, then the class must be declared abstract.If a class is declared abstract, it cannot be instantiated.

Exception Handling:

The Exception Handling in Java is one of the powerful mechanism to handle the runtime errors so that the normal flow of the application can be maintained.In Java, an exception is an event that disrupts the normal flow of the program. It is an object which is thrown at runtime.The java.lang.Throwable class is the root class of Java Exception hierarchy inherited by two subclasses: Exception and Error.

This are the major features which are used in the project.

Snaps

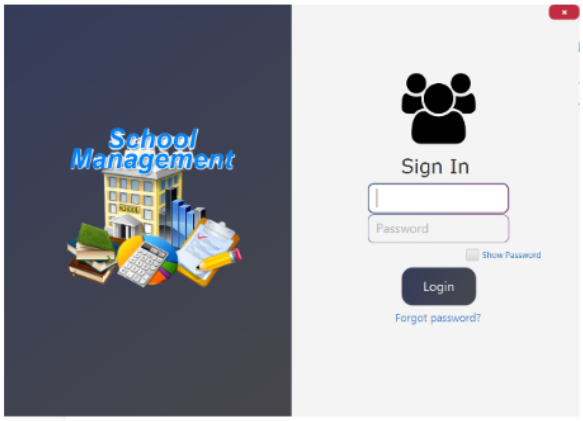


Fig:Login Page

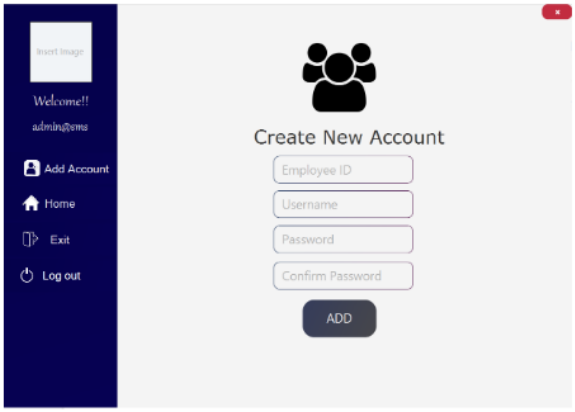


Fig: Create account page

Fig: Dashboard

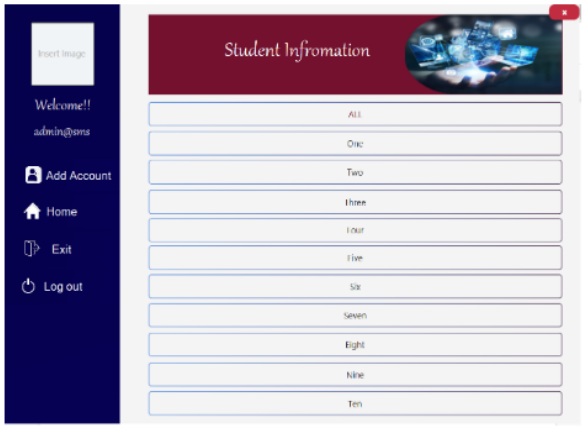


Fig: Student Information Section

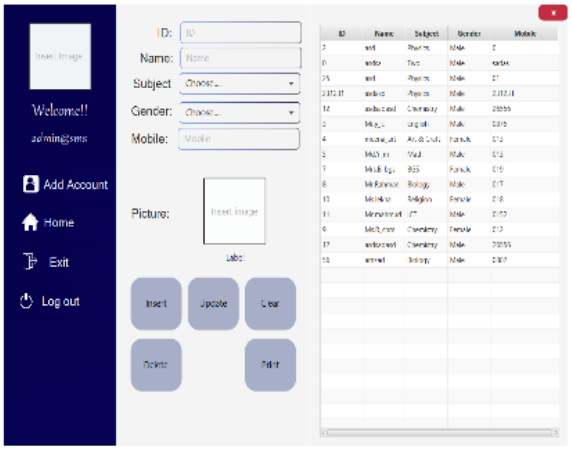


Fig: Teacher Information Section

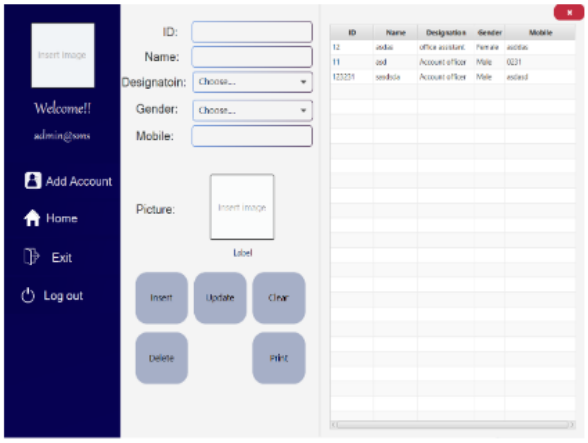


Fig: Staff Information Section

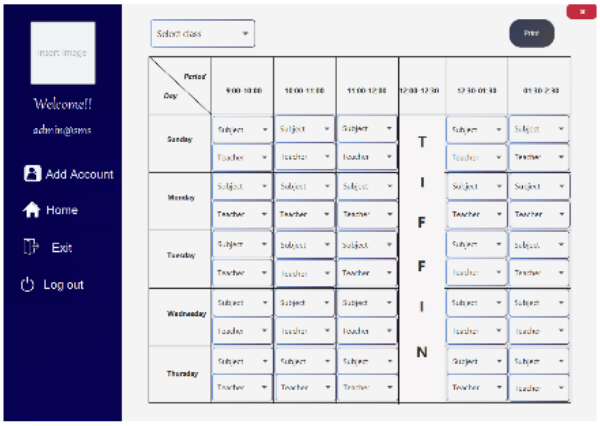


Fig: Routine Section

Fig : Fees collection Section

Fig: About Section

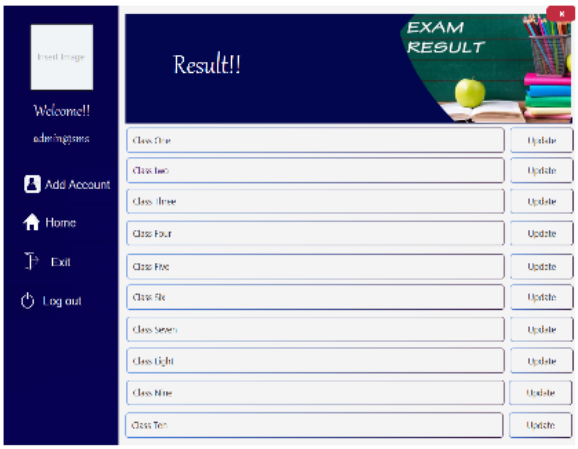


Fig: Result Section

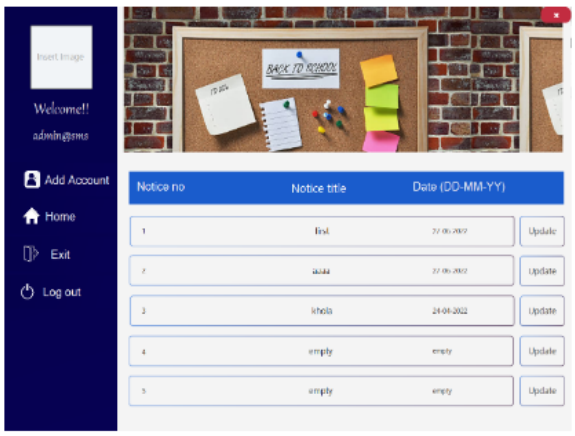


Fig : Notice Section

Platform, Library and Tools:

- Platform: Windows, Linux, macOS.
- Language: Java
- Build tool: Apache Maven.
- Tools : Adobe Photoshop, Pics Art Photo Editor.
- Database: SQLite.
- LaTex editor: Overleaf
- Report maker: JasperReport.

Conclusion:

In this project we have gained lots of experience and had to face many obstacles too. Making a software is completely a new and practical experience to us. So,We had to learn things from the beginning. By this work we have introduced ourselves with the JavaFx(special effects in the Java language) library. Our thinking and imagination capability have grown. We have developed our communication skills by co-operating between group members. Actually it was a new experience for us.

This project helped us in gaining valuable information and practical knowledge on several topics like using java features, use of oop principal, css, usage of responsive templates, designing of reports, and management of database using sql The entire system is secured. Also the project

helped us understanding about the development phases of a project and software development life cycle. We learned how to test different features of a project.

The obstacle we have faced is that making a software is completely a new experience to us and it is different from the programming that we used to. We had to learn things from the beginning which were fully new to us. We had to learn things by video tutorials, internet and learning materials. It can be said that making software is a very sensible work to do because through the Software we try to do critical and time consuming tasks easily manageable for the users .Creating a user friendly model is a difficult task because we have to work with each and every point of the model. There is a scope for further development in our project to a great extend. A number of features can be added to this system as feature. Another feature we wished to implement was providing teachers in the routine based on their availability in the time period. This feature isn't included because of the limitation of time.

Future plan:

- Improve the graphical representation of the Software.
- Feature upgrade for making it more reliable.
- Try to make it online based.
- Implement user option for student and teachers.
- Take user feedback and improve features according to their opinion.
- Introduce new environment and scenes.

Repositories:

GitHub Repository: **https://github.com/Dip-to/School-Management-Software.git**

References:

Apache Maven: **https://maven.apache.org/guides/getting-started/maven-in-five-minutes.html**

Gluon: **https://gluonhq.com/products/javafx/**

JasperSoft: **https://community.jaspersoft.com/wiki/jaspersoft-community**

Scene Builder: **https://www.oracle.com/java/technologies/javafxscenebuilde html**

Typesetting(Overleaf): **https://www.overleaf.com/read/xhtzhxbtsqqx**