QR Code Based Smart Attendance System

BY

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Computer Science and Engineering

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APPROVAL

This Project titled "**QR Code Based Smart Attendance System**", submitted by Ali MD Musfick Jamil to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 09/09/2021

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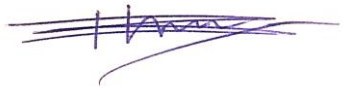

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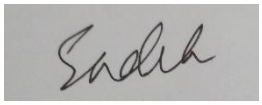

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We hereby declare that, this project has been done by us under the supervision of **Md. Jueal Mia, Sr. Lecturer, and Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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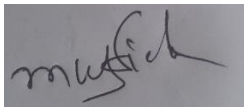

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Finally, we must acknowledge with due respect the constant support and patients of our parents.

ABSTRACT

Nowadays smartphones is the at most common thing we use in our daily life. We can solve many of daily life problem very quickly and easily by using smartphones. Smartphone has made our life simple and easier by using mobile apps. By using this technology the paper motive a system that will help us to manage attendance faster and quickly. Our system has two type of application, first one is web portal for generating QR Code for students and second application for giving attendance using this application by scanning the QR Code which generated by the teacher. Teacher will generate a QR code after entering the class and student will scan the QR code. In this paper we discusses about how the system verifies student identification to close out fake attendance. This system will manage all the student attendance automatically. The teacher don't need to call one by one to take each student attendance in the class. Student will able to give their own attendance by using there smartphones. The attendance system will make the state of every student if the student is in class or not. For absent student teacher will see 'Not in classes and for present teacher will see 'In classes'. Teacher will also able to see student's location in the web portal for the security of fake attendance. The attendance reports will be created in web portal.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1
INTRODUCTION

1.1 Introduction

There are various kind of attendance system already have been come out, using fingerprint systems, log books, QR codes, barcodes, which may have lots of problems like providing wrong information or data to the users and also those are expensive and time consuming. The motive of the QR code based attendance tracking system is to automate the regular way of taking attendance and also give faster, easiest and smarter way to monitor student attendance in any education institution. To make this work we will use the most common device is smartphone.

1.2 Motivation

In every education institution attendance is very common thing to do as a student or teacher. At classroom teacher need to take attendance one by one by calling their name or id. This way taking attendance is very time consuming and slower. Smartphones can help us to solve this problem. If we use smartphone to give attendance to the teacher this will be faster and easier. Teacher don't need to take attendance by calling one by one. This will save the time that wasting for giving attendance and teachers and students also can concentration there study. Nowadays using smartphone is a very common thing, so why we shouldn't take the advantage of this technology for making our life easier and faster.

1.3 Objective

"QR Code Based Smart Attendance System" is made of one mobile application and one website. The android application is for giving attendance by scanning QR code and the website is to generate a QR code and share to the students in class. Here the teacher, who is in charge of take the presence of the students. In classroom each student will be have a mobile application that is need to scan the QR Code. Teacher will enter the class and generate a QR code in daily basis.

Students will scan the QR Code from his own sit by using smartphone. Teacher will able to see real time update on the dashboard of the website. After successfully attendance complete teacher need to submit the attendance and it will automatic save to the database. The main intention of the QR Code dependent attendance approach is to minimize the attendance taking time and automated the regular way of taking attendance in faster and easiest way.

1.4 Expected Outcome

The main aim of this system is minimize the attendance taking time in education institution. This system is less expensive than other attendance system. We all use smartphone and we can use this in our education institution for taking advantage of technology. QR code dependent smart attendance system will provide strong security and generate the output quickly. UI design is very friendly and effective. This will give more accurate and efficient date in short time.

1.5 Project Management and Finance

In this project we need to develop a mobile application and a website. There are no need to develop any physical device. This will minimize the cost of implementation for this project. For making this project the main cost is in develop an android application and a website.

TABLE 1.1: Cost plan of firebase database and domain

Service Name	Cost Plan
Authentication	No Cost
Cloud data	$0.18/GiB
Database writes	$0.18/100K
Database reads	$0.08/100K
Database deletes	$0.08/100K
Domain	$8.80/Yearly

1.6 Report Layout

Chapter 1: Will discuss about motivation, objective, introduction, expected outcomes and project management also finance of our project.

Chapter 2: Will discuss about terminologies, comparative analysis, related works, scope of the problem and challenges.

Chapter 3: In this chapter we will explain about business process modeling, collection and analysis, requirement use case modeling and description and logical data model, design requirement of the project.

Chapter 4: In this chapter we will discuss about font-end design, back-end design, interaction design and user experience, implementation requirements.

Chapter 5: Will discuss about implementation of database, implementation of front-end design, testing implementation, test results and reports.

Chapter 6: In this chapter we will talk about discussion and conclusion, scope for further developments.

CHAPTER 2
BACKGROUND

2.1 Terminologies

In recent days, we are getting used to using technology everywhere. We are trying to involve students and teacher to best use of technology in education institutions. We are developing a very efficient and secure system which can make change the classroom environment with use of technology in fun and interesting way. We hope our project more reliable and faster than any other attendance system.

2.2 Related Work

There are many approach for QR code base attendance system in the compositions and in the market. Most of all do focus on application to be installed on the teacher device, whether and mobile or a laptop, in this section, we will discuss few of these projects.

Reference [1] they propose a system that need to install an android app in teacher and students both smartphone. This system will work in offline. The student smartphone will communicate with the teacher smartphone using the Bluetooth connection and transfer the (MAC) address to the teacher smartphone and the student is present in the class.

Reference [2] another is example is face detection algorithms using Learning Management System (LMS). In the class time this system will automatic detect the present students face and will confirm their presence. Registered students will only able to give attendance by using this system.

Reference [3] this project works with fingerprint scanning. They made a system which verify fingerprint by using derivation of minutiae approach and the system that automates the attendance taking process.

2.3 Comparative Analysis

We noticed that most of them need to buy a physical device or long term using is not suitable. Giving attendance using Bluetooth may fail some time because both device need to connect to each other and then they can give attendance. There are also limit connection that can make a smartphone once at a time. Another one uses the machine learning with pliant methods used to recognize facial changes. By comparative analysis we need one android application and one web site. We don't need to connect phone to teachers smartphone that's why this is time saving. Student can give attendance any time during in class period. Teacher don't need to check one by one. Our system is much faster than those because everything will work on parallel.

2.4 Scope of the problem

Time is very important thing now a day. Time minimizing is the main focus of this project. This system promised to students and teacher that no one need to wait for give their attendance during class time. Giving attendance by scanning QR code is faster and smarter than previous mentions related works.

2.5 Challenges

There are few challenges in this project. One main challenge is reliable internet connection. This project use internet for saving attendance data to the database at real time that why reliable internet is very important. So before giving attendance every students need to give ensure that they have internet connection on their phone.

CHAPTER 3

REQUIREMENT SPECIFICATION

3.1 Business Process Modeling

Our business process model and DFD, which are given below:

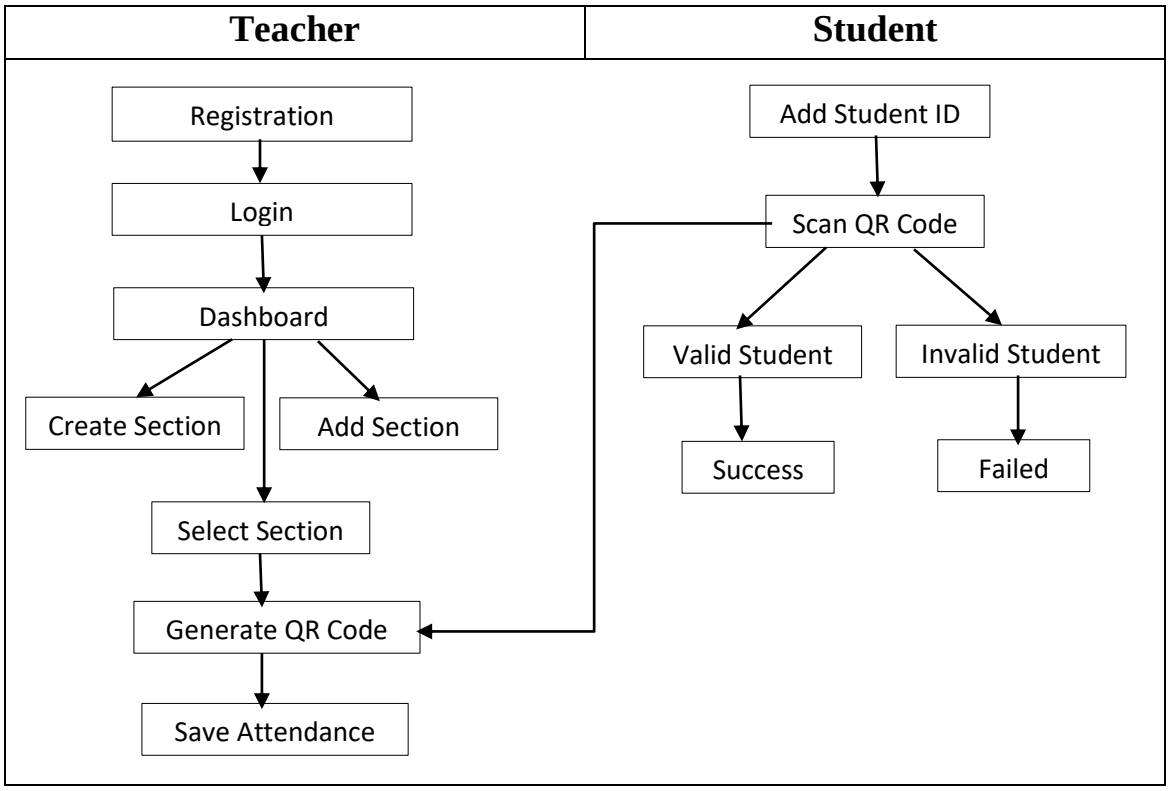


Figure 3.1: Data Flow Diagram

3.2 Requirement Collection and Analysis

This system has two application. One is android application and another one is web application. So it has few Requirement

- Hardware Configuration:
    - An android smart phone for student.

- A laptop or desktop computer for teacher.

➢ Software Configuration:

- OS: Android (API level 21 or higher)
- Tools: Android Studio IDE
- Database: Firebase Firestore
- Server and a domain for hosting website

➢ Features:

- Teacher registration using Email and Password
- Teacher login
- Section create, delete, update
- Student add, delete, update
- Select date
- Generate QR Code
- Enter Student Id
- Scan QR Code
- Submit attendance
- Update attendance
- View attendance report
- Logout

3.3 Use Case Modeling and Description

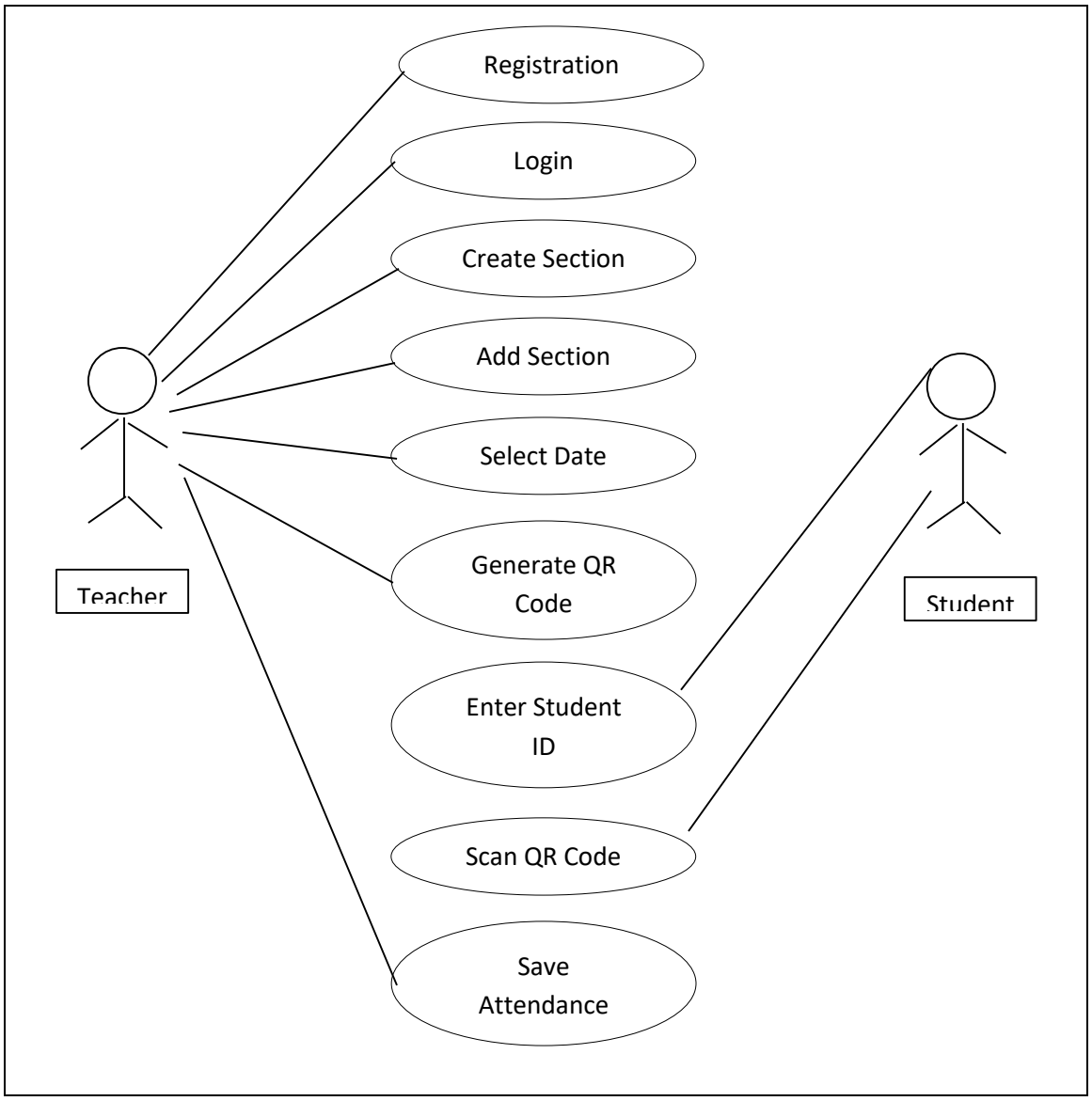


Figure 3.2: Use case diagram

There are two type of actors in this use case diagram. Left person is teacher and Right person is student. Teacher need to register before taking attendance. After register teacher will able to login to the website. For student, they need to install a mobile application on their smart phone and enter their student id in the application. Teacher will create a section and add those student to created class.

Then teacher will select the section and a QR code will be generated for the students. After generating the QR Code students need to scan the QR Code and they will automatically present in the class. Teacher will also able to see student's attendance report in the website.

CHAPTER 4
DESIGN SPECIFICATION

4.1 Front End Design

We are going to use two application one is mobile application and another one is web application. In android application we designed frond end using XML markup language and in web application we used HTML, CSS and JavaScript. Our every design is responsive and support every possible device. Here is a design of android application:

➢ 4.1.1 Splash Screen

This is the home page of android application. Students need to click Lets Start button.

Figure 4.1.1: Home Screen

➢ 4.1.2 Enter Student Id Screen

Each and every student has unique id. Now students need to input their id for giving attendance. After input id click save.

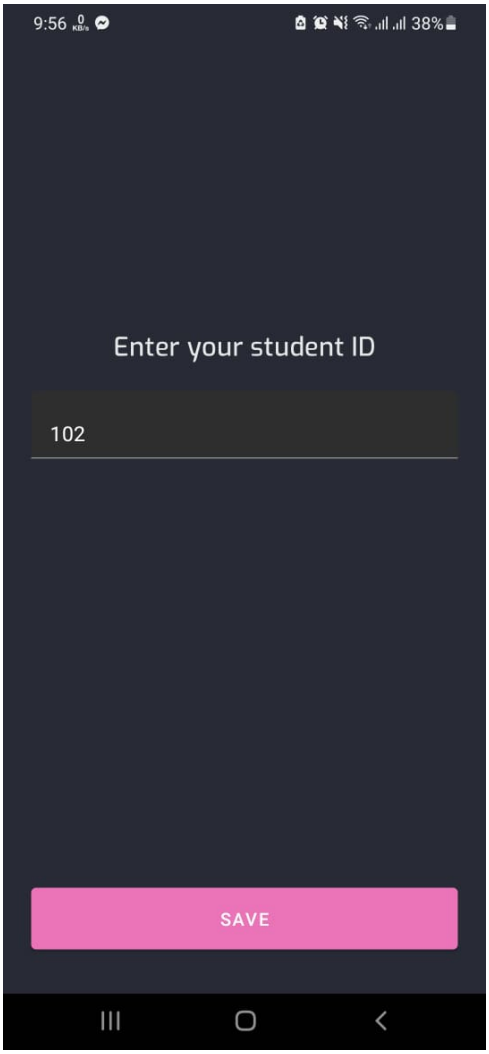


Figure 4.1.2: Enter student ID screen

➢ 4.1.3 Home Screen

This is home screen of mobile application. When teacher will generate a QR code student will scan the QR by clicking scan button.

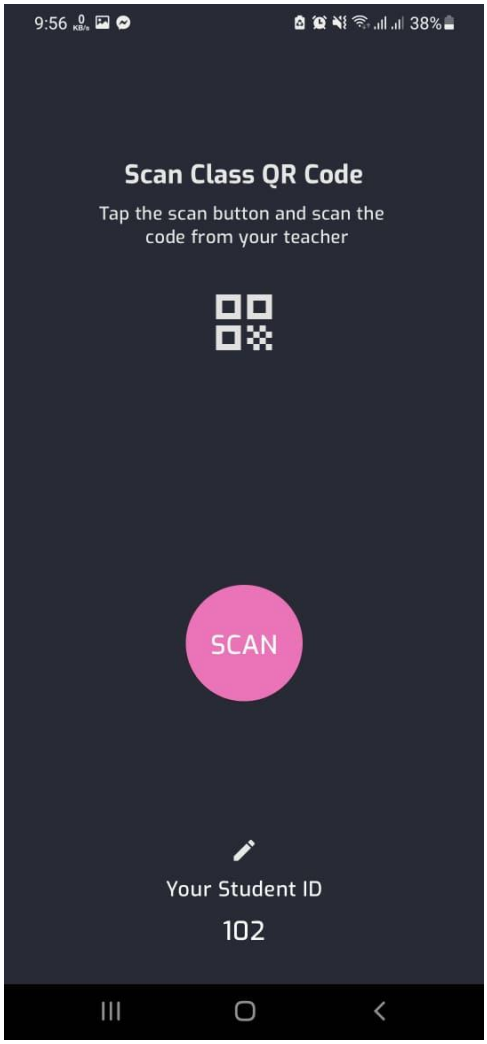


Figure 4.1.3: Home Screen

➢ 4.1.4 Scan Screen

This is scan screen. Students need to scan the QR code in the screen which is generated by teacher.

Figure 4.1.4: Scan screen

➢ 4.1.5 Attendance Success Screen

Student will see the attendance status in the screen.

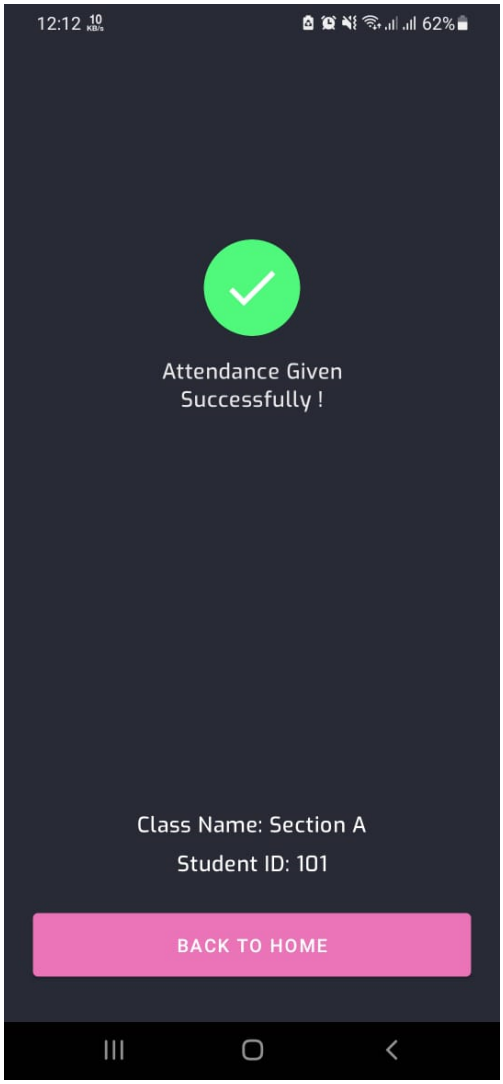


Figure 4.1.5: Attendance Success

➢ 4.1.6 Teacher Registration Screen

Teacher need to registration before login to the dashboard. Here teacher need username, email, password.

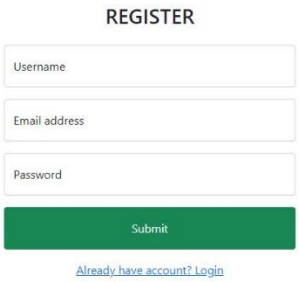


Figure 4.1.6: Teacher Registration

➢ 4.1.7 Teacher Login Screen

For teacher login need email and password.

Figure 4.1.7: Teacher Login

➢ 4.1.8 Create Section Screen

Teacher need to create section for the students.

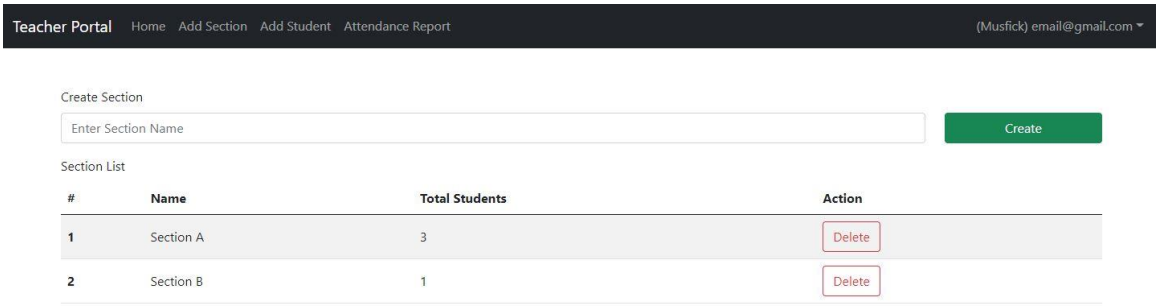


Figure 4.1.8: Section Create

➢ 4.1.9 Add Student Screen

After creating a section teacher will able to add students in the created section. Teacher can also delete the student from section.

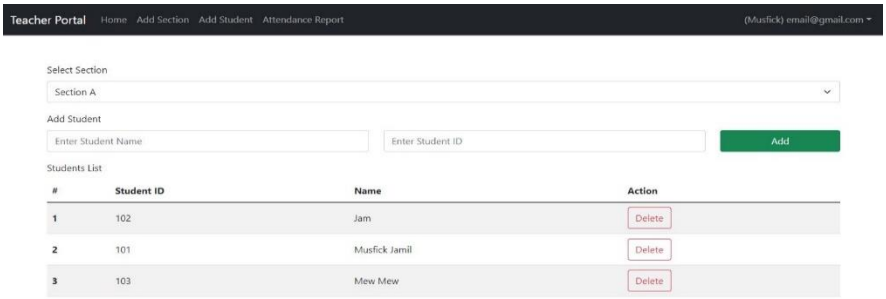


Figure 4.1.9: Add Student Screen

➢ 4.1.10 Home Screen

Now teacher will able to take attendance. First teacher need to select a date and then select a section. Teacher need to click Generate QR Code. This system will automatic generate a QR Code and students will scan this code by using their smart phone. After taking attendance teacher can save the attendance by clicking save attendance button.

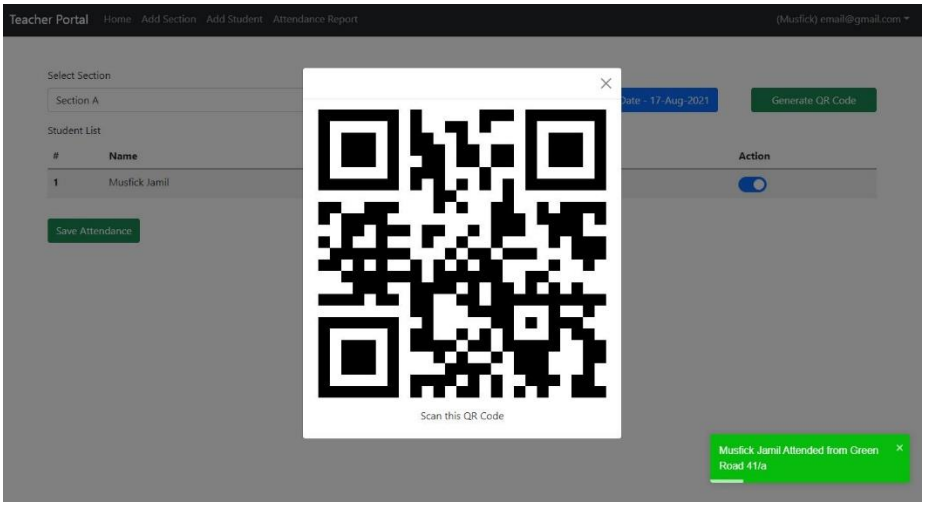
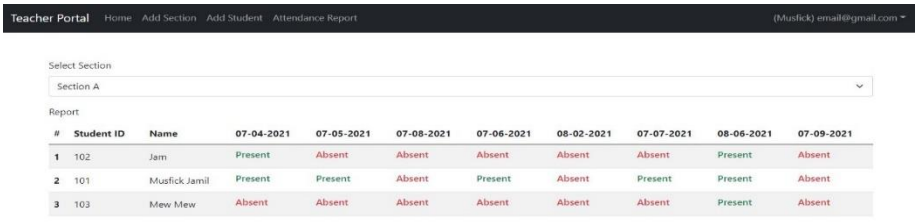


Figure 4.1.10: Generated QR code

➢ 4.1.11 Report Screen

Teacher can monitor every student attendance by their date. An attendance report will automatic generated.



#	Student ID	Name	07-04-2021	07-05-2021	07-08-2021	07-06-2021	08-02-2021	07-07-2021	08-06-2021	07-09-2021
1	102	Jam	Present	Absent	Absent	Absent	Absent	Absent	Present	Absent
2	101	Musfick Jamil	Present	Present	Absent	Present	Absent	Present	Present	Absent
3	103	Mew Mew	Absent	Absent	Absent	Absent	Absent	Absent	Present	Absent

Figure 4.1.11: Attendance Report

4.2 Back-end Design

➢ Web

We uses JavaScript for implement backend for this system. Here are some implementation part.

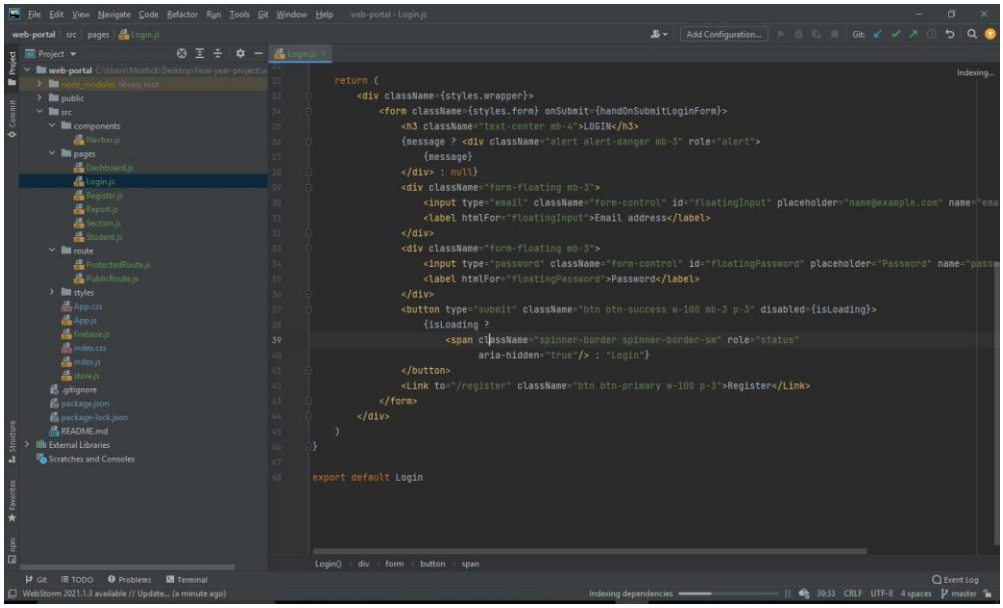


Figure 4.2.1: Login Implementation

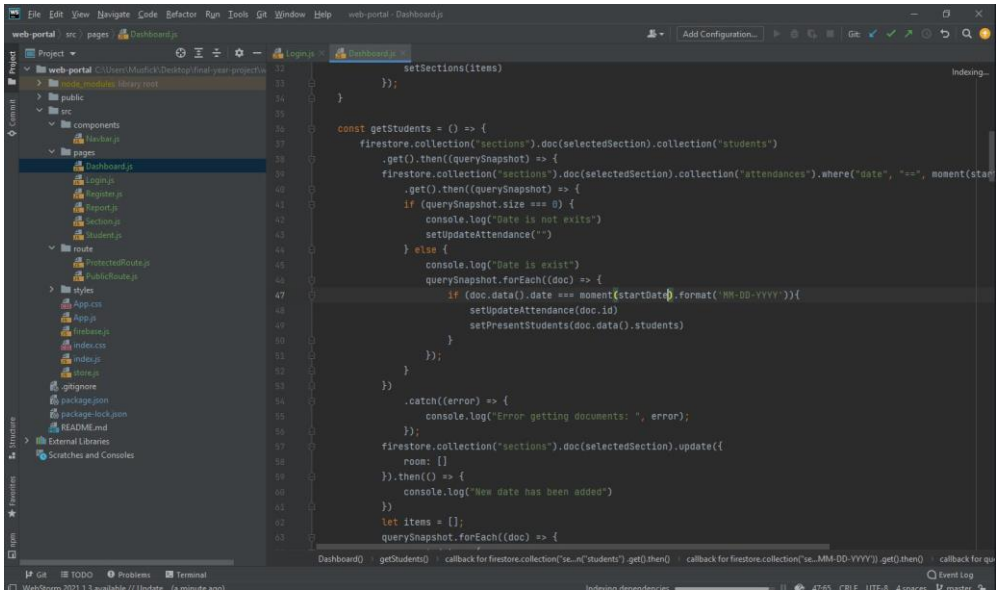
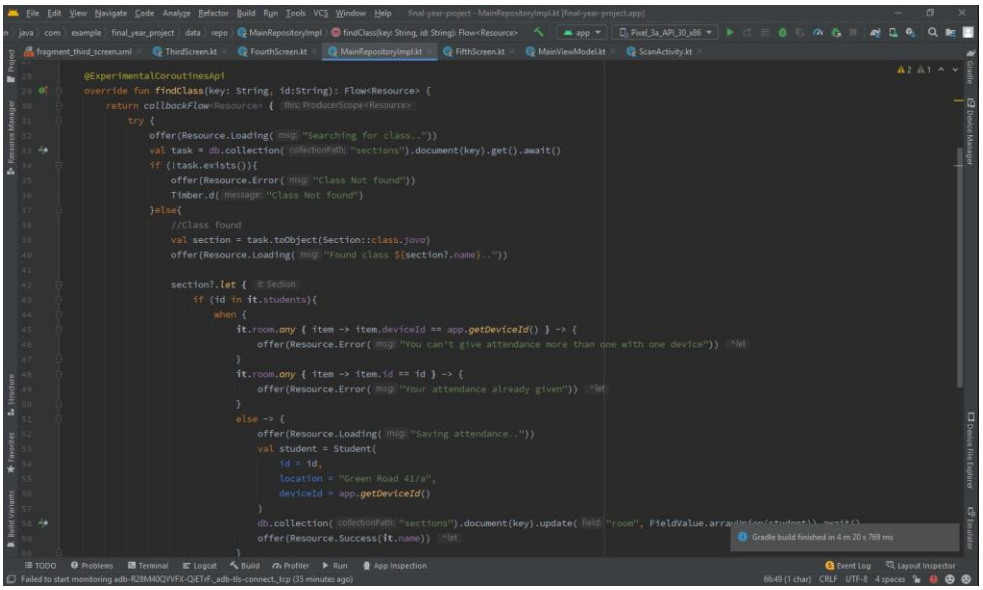


Figure 4.2.2: Home Implementation

➢ Mobile Application

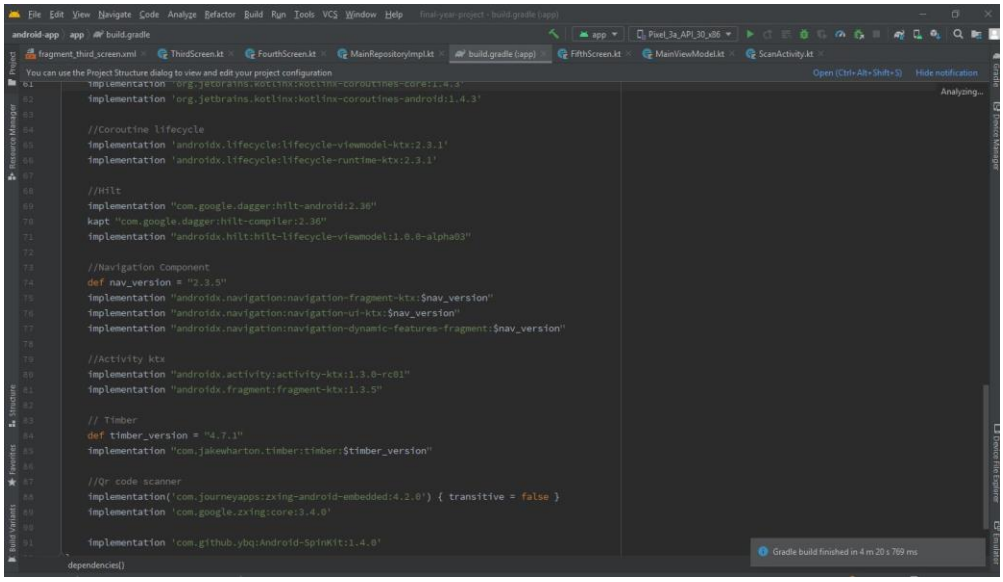
For implement mobile back-end we used kotlin as a programming language. Here are some implementation part:



```
@ExperimentalCoroutinesApi
override fun findClass(key: String, id:String): Flow<Resource> {
    return callbackFlow<Resource> {
        try {
            offer(Resource.Loading( msg: "Searching for class.."))
            val task = db.collection( collectionPath: "sections").document(key).get().await()
            if (!task.exists()){
                offer(Resource.Error( msg: "Class Not found"))
                Timber.d( message: "Class Not found")
            }else{
                //Class found
                val section = task.toObject(Section::class.java)
                offer(Resource.Loading( msg: "Found class ${section?.name}.."))

                section?.let {
                    if (id in it.students){
                        when {
                            it.room.any { item -> item.deviceId == app.getDeviceId() } -> {
                                offer(Resource.Error( msg: "You can't give attendance more than one with one device"))
                            }
                            it.room.any { item -> item.id == id } -> {
                                offer(Resource.Error( msg: "Your attendance already given"))
                            }
                            else -> {
                                offer(Resource.Loading( msg: "Saving attendance.."))
                                val student = Student(
                                    id = id,
                                    location = "Green Road 41/a",
                                    deviceId = app.getDeviceId()
                                )
                                db.collection( collectionPath: "sections").document(key).update( field: "room", FieldValue.arrayUnion(student))
                                offer(Resource.Success(it.name))
```

Figure 4.2.3: Scan code implementation



```
//Coroutine lifecycle
implementation 'androidx.lifecycle:lifecycle-viewmodel-ktx:2.3.1'
implementation 'androidx.lifecycle:lifecycle-runtime-ktx:2.3.1'

//Hilt
implementation "com.google.dagger:hilt-android:2.36"
kapt "com.google.dagger:hilt-compiler:2.36"
implementation "androidx.hilt:hilt-lifecycle-viewmodel:1.0.0-alpha03"

//Navigation Component
def nav_version = "2.3.5"
implementation "androidx.navigation:navigation-fragment-ktx:$nav_version"
implementation "androidx.navigation:navigation-ui-ktx:$nav_version"
implementation "androidx.navigation:navigation-dynamic-features-fragment:$nav_version"

//Activity ktx
implementation "androidx.activity:activity-ktx:1.3.0-rc01"
implementation "androidx.fragment:fragment-ktx:1.3.5"

// Timber
def timber_version = "4.7.1"
implementation "com.jakewharton.timber:timber:$timber_version"

//Qr code scanner
implementation('com.journeyapps:zxing-android-embedded:4.2.0') { transitive = false }
implementation 'com.google.zxing:core:3.4.0'

implementation 'com.github.ybq:Android-SpinKit:1.4.0'
```

Figure 4.2.4: Gradle Script

4.3 Implementation Requirements

- Database: Firebase Firestore
- Dependency Injection: Android Hilt
- QR Code Scanner
- Coroutine
- MVVM and Repository Pattern
- Channel Flow
- Android X
- React JS
- Language: Kotlin, JavaScript

CHAPTER 5

IMPLEMENTATION AND TESTING

5.1 Implementation of Database

In our system we uses firebase firestore. Firebase firestore is a real-time database. For our system real-time database is very important. When a student scan a QR code, its update data in database at real-time. For real-time feature teacher can see live update in the website. Firebase firestore is very secure database. Here is database implementation:

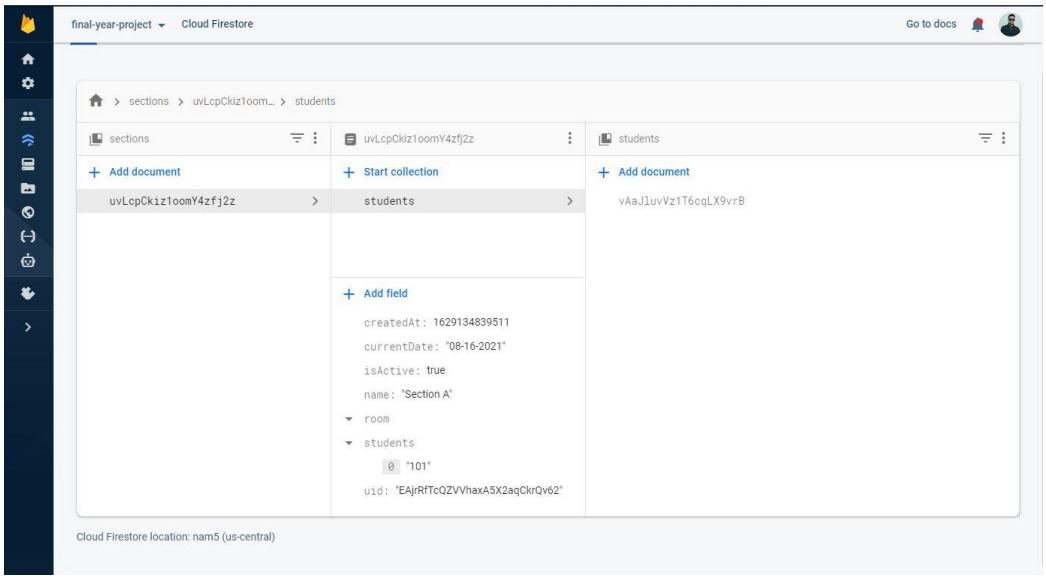


Figure 4.1.1: Database Implementation

5.2 Implementation of Front-end Design

We designed the user interface very carefully. Easy user interface make a software very user friendly. Our first focus was how simple we can make the design that take less time for give attendance. Time saving is the main goal of our project. Every design is minimalistic and responsive.

5.3 Testing Implementation, Result and Report

Our project is already test in many device and different case of input. Our success rate is very much impressive.

TABLE 1.2: Testing Result

Test case	Test input	Expected outcome	Obtained outcome	Passed/ Failed	Testing Period
Install	Tested on different version of smart phone	Installed	Installed	Passed	17/08/2021
Login	Unable to login without register	Not Login	Not Login	Passed	17/08/2021
Register	Input Invalid Email	Not Register	Not Register	Passed	17/08/2021
Login	Input valid email and password	Move to home page	Move to home page	Passed	17/08/2021
Create Section	Empty section name	Validation Failed	Validation Failed	Passed	17/08/2021
Create Section	Input Valid Section Name	New section created	New section created	Passed	17/08/2021

Add Student	Input Valid Student Id	Student added to the section	Student added to the section	Passed	17/08/2021
Generate QR Code	Invalid date and section	Disable Generate QR Code	Disable Generate QR Code	Passed	17/08/2021
Generate QR Code	Valid date and section	Generate QR Code	Generate QR Code	Passed	17/08/2021
Scan QR Code	Invalid Student Id	Validation Failed	Validation Failed	Passed	17/08/2021
Scan QR Code	Valid Student Id	Attendance Given successfully	Attendance Given successfully	Passed	17/08/2021

CHAPTER 6

CONCLUSION AND FUTURE SCOPE

6.1 Discussion and Conclusion

Finally, we have been finished develop and setup our application. We hope our project will help to save more time during in class time. Call by name and taking attendance is very time consuming. We can minimize this time using the smartphone. Our system is fast and secure. Connecting people using smartphone is growing day by day. It is to use technology everywhere that makes our life easy and fast. We believe that our application will granted to all the teacher and student community. Our application will take the attendance management system to next level.

6.2 Limitation

Our system has few limitations. They are:

- If a student bring two phone in class room, they will able to give false attendance.
- Stable and Reliable Internet connection require.
- Every classroom should have projector.

6.3 Scope for Further Developments

- Add face recognition for prevent false present using two phone.
- Add Offline attendance feature using Wi-Fi P2P.
- Make an application for teacher that teacher can also take attendance using smart phone.

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