DESIGN OF RESOURCE MANAGEMENT AND ATTENDANCE SYSTEM USING GEO-PHYSICAL LOCATION

A THESIS SUBMITTED TO THE GRADUATE

SCHOOL OF APPLIED SCIENCES

OF

NEAR EAST UNIVERSITY

BY

YEMI OKOME

In Partial fulfillment of the requirements for the Degree of Master of Science in Information System Engineering

NICOSIA 2021

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Yemi Okome: DESIGN OF RESOURCE MANAGEMENT AND ATTENDANCE SYSTEM USING GEO-PHYSICAL LOCATION.

Approval of Director of Institute of Graduate Studies

Prof. Dr. K. Husnu Can Baseri

We certify this thesis is satisfactory for the award of the degree of Master In Information System Engineering

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Assist. Prof. Dr. Elbrus İmanov	Department of Computer Engineering, NEU

Declaration

I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all materials and results that are not original to this work.

Name: Yemi

Surname: Okome

Signature:

Date:

Dedication

This thesis is wholeheartedly dedicated to Almighty God thank you, who have been my source of inspiration and gave me strength when I thought of giving up, who continually provide their moral, spiritual, emotional, and financial support. To my Family, brothers, sisters, relatives, mentor, friends, and classmates who shared their words of advice and encouragement to finish this work. And lastly, I dedicated this thesis to myself, for, strength, power of mind, and skills to be able to come up with this work.

Abstract

The Internet of Things (IoT) additionally called the Internet of Everything or objects is another innovation worldview imagined as a worldwide technology of either machines or gadgets equipped for cooperating with one another. It accomplishes the objective of intelligent identifying, locating, tracking, monitoring and overseeing things. This work proposes a framework platform that provides mobile applications as a tool. The application utilizes present day informations and recent trends on mobile phones, for example, location information, face reconginition and finger print scanner that are already in build inside the phones. Latitude and longitude are the forms used to specify a location of cell device. This information is then converted into a full address with the help of this application which includes, location destination address. The user can basically use this application to take attendance and monitor the use of class room equipment and take attendance of number of student attendenting a particular letures . The design shows the best way to execute, program and build up this application and has been tried on barely three cell phones. The versatile application upholds state protection, where user explicit information and application status are put away for the user's future reference. It additionally empowers application suppliers to progressively control admittance to the usefulness of their applications. Execution assessment results show that the application can utilize server versatile asset provisioning to offer adaptable adaptability, while fulfilling certain QoS requirements.

Keywords: Internet of things; Location; Finger print; face reconigition, mobile application, attendance system, resource management.

ÖZET

Ayrıca Her Şeyin veya nesnelerin İnterneti olarak adlandırılan Nesnelerin İnterneti (IoT), birbirleriyle işbirliği yapmak üzere donatılmış makineler veya araçlardan oluşan dünya çapında bir teknoloji olarak hayal edilen başka bir yenilik dünya görüşüdür. Nesneleri akıllı tanımlama, bulma, izleme, izleme ve denetleme hedefini gerçekleştirir. Bu çalışma, mobil uygulamaları bir araç olarak sunan bir çerçeve platformu önermektedir. Uygulama, örneğin konum bilgisi, yüz tanıma ve telefonlarda yerleşik olarak bulunan parmak izi tarayıcı gibi cep telefonlarındaki güncel bilgileri ve son trendleri kullanır. Enlem ve boylam, hücre aygıtının konumunu belirtmek için kullanılan formlardır. Bu bilgiler daha sonra konum hedef adresini içeren bu uygulama yardımıyla tam adrese dönüştürülür. Kullanıcı, temel olarak bu uygulamayı, yoklama almak ve sınıf odası ekipmanlarının kullanımını izlemek ve belirli bir konferansa katılan öğrenci sayısının devamını almak için kullanabilir. Tasarım, bu uygulamayı çalıştırmanın, programlamanın ve oluşturmanın en iyi yolunu gösterir ve ancak üç cep telefonunda denenmiştir. Çok yönlü uygulama, kullanıcının açık bilgilerinin ve uygulama durumunun kullanıcının ileride başvurması için kaldırıldığı durum korumasını destekler. Ayrıca uygulama tedarikçilerine, uygulamalarının kullanışlılığına kabulü aşamalı olarak kontrol etme yetkisi verir. Yürütme değerlendirme sonuçları, uygulamanın belirli QoS gereksinimlerini karşılarken uyarlanabilir uyarlanabilirlik sunmak için sunucu çok yönlü varlık provizyonunu kullanabileceğini göstermektedir.

Anahtar Kelimeler: Nesnelerin İnterneti; Yer; Parmak izi; yüz tanıma, mobil uygulama, devam sistemi, kaynak yönetimi.

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List Of Abbreviations

IOT	internet of thing
RFID	Radio Frequency Identification
ICT	information and communications technology
LANs	local area networks NANs neighborhood area networks
WANs	wide area networks
WPANs	wireless personal area networks
GUI	graphical user interface
GPS	Extracts signal from global positioning system
PI	Assists with accurate and longitudinal point of interest mapping
OS:	Open source code
MA:	Mobile Application
SOA:	simple Object Access Protoco
HTTP:	Hypertext Transfer Protocol
UI:	User interface
LTE:	long-term evolution

CHAPTER ONE: INTRODUCTION

1.1 Background Of The Study

From recent research it was discovered that people are has grown a culture of utilizing the internet and various resources through mobile phone and also the rapid growth of internet technology and smart embedd systems that connects to mobile App. The thesis focuses on the resource management and attendance system of Near East university, there is no system on ground that help to monitor, track the usage of class room equipment and a traditional paper base is use to monitor student attendance system to classes. This gives the instructors huge amount of paper works to deal with when using attendance for allocation of marks or monitoring of class and to know the total numbers of students that are constant in classes. With the propose system everything will be automated from each student mobile, biometric scanner and geolocation will be use to ensure the student is in the class room to before he/she can click on the attendance key or interface with the application. The application will be the first of its kind because various attendance system are not deployed on mobile phones and do not use geolocation feature.

With the fast increment of Smartphone gadgets, the users are additionally expanding as it turns into a significant wellspring of data. It is showing the interest of users in portable applications that give storage, analysis, and visualization of the information (which for retrieval in the reference is the name of the user who posted the app to Google Play Store, AlienmanTechnologyLLC, 2015), (Hardy, 2014). A large portion of advanced phones furnished with PC preparing capacity is utilized to get to organize and utilize various applications created to meet the user requirement via a mobile communication network. (Salman and Saleem, 2015). Distinctive android Mobile applications have been created including top paid and free applications additionally some focus on GPS Global Positioning System are developed (Saleem and Khan, 2015). Recent years have seen expanding force for portable applications that can adjust their conduct as indicated by client setting. Setting like such incorporates area data; client profile, client evaluations, gadget profile, and time. There are a few stages for creating advanced cell applications. The majority of the telephones and helpful gadgets uphold Android operating systems (OS).

Mobile phones Resource Management can be utilized for nearly everything, from emailing to reading books, playing games, shopping etc (Thornton & Houser, 2017). They can offer help restrain the separation between the classroom and the out-of-school area, and donate accessible resources regardless of time and place, which enable students to learn when and where they want (Chen et al, 2016; Johnson et al, 2017). Moreover, they have strong search capabilities and affluent interaction, and provide powerful support for compelling learning and performance based assessment (Reinders & Lewis, 2019). Further, mobile learning makes learning more enjoyable and allows students to share ideas with their resources and peers (Sixsmith et al, 2016). At the college level, mobile phones are commonly found in the hands of indiviuals in and outside the classroom as an insightful communication tool through email, substance, audio and voice discussion board postings (Armatas et al, 2015; Checho, 2017). Wagner (2015) demonstrated that students can use.

1.2 Statement of problem.

Various Attendance system uses a hardware framework involving keycards and outpost fingerprint center at any location. Some attendance systems still use paper-based or manual attendance to check-in/out staff or equipment.

Taking the advantage of the internet of things it is possible to make use of mobile phone GPS, Biometric scanner to build an attendance system that will require your physical location to the building or classroom. The system will also monitor the capacity of people in a particular room to ensure it is not over crowed having in mind that we are in a pandemic period. Furthermore, it is convenient and comfortable and gives the elderly and handicapped people the ability to control their

Therefore, the primary reason of this study is to extend this line of research by exploring Mobile Phone Resource Administration and participation framework and the range of mobile phone use in tertiary institute classrooms based on students and instructors' involvement utilizing Near East College class Room equipment as a case of think about.

1.3 Aim and Objective of the study

The main aim of this thesis is to develop a mobile app on the Android platform and confirm the functions are suitable for resource management and attendance system using already inbuild

modules inside the mobile phones. We have used the LTE and WiFi for this comparison and ensure that the proposed work has the best performance

This study has taken into wide general views and perceptions of instructors about mobile usage. In order to implement technology in education it is necessary to find the easier way of its realization in higher educational establishment, since this could impact instructors' viewpoints.'

Below are the objecive of the study:

1. To design and Implement of Mobile Phone Resource Management system and attendance

2. To permit instructors to screen understudies who are not effectively attending classes

3. To get the participation record of the equipment usage and room attendance.

4. To automate the attendance system with a mobile phone

5. To use geophysical location, biometric scanners that already exist in mobile phones as security means in ensuring the system is not cheated.

6. To create a system that will reduce paperwork and eliminate errors associated with the resource management and attendance system.

1.4 Significance of the Study and Contribution

Once the present study is completed, a number of stakeholders will benefit from its results. First, academics and researchers worldwide will add to their libraries another piece of important research that gives further insight into how new technologies such as mobile devices can be

The goal of this research is design and Implementation of Mobile Phone Resource Management and attendance system with primary novel features that make it different from other apps:

- Geo-location authentication -: the application will only give you access to assign or book attendance if you are in the set location
- Inbuild fingerprint and face recognition scanner in mobile is utilized to ensure biometric confirmation went booking attendance.
- Attendance and resource management system the runs on android phone
- User privilege for resource allocation

After further analysis on the performance of the app, it is concluded that the app can use on both LTE and Wifi perfectly but a more smooth performance was recorded went the app was connected to a Wifi network within the school environment.

1.5 Limitation

After critical and rigorous analysis on the response time of the existing similar apps, it is recorded that the existing app have high response time and I am able to pick this limitation with the following novelties

- **Implementation of Biometric Scanner:** Introducing a biometric scanner make the application limited to only android phone user with fingerprint or face recognition scanners. The also means that any android phone produce below 2006 cannot use this application.
- **Implementation of Splash screen:** Introducing the welcome screen activity (which is also known as the mobile app splash activity) whenever the application is running is one of the steps to help improve the experience of the mobile user by masking the genuine application response. I have implemented a splash screen which shows up when the app is launched. This feature is not available in some of the existing mobile apps.
- **Removal of unnecessary date and files:** Too much of data/files on an app take a very long time to download. Response time of the proposed mobile app has been fully optimized by diminishing the size of a payload sent from the server to the cell phone; the time a user spends holding up can be decreased.The data that users do not need has been removed so as to reduce the app response time.

1.6 Proposal Organization

The dissertation is split into six chapters, plus references, conclusion, appendices.

Chapter 1: Provides an overview of the research and its context. The study's Aim, research methods, etc)

Chapter 2: Literature Survey: Include a review of the literature on the major subject of research.

This chapter introduces the conceptual framework that will be used to comprehend the

remainder of this thesis. Citation of related works and comparison

Chapter 3: System Architecture, include a brief overview of research techniques and a description of the methodology used in this study

Chapter 4: User Interface and Implementation, this gives an overview of how the application looks likes and also talks about the GUI.

Chapter 5: Performance and Result Analysis

Conclusion and Recommedation

CHAPTER 2: RELATED RESEARCH

These days, urban communities confront complex challenges to progress their residents' fulfillment. Since metropolitan obsession, individuals' regular situations have been influenced by expanded gridlocks, carbon dioxide, ozone hurting substance surges, and rubbish evacuation. The thought of a sharp city has created celebrated within recent years. It acknowledges many estimations depending upon the significance of "shrewd" and preferences from creative utilization of modern sorts of information and correspondences advancement to assist open sharing (Ullah, 2021). The likelihood of the digital/smart city may be a reaction to all the emerging issues. Various urban communities characterize themselves as "brilliant" when they recognize parcel traits as being so, (for case, broadband arrange, progressed consolidation, and data labor drive). Improvement arrange is utilized as the exercises and methods to be taken after amid the arrange and action of correspondence organizations, along these lines contributing goodness and throughput. With the start of the 5G farther correspondence system, a related and grounded society is said to continue, allow distinctive sorts of commercial structures, area capacity, and organizations, related with distinctive sorts of activity plans and exceptional prerequisites (Kumar, 2020).

Internet of Things (IoT) is called another model correspondence framework, where various sorts of items, for example, cell phones, sensors, or gadgets are communicating with one another over the web. As human portability turns into a significant perspective in many smart-city applications, information from cell phones has been given a lot of attention (Al-Turjman, 2019). IoT encourages a wide assortment of heterogeneous gadgets which are to be associate with, convey, and producing a huge measure of information. Technology is advancing in such a way that everything is now getting connected to the internet which enables people to easily communicate and share information with no stress. (Malchi, 2021). Capacity the board of IoT information is a fundamental part of shrewd information stockpiling IoT-applications

2.1 mSpace Mobile: A Mobile Application for Location

This is a mobile application that was developed for the same purpose but this mobile was developed for Windows phones. This Mobile application (Fig. 2) joins a creative interface and design to help the prepared investigation of rich data spaces. As opposed to compelling iterative, discrete watchword questions, it keeps up the set of related data when it is in support of the fast investigation of a wide grouping of related sources. This app uses the Software Framework of mSpace (Harris, 2004), which bolsters the cooperative effort together with the portrayal of disseminated related assets. Additionally, this mobile app underpins thin new data distribution: remarks and suggestions might be distributed in any of the components found with the help of the interface. With this, the app utilization advances give a successful data investigation experience while additionally adding to the development of information stores for the Web.

Figure 2. 1: There are five highlights inside the UI: A –columnar of the app browser; B –a box containing information; C –the cup map preview; D –the app selector; E –the list of favorites.

(Max and Alisdair, 2014)

This thesis depicts the application as far as its value, user interface, and support plan. It has three core features which are i) the custom small-screen specific interface (Figure. 2.1) to help connect the model of the mobile application (Schraefel, Karam, & Zhao, 2003) for logical investigation of huge data spaces, ii) it supports the coordination of distributed web resources and, iii) it creates awareness when you are in a particular location. The interface of the app is designed to allow the application users of a little screen mobile app to run complex queries through direct control and composing a text is not needed. This mobile app uses the architecture which is built on three-layer.

2.2 Smart Attendance System Using Face Recognition

Based on the writing study as we have examined different topics completely that are specifically connected with our extend we are attending to plan a possible arrangement to our issue. In this portion, we'll propose a strategy that will allow a diagram of the approach to our venture and the ways it ought to be done. As the previous work was not sufficient which drive us to the development in this extend within the most attainable and productive way conceivable. The proposed confront discovery module for this venture is Viola jones's calculation. Moreover, for confront acknowledgment modules which is proposed for this extension may be a neural organize design with LBPH. The taking after figure appears the venture framework circuit design. Nowadays, digital image processing and machine visualization have been pettishly progressing and can cover vital side face recognition system (Imanov & Alzouhbi 2019)
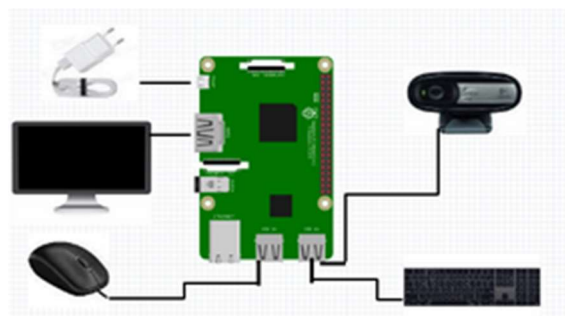

Figure 2. 2: The Raspberry pi system setup

2.2.1 The Open CV-Python software

OpenCV may be a program that bargains with a few programming languages like Java, Python, and C++, these all are clear and useable on distinctive stage counting IOS, Android, OS X,

Linux, and windows. Interfacing for fast GPU errands dependent on CUDA and OpenCL are likewise beneath dynamic progression. OpenCV-Python may be a library of Python expecting to require care of PC vision issues (OpenCV, 2018)

2.2.2 The Visual studio code software

Windows Microsoft and Linux made a code chief source title visual studio code. Essentially, this strategy offers assistance to the windows to troubleshoot, embedded Git control and GitHub, dialect structure highlighting, shrewd code finishing, scraps, and code refactoring. Which I utilized in a venture to run python code.

2.2.3 The QT Creator software

Qt Maker may be a cross-stage C++, JavaScript and QML incorporated headway condition which could be a piece of the SDK for the Qt GUI application change structure. It incorporates a visual debugger and a facilitated GUI format and structures fashioner. The publication manager's highlights join sentence structure highlighting and auto finishing of reasonable UI.

Mechanized participation observing framework was the venture chosen by us by keeping in see of the demand of day-to-day needs and needs of the society. The headways in technology lead us to think out of the box and come up with some thoughts that may be future-changing. Instruction is the most imperative thing which each individual should acquire as it is the premise for distant better; a much better; a higher; a stronger; an improved">a higher way of life and will surely alleviate the standard of a living community. What our instruction system needs is the inclusion of understudies within the schools, colleges, and colleges. Rather than going to addresses and studying they lean toward remaining absent from the course and keep engaged in utilizing these contraptions. Moo participation implies that the students and not there to secure the information which they are gathered get and is of gigantic significance for them and can lead them to distant better; a much better; a higher; a stronger; an improved">a much better future.

2.3. Fingerprint Attendance System.

The fingerprint attendance system is a Unique mark participation framework that points to robotize the participation-taking procedure of an instructive founded utilizing biometric innovation (unique mark). The automated participation-taking method is greatly productive compared to the traditional title call-out methods (Alhothaily 2015, Alradaey 2015) It spares the time expended by the conventional method. Be that as it may, the accessible commercial

participation frameworks are costly and complex to plan and create. This thinks about proposes a framework that is adaptable, inexpensive, simple to utilize, and able to coordinate with a future improvement of an educational established. In brief, the proposed framework is the most productive and broadly employments solution that keeps the teaching of the understudies at the most noteworthy level and permits the guardians of the understudies to screen and take after upon the participation of their understudies via Web.
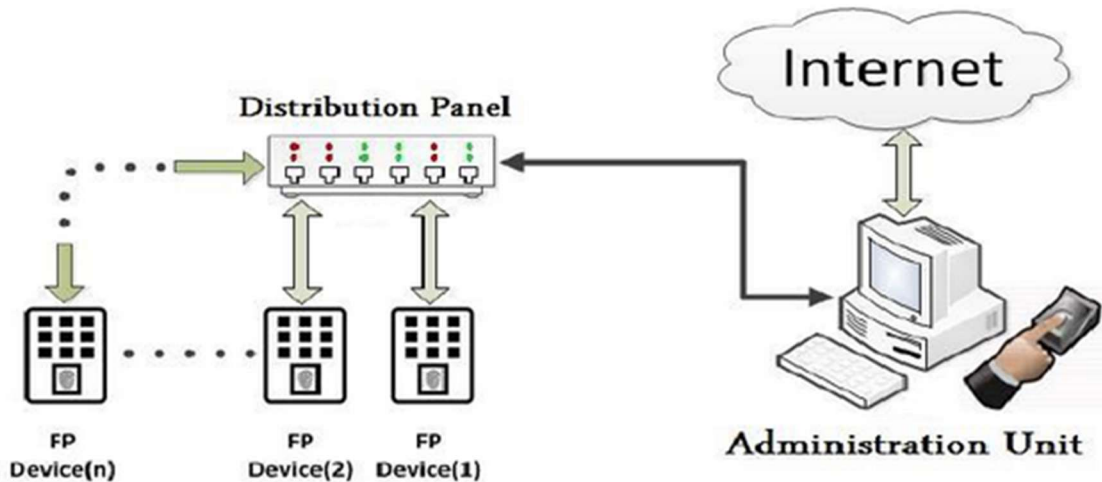
Figure 2. 3: System's Structure

It has ended up a scholastic run the show that an understudy must go to 75% of addresses in a course for a semester in arrange to be qualified to be assessed in that course. To check the attendance rate for each understudy and course by utilizing the manual participation sheets is exceptionally tedious and impracticable. Consequently, this ponder proposes a framework that can capture the biometric unique finger impression of understudies and utilize it to check participation in lectures and other exercises. Too, biometrics guarantees physical nearness, not at all like password and card security frameworks which are transferable. The unique finger impression gadget attendance-taking strategy is a proficient strategy that needs no supervision of a principle. Moreover, this robotized framework permits the gatekeepers of the understudies to screen and take after upon the participation of their understudies anytime and anyplace in genuine time via the web-interface framework. Too, it permits the gatekeepers of the understudies to have reports of their students' attendance.

2.4 IoT applications

The Internet of Things (IoT) has numerous and diverse applications in many aspects of people's day-to-day lives, which extensively span society, industry, and the environment, among other things. Internet of Things (IoT) applications are becoming increasingly popular around the world. Countries in Western Europe, North America, and China are among the most important drivers of this trend. From 5.6 billion connections in 2016 to 27 billion connections in 2024, the number of machine-to-machine (M2M) connections is anticipated to rise significantly. this growth confirms the Internet of Things as a major future market with the potential to become a cornerstone of the fast-growing digital economy. The Internet of Things is expected to grow in revenue from $892 billion in 2018 to $4 trillion by 2025. M2M connections are utilized in a broad variety of applications, including smart cities, smart environments, smart grids, smart retail, and smart agriculture. (Hassija et al., 2019)
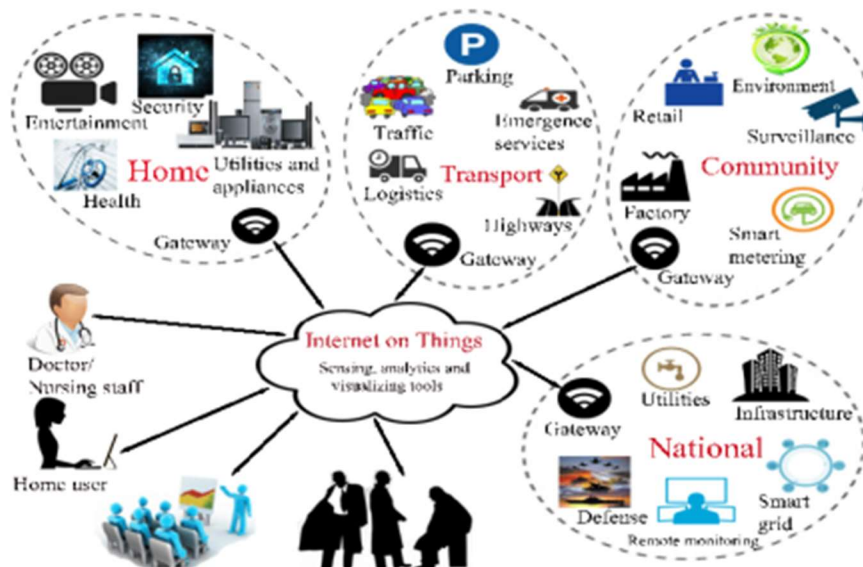

Figure 2. 4: IoT Application Framework

2.5 Related works and Comparison

The paper describes the application in terms of its functionality, user interface, and supporting architecture. It has six functionality

i.) classroom attendance system

ii.) attendance report system

iii.) equipment management system (this help to track the use of classroom equipment)

iv.) geophysical location tracking for each resource and user in the system

v.) identification of room capacity and equipment availability.

vi.) finger and face recognition

I have taken enough time to review various related works and applications concerning attendance systems and resource management, the key features of attendance system are card chip/clock device, geo-location, RFID tags and scanners, Biometric attendance, mobile and cloud support system, reporting and calandar intergration. These features are listed in below table 1.1 and each reference system listed are identified with their key features.

Name of Applications	Platform	Features						
		Card chip/clock device	Geo-location	RFID tags and scanners	Biometric attendance	Mobile and cloud support	Reporting	Calendar integration
Creatrix Campus	Hardware/windows	X		X	X	X		
STUDENTS ATTENDANCE MANAGEMENT SYSTEM (KALAISANKARAN B)	Web			X			X	
Attendance Management System(Rozlina Mohamed)	Web	X		X			X	
Attendance Management System (Abdoulrahmaine Mohammad-134301)	Android/Web	X		X			X	X
NEU Resource management and attendance system	Android		X		X	X	X	X

Table 1.1: Comparison table

CHAPTER 3: SYSTEM ARCHITECTURE

NEU Resource management and attendance system have been built with Ionic using Visual studio code, Android Studio ad SQL. The project is complex but the UI is easy to use. It contains few JAVA and HTML files. The app has been built on google standard and google location tracking to ensure the highest accuracy and portability and has a dynamic backend based on SQL, this will help the administrator to update and maintain backend data without any additional server. **Figure 3.1** show the life cycle of an android application and how its operated.
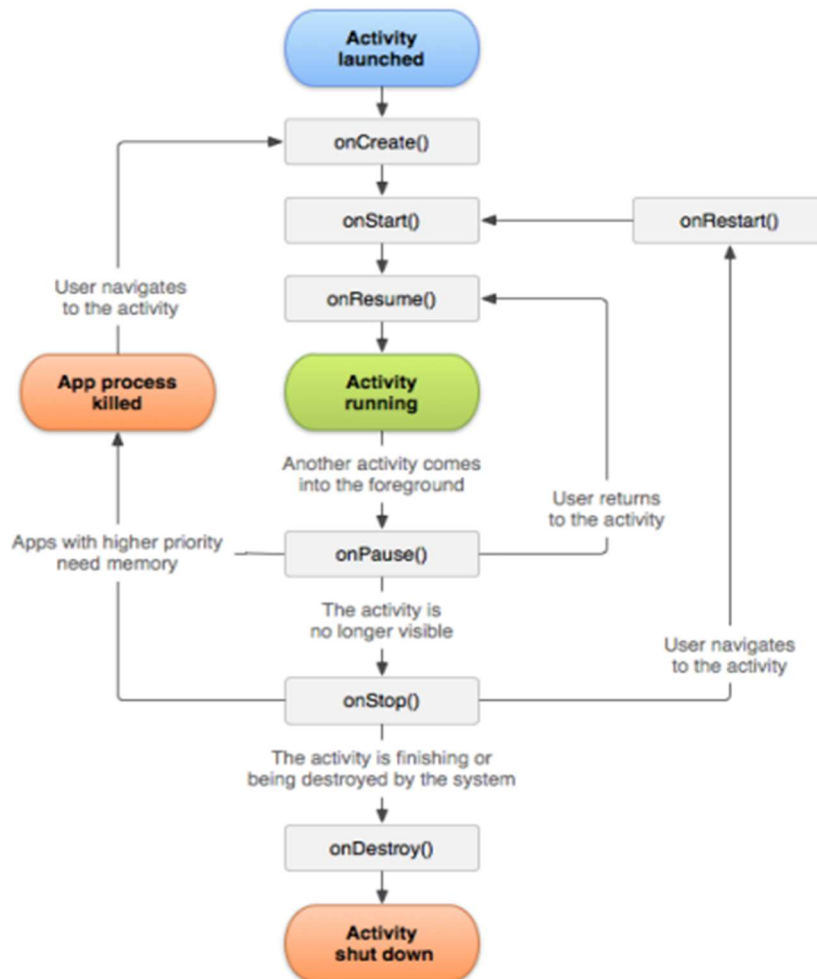
Figure 3. 1: Android mobile application activities lifecycle

There are three key loops to use when within activities:

a) *The entire lifetime of activity:* this happens between the most call to onCreate(Bundle) through to a single final call to onDestroy(). A development will do all course of action of "around the world" state in onCreate(), and conveyance all overabundance resources in onDestroy(). For occurrence, within the occasion that it features a string running out of locating to download data from the organization, it might make that string in onCreate() and a short time later halt the string in onDestroy().

b) *The visible lifetime of activity*: it takes place between a call to onStart() until a comparing call to onStop(). During this time the client can see the movement onscreen, be that as it may not be within the closer see and collaborating with the client. Between these two procedures, you'll keep up resources that are expected to show the activity to the client. For occurrence, you'll be able to enroll a BroadcastReceiver in onStart() to screen for changes that sway your UI, and unregister it in onStop() when the client now not sees what you're appearing. The onStart() and onStop() methodologies can be called on distinctive events, as the development gets recognizable and secured up to the client.

c) *The foreground lifetime of an activity:* occurs between a call to onResume() until a comparing call to onPause(). During this time the action is noticeable, dynamic, and associating with the client. An action can as often as a possible go-between the continued and stopped states for instance when the gadget rests when a movement result is conveyed when another aim is conveyed, so the code in these strategies ought to be genuinely lightweight.

The whole lifecycle of action is characterized by the accompanying Activity techniques. These are snares that we abrogate to accomplish suitable work when the action changes state. All exercises will execute onCreate(Bundle) to do their underlying arrangement; many will likewise actualize onPause() to submit changes to the information and get ready to stop communicating with the client, and onStop() to deal with done being obvious on screen.

3.1. Material Design and Optimization

The first thing a developer should consider when working on a project is to design the project structure including the UI/UX design for the system. Material Design is a visual language that integrates the exemplary standards of good plan with the advancement of innovation and science. It is very important to have a presentable user interface by using a well-pleasing design. (which for retrieval in the reference is the name of the user who posted the article, Material Design).

To recognize a bunch of UI segment classifications that much of the time happen in Android applications, we referred to famous plan apparatuses and dialects that uncover segment libraries has been referenced such as Balsamiq (Balsamiq, 2018) and Google's Material Design. (Call-Em-All, 2018). The material design has been maintained for the Location Finder mobile application to decorate the user interface and to ensure the app is mobile-friendly and fully optimized. All basic components are nicely decorated with unique looking and gorgeous color combinations. Optimization of code is essential to make the app run smoothly without lagging and that is why the app has been developed with the code fully optimized. Every single implementation has been optimized for the highest performance. Also, the code has been beautifully crafted and modularized to enable other developers to easily understand the code. Comments are used where necessary to describe certain lines of code.

3.2. Android Studio setup

This is free software built purposely to develop Android apps. After installing this software, the next thing is to download the necessary plugins including Java IDE and SDK. The next step is to launch the app and start a new project as illustrated below in **figure 3.2** and **figure 3.3**
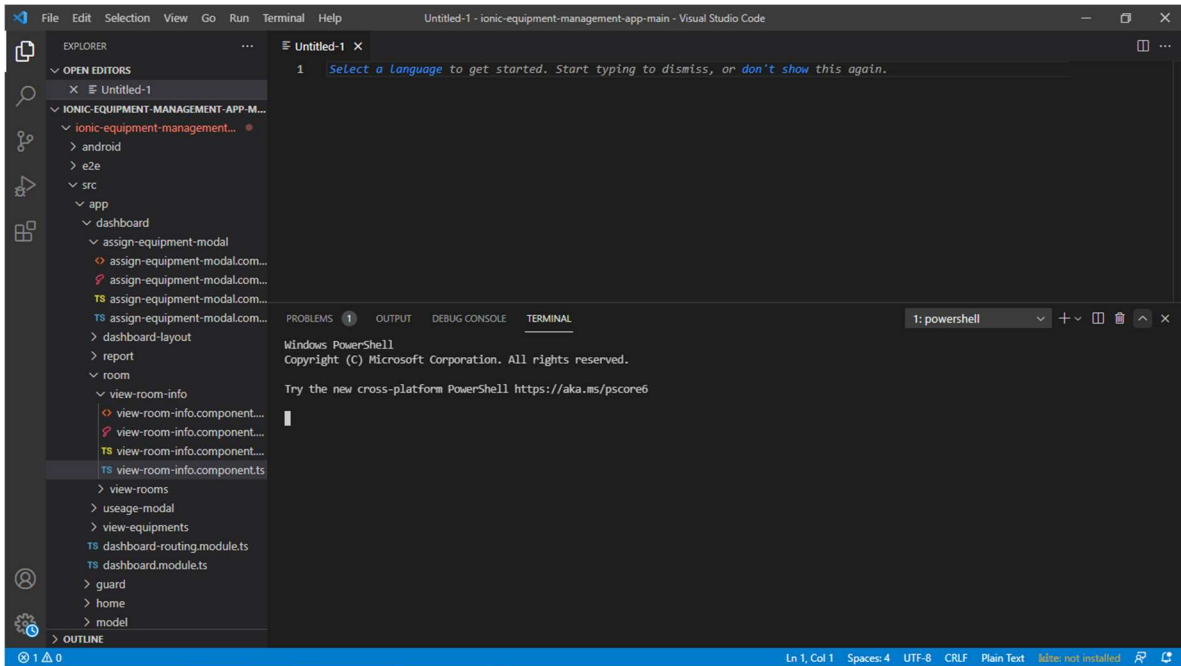
Figure 3. 2: Android Studio Interface

If a project has been created already, it will be listed at the left corner of the screen and the project can be easily selected. In this case, the project folder is named NEAR EAST UNIVERSITY Resource management and attendance system. Once that has been selected, the project will be synced by Gradle and the screenshot below will be displayed.
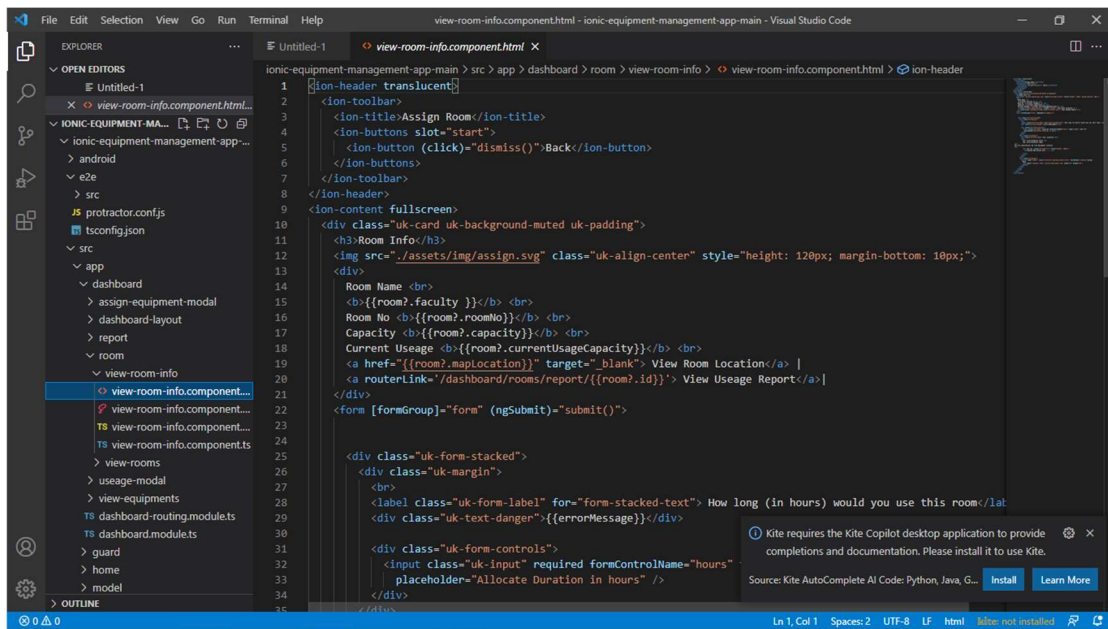

Figure 3. 3: Android studio Interface after Opening a project.

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The file in the folder contains the Ionic and HTML files.

3.3. Backend customization

The MySQL design depicts how the various parts of a MySQL framework identify with each other. The MySQL engineering is essentially a client-server framework. MySQL information base server is the server and the applications which are associating with MySQL data set server are clients.

An internet connection and a centralized database (MySQL) are needed for this mobile app. This app represents client/server architecture. Apps developed for Android devices serve as clients while the combination of MySQL database and PHP APIs scripts forms the server. PHP APIs script acts as a link between the Mobile application and the MySQL database. **Figure 3.4** shows the structure of this application. The main functions of PHP API are to do the following:

- Accepting the read and write request from the clients.
- Run and manipulate the request to MySQL database
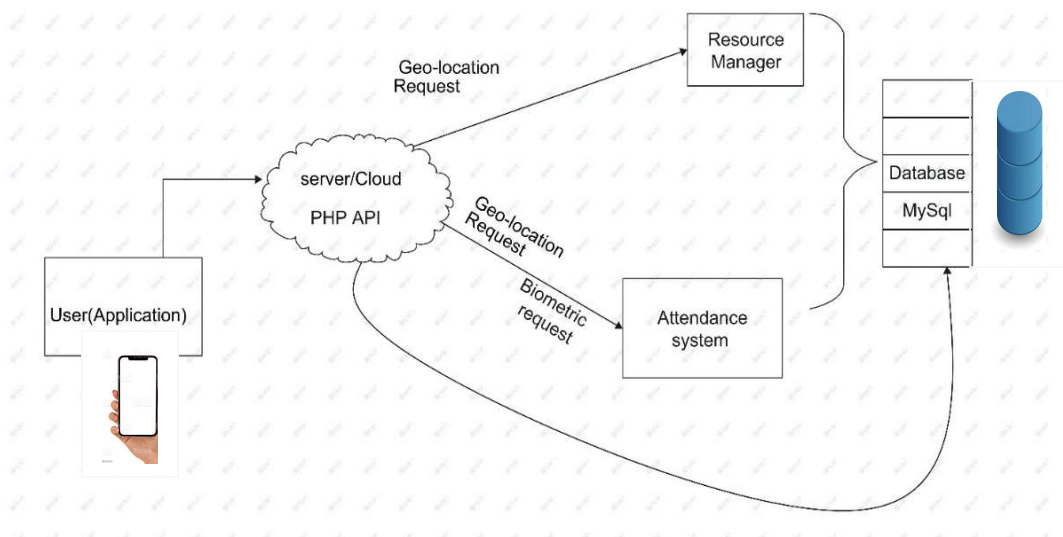- Formatting the output as JavaScript Object Notation (JSON)

Figure 3. 4: The structure of NEU Resource Management and attendance system

Operations that are applied on the location tracking and biometrics: The developed application presents some operations that have been created to make some interaction with users. These operations are:

- Add a new location marker on the app
- Input user allocation time
- Scan fingerprint and face recognition
- Location distance from user to room or equipment

A SQL database is created so we add the data that will appear on the NEU Resource management and Attendance system dynamically.
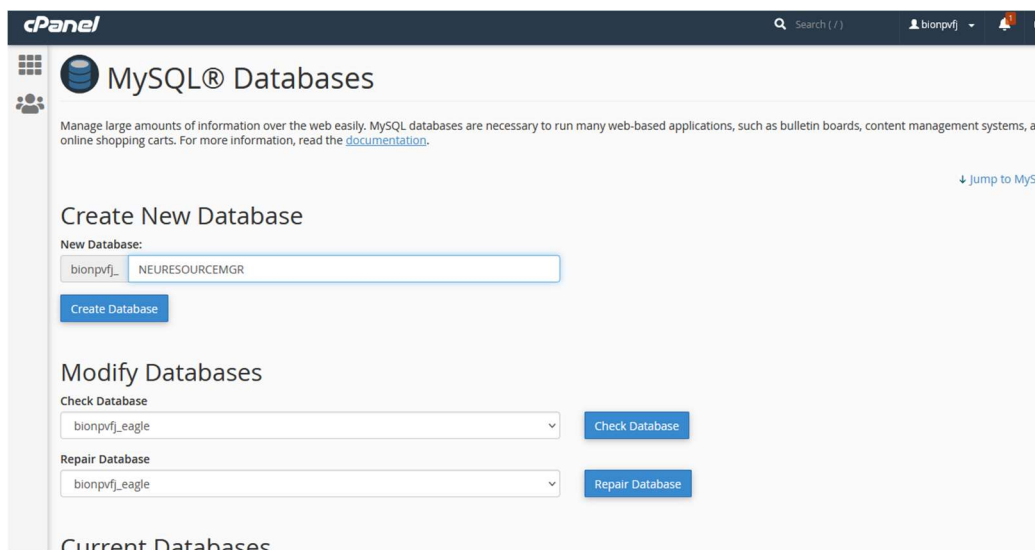
Figure 3. 5: Creating SQL Database for the App

A database is an organized collection of data, generally stored and accessed electronically from a computer system. Where databases are more complex they are often developed using formal design and modeling techniques. The database management system (DBMS) is the software that interacts with end-users, applications, and the database itself to capture and analyze the data. The database is needed in this project for data storage. After creating the database, a user is also created to enable permissions for reading, writing, and so on. Once we are done creating the database and user, we open the phpMyAdmin dashboard to create tables.

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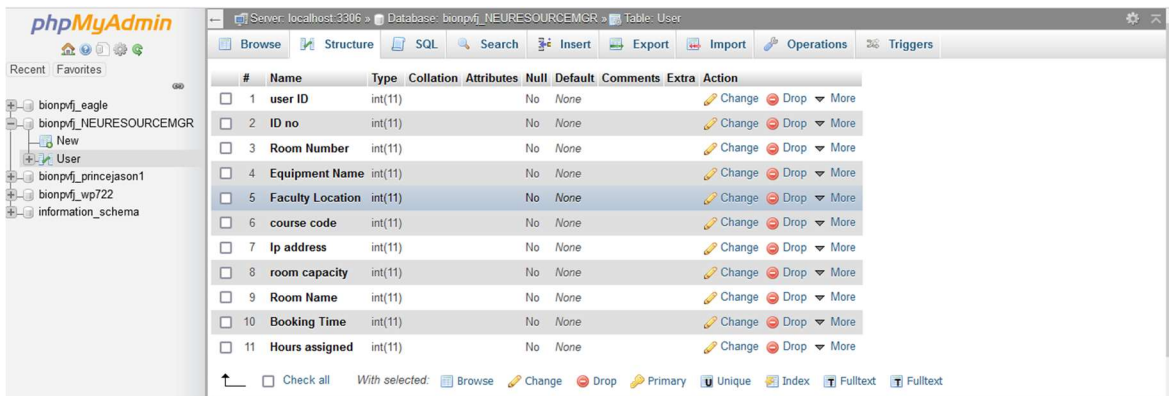
Figure 3. 6 Adding tables to the database

We have created eleven tables which are User ID, ID No, Room Number, Equipment Name, Faculty Location, course code, Ip address, Room capacity, Room Name, Booking time, and hours assigned.

a) User ID: under this section, is where user id is stored e.g okomeyemi

b) ID No: this is where student numbers are stored for login purposes

c) Room Number: various room numbers are stored on this table

d) Equipment Name: names of room types of equipment are stored in this section

e) Faculty Location: the log and lat of sample building from google map kept here

f) Course code: input course code from users is kept here to generate attendance reports.

g) The IP address: each user IP address is stored in the database

h) Room Capacity: the total room capacity are kept here

i) Room Name: The name of each room in the faculty are kept here

j) Booking time: allocation time from each user are stored here to generate a report

k) Hours assigned: the input hours the user requested to use the room or the system for.
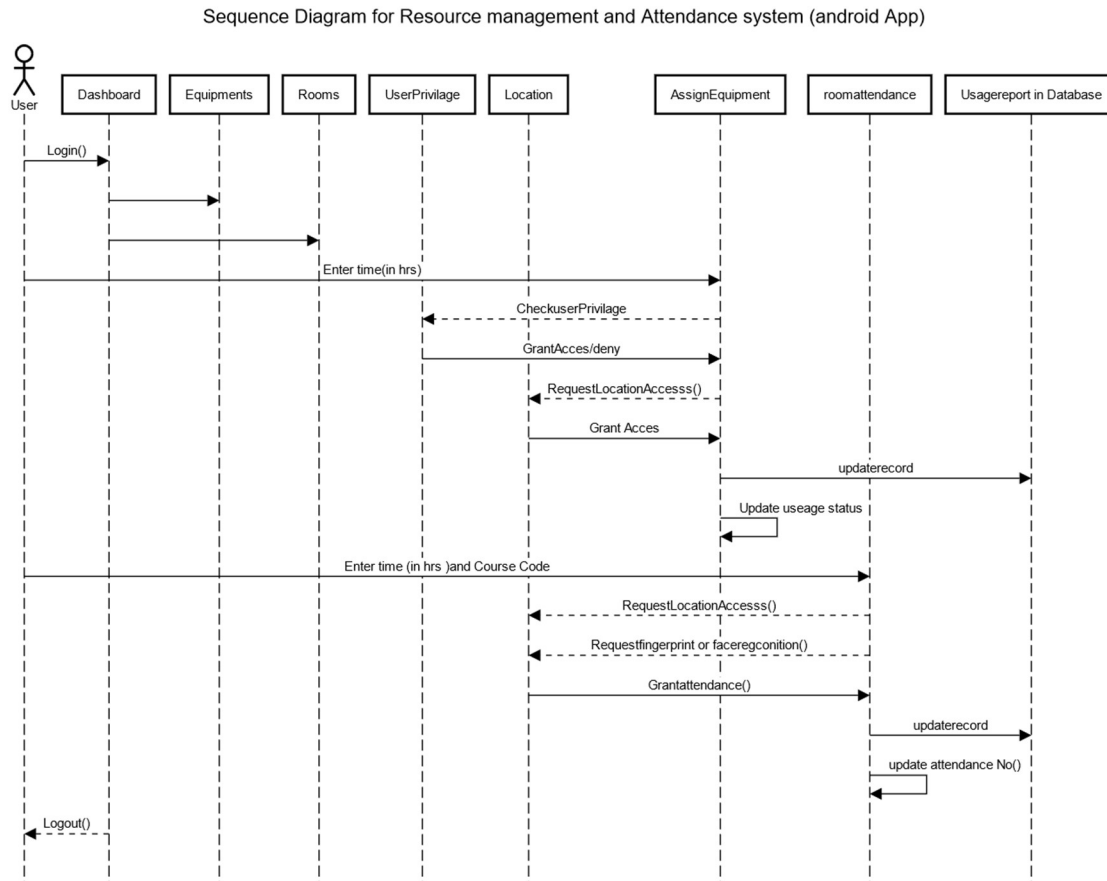
Figure 3.7: Propose system architecture via sequence diagram

Fig shows the architecture of our system. We have developed a prototype to test the fundamental functionality of our mobile app. The prototype implements the context and data management on the server-side while the mobile user interface resides on the mobile device. The user interface is implemented using the latest Android SDK. The server components are responsible for managing the database and dispatching relevant applications along with recommended actions.

The database and the tables with the values that have been used for the creation of the database. After creating the database, the server URL will be copied and this is

what will be used in Android Studio to display information on the app. An Ionic class has been created in Android Studio called Constant. This class takes the parameters of the SQL database tables. The code is given below in **figure 3.8**:

```
public static final double city_lat = 35.22789255;
public static final double city_lng = 33.32274106;
```

Figure 3.8: Linking The SQL to NEU Resource management and attendance system

After adding this project id to Android Studio, the apk file is generated by selecting Build >Generate Signed Bundle/APK, as illustrated below in **figure 3.9**:
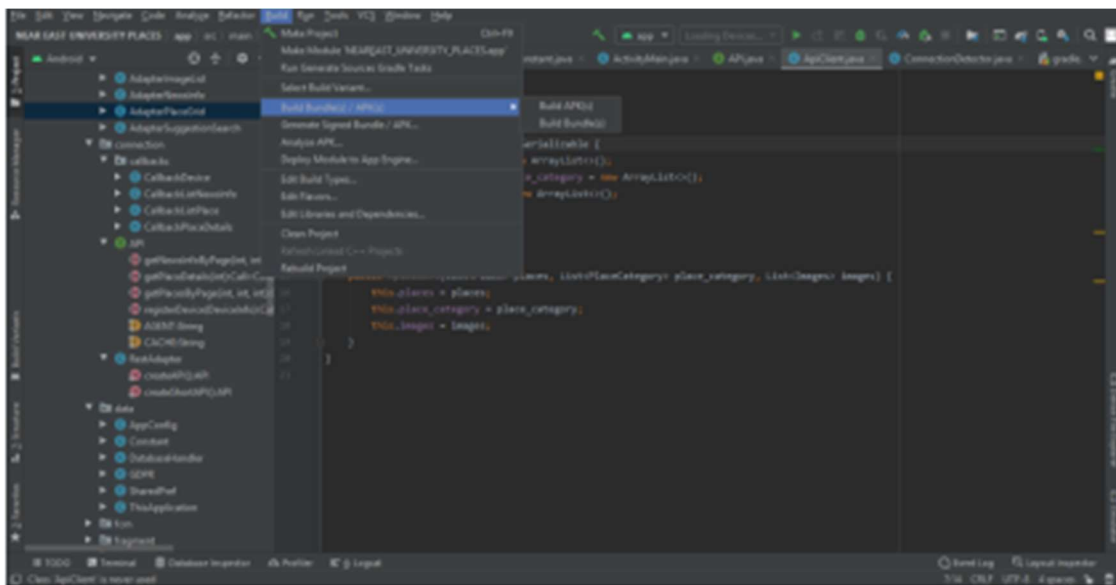

Figure 3.9: Generating the Apk file

After generating the apk file(Figure 3.9), the app can be either installed on any Android device or published on Google Play Store for people to install. Having explained the architecture design of the NEU Resource management and attendance system, we can now move to the user interface and implementation

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CHAPTER 4: USER INTERFACE AND IMPLEMENTATION

The NEU Resource management app interface is designed to allow users of small-screen devices to easily screw down or navigate for a particular query like a room in different faculty because the room is a group to their faculty. To this end, the application utilizes the primary features of the app interaction model. The features of NEU Resource management are:

- The app will automatically detect the user's current location.
- The app will automatically calculate the distance between the user and any equipment and rooms.
- The app will only grant access for the user to assign equipment or attend a class when they are in the same location as the equipment of the room.
- The app generates usage reports for any equipment or room
- App user biometric as a security interface
- App save user Ip Address for security reason
- The app differentiates between user I,e instructors, students, and directors with the help of their specific ID numbers.

The screenshots of the user interface are listed below in **figure 4:1** screenshot A shows an empty equipment report section, screenshot B shows the list of equipment, and screenshot C shows biometric request.
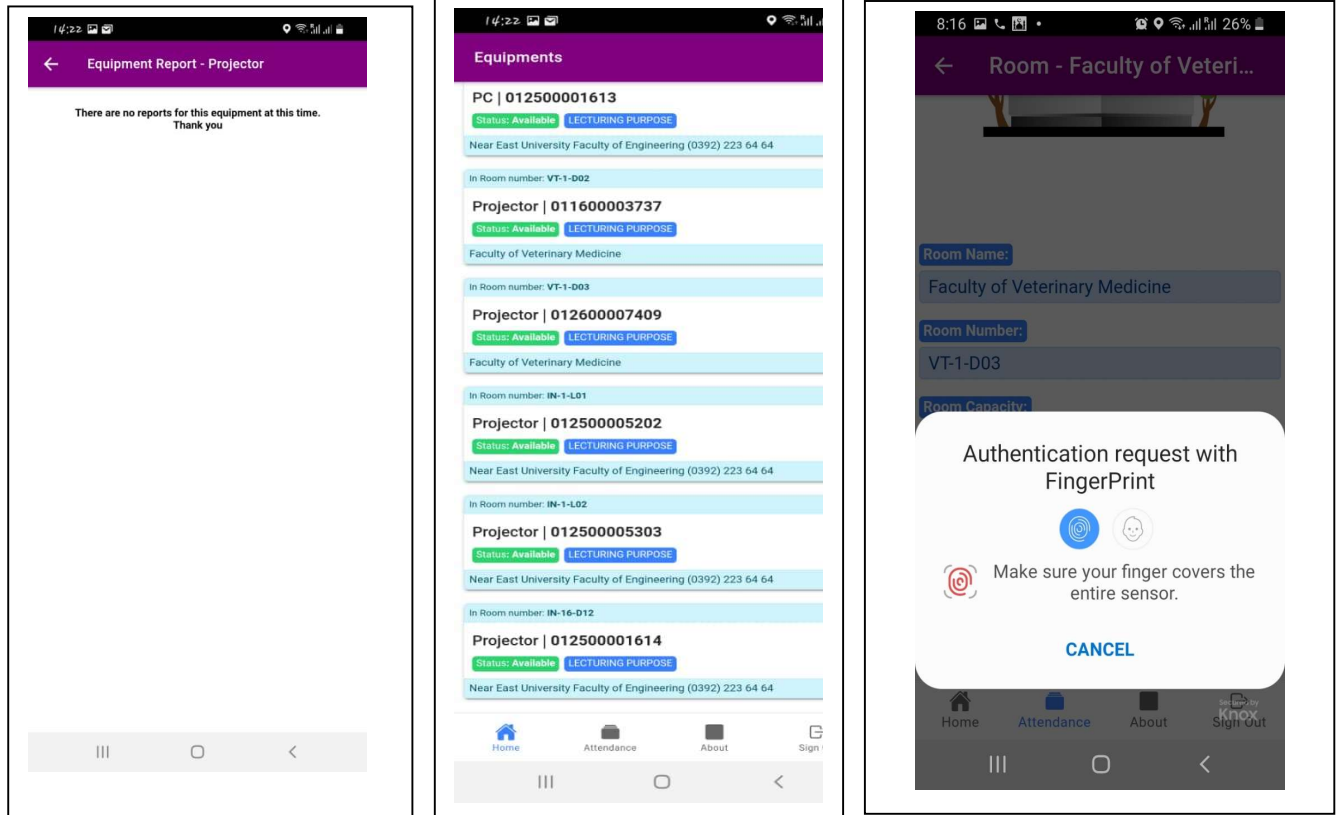
A   B   C

Figure 4.1: screenshot from the application

Using the NEU Resource management and attendance system to assign a room or to book attendance, the user at first opens up the app and the first screen that shows up is the splash screen with the app logo and a short description. The user then permits the app to access the location, if not granted, the app will not give the precise location; the user's location will be detected after granting the permission to access the location, the user inputs login details on the login page then log in. The Equipment dashboard will appear will a list of equipment as per the faculty. Users can also navigate to the attendance system where various faculty are displayed. Users can also navigate to about to read about the developer and supervisor.

4.1 Installation

The process of the app installation is planned to be direct and should not take long or any responsibility from the user. This mobile app should initially be downloaded and installed from a given cloud store and requires under 10 MB of space. Immediately after installing the app, it can be launched for usage. It permits app users to see how the mobile application functions, approve suitable authorizations and affirm that information assortment can start. Users will commonly be approached to give authorizations identified with the utilization of the location. A window will also popup asking for the user permission to access the current location, if the permission is granted by the user, the first activity will be displayed. If the app user did not grant permission, the mobile app will automatically close.

4.2 Foreground operations

Data security and consent: Related conduct information and Location are sensitive measures, and consequently, conventions should guarantee that the security and information of the user are protected when collecting user's data (James, Jankowska, Marx, & Laden, 2016). When the app is launched at first, users are given a concise data screen that indicates what data will be gathered and how to stop information assortment. This data and the terms of administration and security strategy can be reviewed whenever from inside the application. During the assortment stage, all area information is put away in a 256-bit SQL data set. This guarantees that regardless of whether the application source code was undermined, no information can be recovered in the absence of the first data. Just the portable application engineer can get to this data set.

4.3 Background Operations

NEU Resources management and attendance system mobile application relies on the ACCESS_NETWORK_STATE, ACCESS_FINE_LOCATION, READ_GSERVICES, and ACCESS_COARSE_LOCATION permissions. This gives admittance to GPS, Wi-Fi, and organization investigation to recover scope, longitude, precision levels in meters estimated by a range of certainty. The application is viewed as high need, which implies that the most precise perusing accessible is given, paying little mind to battery use. The request for positivity of the following (comparable to precision) is consequently: GPS, at that point, the wireless network,

trailed by network examination (Canzian and Musolesi, 2015). Every five minutes, a location update is requested by default. A lengthy table is returned and it is automatically stored in the SQL database.

4.4 Resilience of the NEU Resources management and attendance system

Seven potential ways that the background operations of the mobile app can be prevented from functioning have been identified. Data collection can be stopped inadvertently by the app users with the following steps: (i) switching off their mobile device, (ii) existing or shutting down the app, (iii) stopping the foreground tasks which are running, (iv) forcing the shutting down of all active applications, (v) disabling the location services, (vi) activating the power saving modes, or (vii) uninstalling/removing the mobile app completely from the device. Additionally, if the frontal area segment of the application is shut, the foundation administration will keep on running. Regardless of whether all closer view applications are cleared, foundation administrations won't have interfered. In any case, on the off chance that a power conclusion of all applications happens, at that point, the member will be needed to open the application again to proceed with the information assortment. In the activity that a user doesn't have area consents empowered, then the app will send the user a warning. This reminds the user that area authorizations ought to be empowered. Users can tap on the warning, which will guide them toward the pertinent settings through which applicable authorizations can be re-empowered. Furthermore, the force saving modes present in some Android gadgets may restrict the quantity of area focuses recorded by a gadget on the off chance that it has not been utilized for a protracted timeframe (which for retrieval in the reference is the name of the user who posted the article to Android Developer Website, Android Developer, 2018). In any case, this can halfway be relieved by guaranteeing that clients physically whitelist the application, which expands the quantity of accessible information logging windows. Lastly, removing/uninstalling the application is interpreted as a desire to withdraw from the usage, and this will stop the collection of data and delete all the files that are associated with the app.

4.5 Customization

The source code can be modified and customized. The frequency of location and the location data source such as GPS, Wi-Fi, etc., is used by default. We have illustrated these files in the Constant.java file. By following the customization process, the application can then be redistributed on the Google Play store. Data will not be shared with the other apps on the device. All the information gathered by the mobile app can be analyzed with some other streams of data which has been obtained from different devices or apps. This might include methodologies that capture time-stamped objective measures of behavior (e.g., physical activity from an accelerometer), or survey response items over longer periods (e.g., mood assessment from an experience sampling application) (Jankowska, Schipperijn, & Kerr, 2015).

4.6 Location processing and analysis

Data of any location can be analyzed in three key ways. The first way is to place the points of a particular location in the database, like lecture rooms. We can characterize the identified locations with this method based on how they are related to some other geographic databases; examples are the longitude, latitude, and the full address. The second method is by characterizing movements as a form of behavior in several ways (Carlson, Jankowska, Meseck, Godbole, Natarajan, Raab, & Kerr, 2015). Information related to the radius of gyration, travel distance can be provided. According to the research carried out by the psychological experts of recent, it appears that the analysis which includes information related to both destination and journey is more valuable incrementally (Huang and Barnes, 2016). Lastly, the consideration of time can provide information as regards when an individual is engaged in specific behaviors or activities. As location data become easier to collect, there are still potentials for all these analyses to develop/improve further.

4.7 Response time

The mobile API response time matters when it comes to mobile app development. Slow response times can be hindering the adoption of mobile apps. A delay of just a few seconds is sufficient to make a few users relinquish an application. Application response time is a significant factor that can impact the reception and utilization of portable. This can be especially obvious in the

venture, where making a versatile application can be costly, partially due to a complex mix with back-end frameworks. The expense of portable application improvement ought to be offset with the worth it makes for the business to help produce a quantifiable profit.

With mobile applications that employees rely upon to finish their jobs, slow load times can decrease efficiency and lead to representative disappointment and customer disappointment. Portable applications, in contrast to work area applications, have restricted assets, for example, battery life, preparing pace, and transfer speed use, and UI/UX plan choices need to represent this. Luckily, a few stunts and acclimations to the RESTful application programming interfaces (APIs) that regularly give information to portable applications can help improve load times while being mindful of asset utilization. NEU Resource management and attendance system mobile app has been fully optimized to get a better and fast response time, some of the methods used are listed below:

a) **Implementation of splash screen:** A significant part of mobile UI/UX configuration is the apparent reaction season of portable APIs in stacking information. Introducing a sprinkle screen when the application is dispatched is one stunt to help improve client experience by veiling the genuine application load time. These beginning-up screens look like the fundamental subject of the application yet is without content, giving the client consolation that something is going on while the application loads content.

b) **Mobile-centric APLs to connect back end:** Numerous organizations depend on inheritance frameworks that were not planned in light of versatility. Information coming from inheritance APIs may not be advanced for show or preparing on a cell phone and can debase the client's experience. In any case, numerous undertaking portable arrangements need the information and data that is put away on heritage frameworks. MBaaS contributions give the instruments and climate important to make versatile driven RESTful APIs that are intended to coordinate with heritage frameworks, offer quicker burden times, and create portable cordial information.

c) **Removal of unnecessary data and files:** Huge volumes of the information set aside a long effort to download. By limiting the size of a payload sent from the worker to a cell phone, the time a client spends holding up can be diminished. Numerous methods exist to decrease payloads. One technique is to eliminate information that the cell phone and

client needn't bother with. While this may appear glaringly evident, it can undoubtedly be neglected during improvement. Current MBaaS arrangements frequently uphold the Node.js JavaScript runtime, which can rearrange mentioning and marshaling heritage information to eliminate superfluous fields and change to gadget inviting JSON designs. This can diminish the payload and consequently cut the time a cell phone spends downloading information. Moderate reaction time or anything that can hamper appropriation or use can bring down the estimation of the application and any subsequent ROI. Quicker reaction time can improve portable achievement both as far as representative and client selection. Portable-driven APIs, storing instruments, and some other great UI/UX practices can assist with accomplishing this.

4.8 Biometric Feature

As informed by the design section, the implementation is done using the vision.CascadeObjectDetector in Ionic and google API which detects objects using the Viola-Jones algorithm. "The cascade object detector uses the Viola-Jones algorithm to detect people's faces, noses, eyes, mouth, or upper body" (MATLAB R2018 Documentation). The Viola-Jones calculation looks at a picture inside a sliding box to coordinate dim or light locale to distinguish a confront that contains mouth, eyes, and nose. The window estimate shifts with distinctive faces on distinctive scales with the proportion unaltered. The cascade classifier in Ionic and google API will determine the regions where a face can be detected. According to Ionic and google API Documentation, the stages within the cascade classifier are planned to run the show out districts that do not have a confrontation within the introductory arrange (dismiss negative tests) to spare time to analyze districts with conceivable potential faces within the following stages.

Android Permissions

Our app needs to have access permissions for it to access biometric inside the phone. The app can request required permissions in the manifest file. We have used READ_BIOMETRIC and WRITE_BIOMETRIC permissions in our application for this purpose. The app can get the biometric data using security already provided on the phone. Google API on security provider is a content provider which is one of the components in android and lets app share data with other apps. We have linked the mobile app with the mobile biometric with these two permissions.

4.9 Implementation

The location-based service is a key functionality that is used in smartphone applications. To give a good experience to the user about various locations, we often combine locations with maps. The Android devices support Application Programming Interfaces which are generally known as APIs (which for retrieval in the reference is the name of the user who posted the article to Android Developer official website, Location Manager Application Programming Interfaces). The current location can be discovered on a mobile app by using the location service. The periodic updates of device location information can be requested on any location-based app.

4.10 The Application Programming Interface of Android Location

The Android location APIs are classes different from some other APIs. These classes are available in the package of Location API. Location APIs are also used for retrieving the location information of users (which for retrieval in the reference is the name of the user who posted the article to Android Developer's official website, Location Manager APIs).

a) **The location Manager:** This is a class that gives the location services access. Additionally, this also gives room to discover the criteria of the best location provider.

b) **The Location Provider:** This is the location Provider abstract superclass. It gives the reports of the period on the location geography of a mobile device.

c) **The location listener:** A class that gives call-back methods. This class is called whenever the location changes. The location manager has to be registered under the lister object.

d) **The criteria:** this is a class that provides the mobile app to select a suitable location provider by giving access to a set of required properties of the LocationProvider.

Access to GoogleMaps is also Provided by Android with the help of API. Required places can be displayed on the screen to the user on the map with the help of APIs for location and Google maps.

4.11 The API of Biometric

The API biometrics all work on the premise of comparing the biometric test against a known layout, which is safely acquisitioned from the client when he or she selected on the framework at

first. Be that as it may, this template coordinating handle gives rise to a characteristic execution plot between the two fundamental mistake rates administering biometrics. The Untrue Acknowledgment Rate, or the rate at which a charlatan is accepted by the framework, and the Wrong Dismissal Rate, or the rate at which the approved client is rejected from the framework. The mistake rates share a commonly elite relationship as one mistake rate decreases, the other tends to extend, giving rise to a circumstance where not one or the other of the blunder rates are typically both at zero percent.

a) **Fingerprint Recognition**

The foremost commonly conveyed biometric, with a developer and demonstrated innovation. The unique mark comprises edges and valleys that shape particular designs, such as circles, whirls, and curves. The ridges and valleys are characterized by spasmodic and inconsistencies are known as particulars – these are the particular highlights on which most unique finger impression innovations are based. In arranging for the unique mark image to be captured a proper use is required

b) **Facial Recognition**

This uses the particular highlights of the human confront in arrange to verify a client. The highlights often utilized are those which alter exceptionally small over time, such as the upper edges of the eye attachments, areas around the cheekbones, sides of the mouth, nose shape, and the relative position of these highlights relative to each other. The facial picture itself can be produced from any inactive camera or video framework that can create a picture of adequate quality, such as a web camera.

4.12 System Testing

We have developed the proposed app using the Android Studio software. This is software for mobile app developers for Android apps. All the APIs that have been mentioned covered the app development. This app has been tested on Samsung Galaxy A7 (this device is A-GPS mobile device). The CPU of the device is Android 11.0.

Android Permissions

To perform network operations in our application, we have included the android. permission.INTERNET in our manifest file. Without this permission, the mobile app will not be able to connect to the internet. The location permissions offered by Android are two which are ACCESS_COARSE_LOCATION and ACCESS_FINE_LOCATION. We have used these two permissions to determine the best accuracy of the location returned by the API.

CHAPTER 5: PERFORMANCE AND RESULT ANALYSIS

System testing strategies will be discussed here, programs are tested and debugged to ensure that the general operation of the program meets the overall system objectives. The chapter also covers the computer target requirements, lastly, maintenance issues are discussed, and the researcher also states how the software can be maintained.

For any mobile app, performance is very critical. We ensure that the performance of the proposed mobile app is fully optimized because if the mobile app is slow, the end-user will uninstall the app and find other related application that performs better. Our system is compatible and able to take benefits of existing features in present-day android phones. We have chosen this approach because we are interested in the attendance and resource management section of the Application.

5.1 Test Environment and Test Plan

The two environments where the tests will run, together with the tools and required hardware constitute the test environment.

The test environment in this research consists of:

   I.   Mobile devices testing
   II.   Tool for monitoring the utilization of hardware resources in the mobile devices

The web cloud has 2Gb of RAM, 5Gb of Hard disk, and a Quad-core 3.3GHZ CPU. The list of mobile phones and specification that has been used for testing the app is displayed in **table 1.2** showing details of eacch phone and performance.

Phone model	Operating system	Processor	RAM
Samsung Galaxy A70	Android 11	Octa-core (2x2.0 GHz Kryo 460 Gold & 6x1.7 GHz Kryo 460 silver)	6GB
Samsung Galaxy A10	Android 9.0 (Pie)	Octa-core (2x1.6 GHz Cortex-A73 & 6x1.35 GHz Cortex-A53)	4GB
Samsung Galaxy A9	Android 8.0 (Oreo)	Octa-core (4x2.2 GHz Kryo 260 Gold & 4x1.8 GHz Kryo 260 Silver)	8GB

Table 1. 2: Mobile Phone test specification

For each test, we measure the time required for a task to execute, the usage of RAM, and CPU. The tests were run on Wi-Fi and 4G network. The time required for a task to execute is calculated within the code. The execution time for cloud calculations will include the overall time needed for the request to finish. Additionally, the server time needed for processing will be measured so that we can observe the delay for each cloud request. To measure the utilization of the device's resources, RAM, and processor, the Android Profiler tool will be used. Android Profiler is part of Android Studio 3.0; it provides a real-time graphical display of CPU usage, memory, and network usage for the running mobile application. The process of accurately measuring mobile phone power consumption is a difficult task. One approach is to take physical power measurements on a piece of real hardware with specialized measurement equipment. There are software tools to perform this type of measurement, but it is hard to get an accurate value. So the focus here is on execution time, CPU, and memory utilization of mobile application functions, where more accurate values can be gathered.

5.2 Mobile Devices testing

The primary goal of testing is to take the smallest piece of the testable section in the application to determine whether it behaves exactly as it is expected to behave and to meet the objectives of this thesis.

- **5.2.1 Speed test.**

The speed test help us to check the best netwrok condition to operate the application. The speed of the device is listed on the y-axis in Kbps while the devices with their parameters which we call devices and the network type are listed on the x-axis. We have analyzed the connection speed on three different devices which are Samsung Galaxy A70, Samsung Galaxy A9, and

Samsung Galaxy A10. We have decided to use these devices because they are the most popular and widely used Android devices. After which we run the app on all these three devices, the output is given in **Figure(5.1).** The best connection is WIFI according to our result which means that our app can run on the latest connection speed but LTE connect is still within the limit.
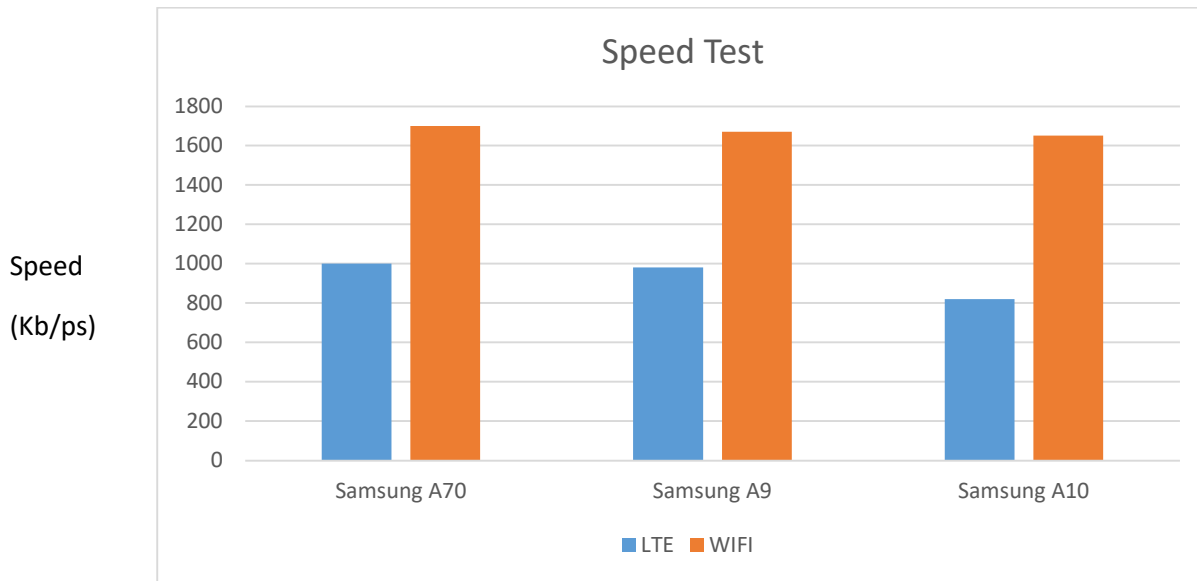

Figure 5.1: Execution Time

The tests were executed on a network with the taking after normal download/upload speed: 1800kbps/100kbps for Wi-Fi association, and 1200Kbps/700kbs for LTE association. The normal execution time is taken for each test. Values are shown in milliseconds. In **Figure 5.1**, the execution time of getting to a component is appeared, for nearby, Wi-Fi and LTE. In this test, a cluster of predefined lengths is made, and to begin with, a component is returned.

- **5.2.2 Results from Geo-Physical location testing.**

Geo-physcial mean your present location with refrence to google map (Log and lat).Geo-physical location Algorithm programmed on the application enables the user to access some equipment when it is within the stated km in the source code. It was tested by moving 10meters from the case study building (Faculty of Veterinary), in this process, the assigned link disappeared, and the system showed the distance from the present user to the Building as shown in **Figure(5.2).** To confirm the function is working well the user enters the veterinary build and the Assign/Attend button appeared claiming the user is within the location of the building.

Figure(5.3). The user must be within 10meters of the refrence location programmed on the application.

Figure 5.2: location distance

Figure 5.3: Assign button

- **5.2.3 Results from UserPrivilage test:** For the below **figure 5.4** I tested the User Privilege (i.e only specific users are allowed to use some classroom Equipment) so I login in as a student to try to assign a projector and computer but I got an Error message as shown on **figure 5.4.** After I login in as an instructor to confirm if the system will allow access since I am logged in as an instructor and I got a success message as shown in **figure 5.5**
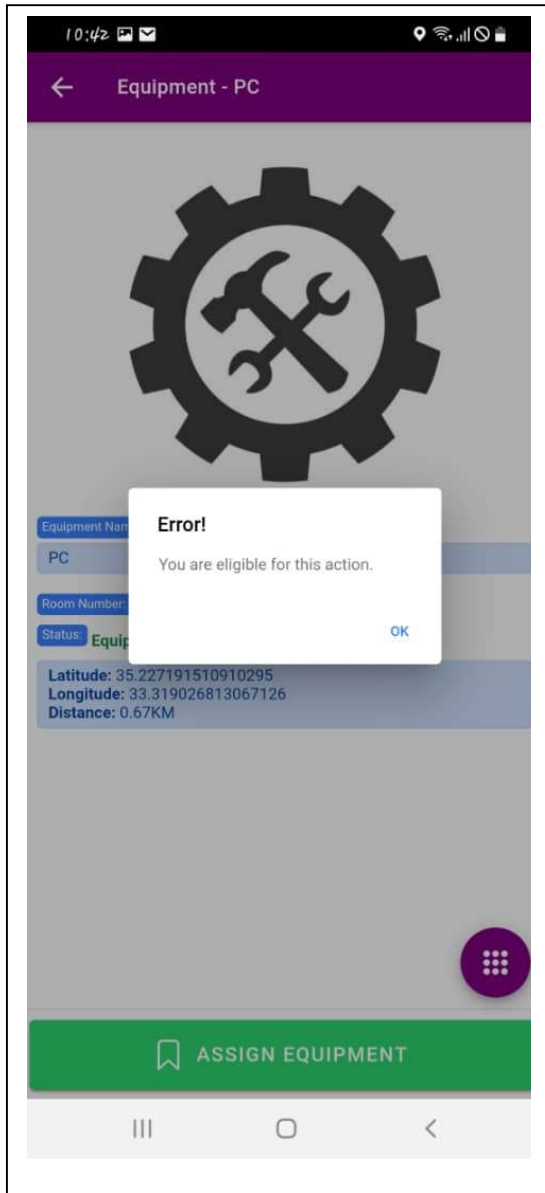
Figure 5.4: error message
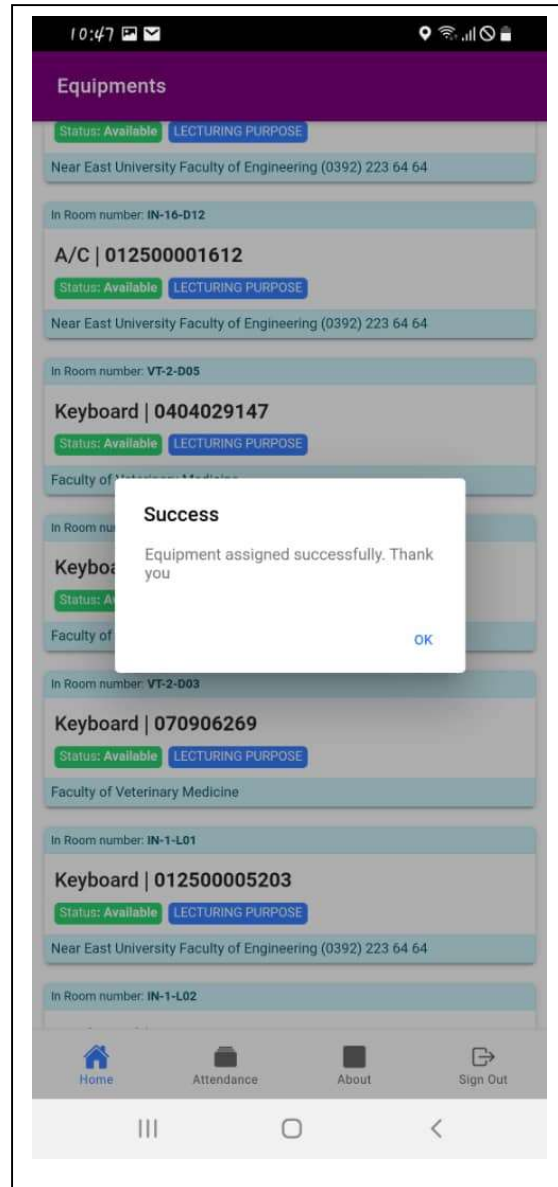
Figure 5.5: success message

- **5.2.4 Usage Report:** The system is designed to show a usage report for both room and equipment usage Veterinary **figure 5.6 and figure 5.7. figure 5.6** show a totals number of 4 student or users attending a class while **figure 5.7** show the number of users that have assigned equipment in the past hours. The report for the room section plays a very vital room in the attendance system which the classroom instructor can use to mark student attendance to a particular course been taking in a room or lab. The report section keeps track of the course code the user input after clicking the attendance button.

Figure 5. 6: user Report
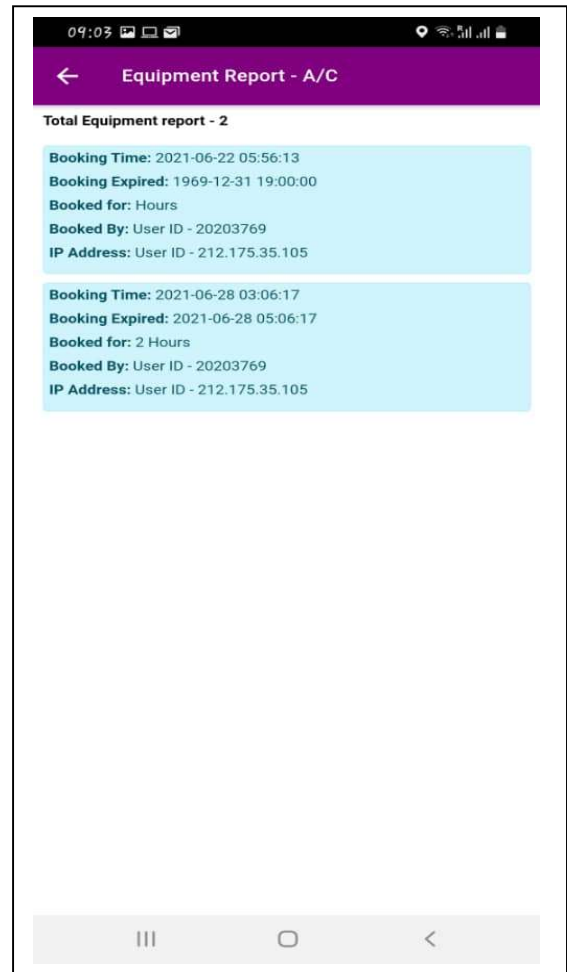
Figure 5.7: User Report

- **5.2.5 Biometric Authentication:** The biometric authentication involves a fingerprint scanner and faces recognition that's already installed on the phone by the OEM, The application request either of the authentication depending on the one active on the phone as shown in **figure 5.8**. The process comes up when the user clicks the attend button on the attendance section to register attendance to any ongoing course in a particular room. The main reason for this process is to ensure compliance with the attendance rule (i.e one student can only mark his/her attendance from his device if another student tries to use his fingerprint or face reg to register attendance from a friend device the system will prompt an error of "match not found as shown on **figure 5.9**.
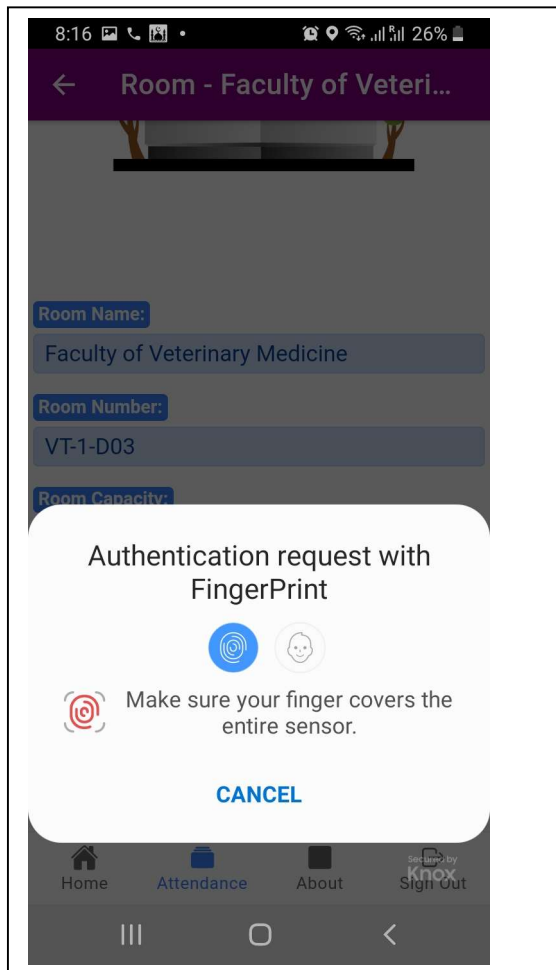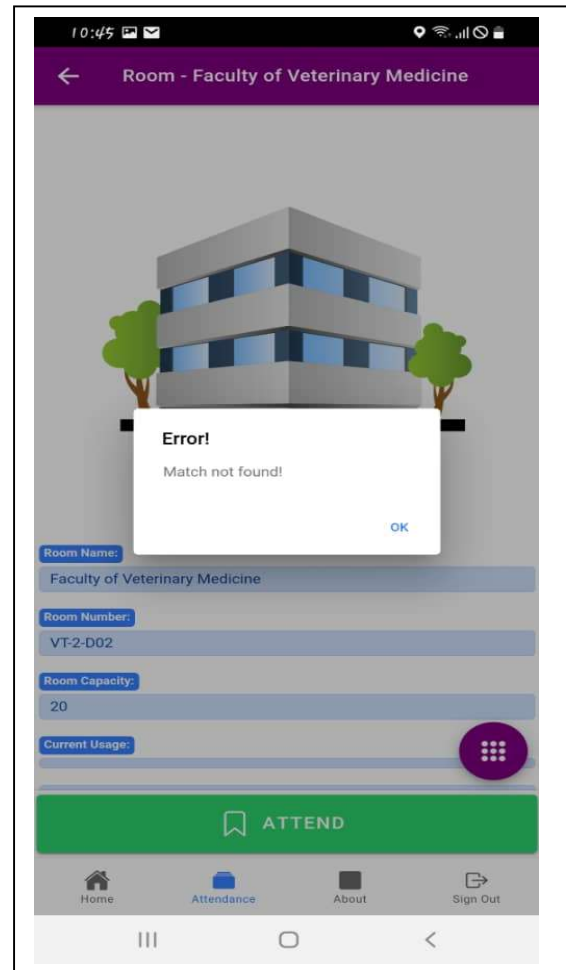
Figure 5.8: Biometric request

Figure 5.9: Error message

- **5.2.6 Room Capacity for attendance:** The application is design to display the number of users presently using a particular room and will promote action if the capacity is exceeded. Once the system records any number of users, the system will display the present number of users on the room tab as shown in **figure 5.10**.
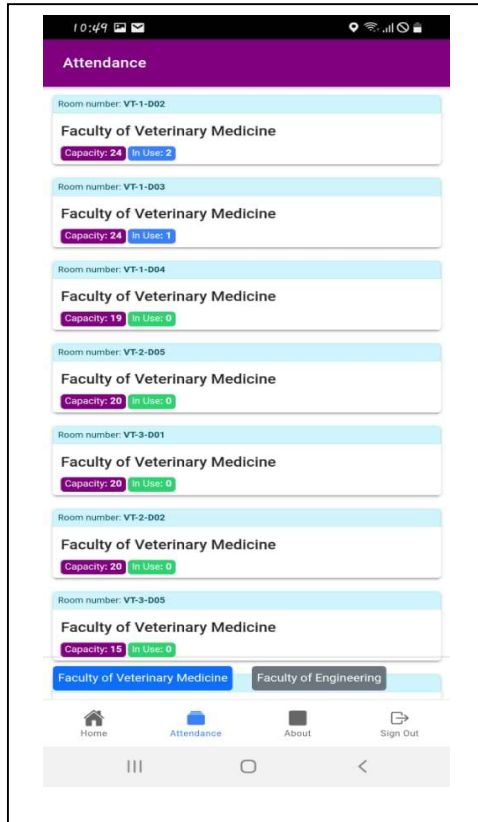
Figure 5.10: Room capacity

5.3 Tool for monitoring the utilization of hardware resources

One of the key tools used to monitor the app utilization of hardware resources is Device Analyser. Typically an energetic data grouping gadget which can dependably assemble information on Android Smartphone utilize from an open neighborhood region of donors. The device analyzer runs on Android devices as it were. The key factors as an advantage in building a mobile application is that the application is divided into two sections which are client and server side. The server in this case is the cloud where the SQL database is hosted while the client is the mobile phone where the application is installed. With the help of PHP API the client and server will communicate well. The will then enable us to test the application operation on the client side(Android phone) in term of RAM and CPU usage. Testing on the server side involves checking the bandwidth usage which is basically explain as the amount of data that is accessed on server by different user at a particular time. The server (cloud) that was used for this

application in an unlimited share hosting which offers unlimited memory (bandwidth) So, the database cannot crash no matter the number of users accessing the database.

- **5.3.1 Memory Usage:** This memory usage focuses on the utilization of the random access memory(RAM) The application is design to consume a maximum RAM usage of 311Mb when running and 180Mb while running in the background. This was subjected to testing on three different phones and we came up with the below **figure 5.11**.
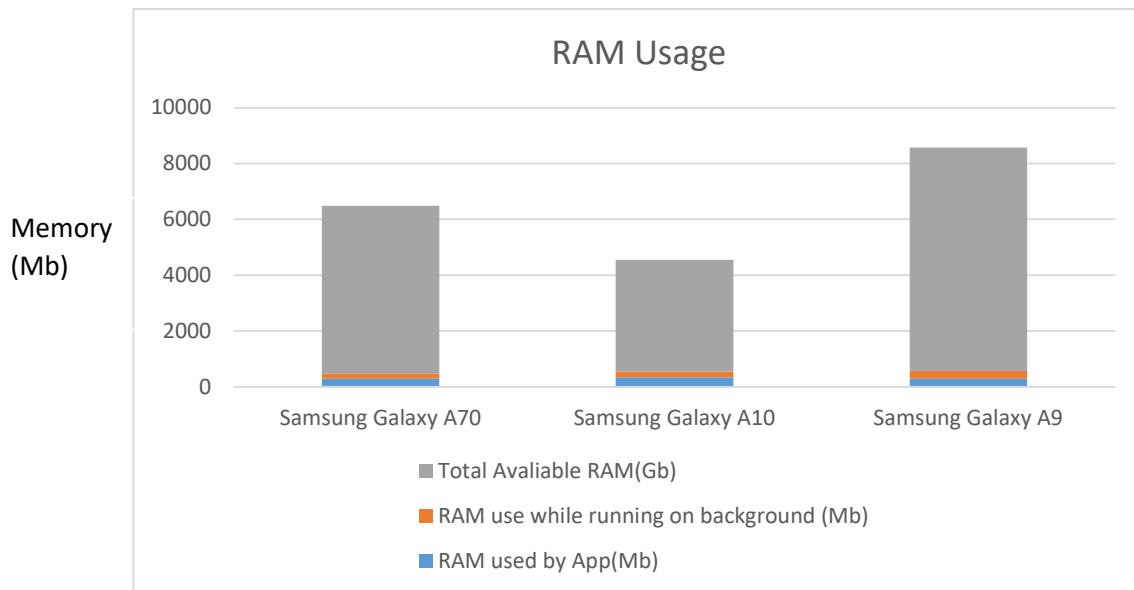

Figure 5.11: RAM Usage

- **5.3.2 The Central Processing Unit (CPU) Usage:** This validation/test show us how the application utilizes the user's phone CPU processing power. The displayed CPU utilization rate is in terms of the entire CPU capacity. Since we utilize single-threaded code, one center is utilized for processing. The CPU utilization bounces for neighborhood preparing, in test cases with the final three tests in Samsung Galaxy A70, Samsung Galaxy A10, and Samsung Galaxy A9. In the various test case, the CPU usage ranges from 4%-9%. As shown in **Figure 5.12**
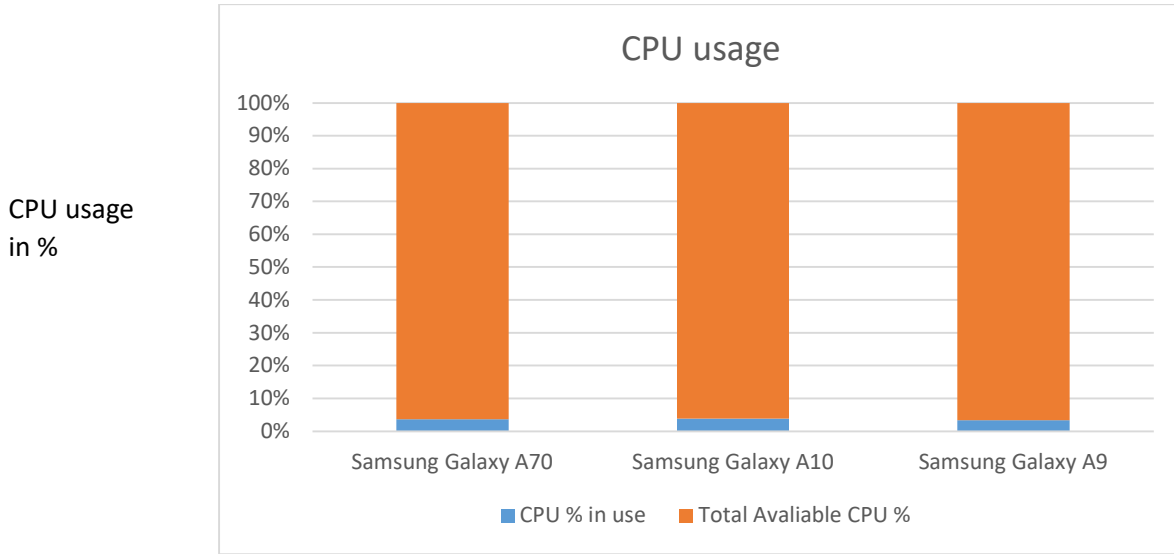
CPU usage in %

Figure 5.12: CPU Usage Report

5.3.3 Server Bandwidth Usage: This function allows me to see the bandwidth usage for the application. It shows the total bandwidth usage when fifteen user access the application for 24hrs as shown in **figure 5.13** and one week as shown in **figure 5.14.** The test server has an unlimited bandwith size which enable the application to function without any error message, having a bandwidth of 320mb for 10 users for 24hr is a good sign that application will function as expected. Mobile application has proven to function as expected when operating for the server end and The result of this bandwidth has confirmed that.
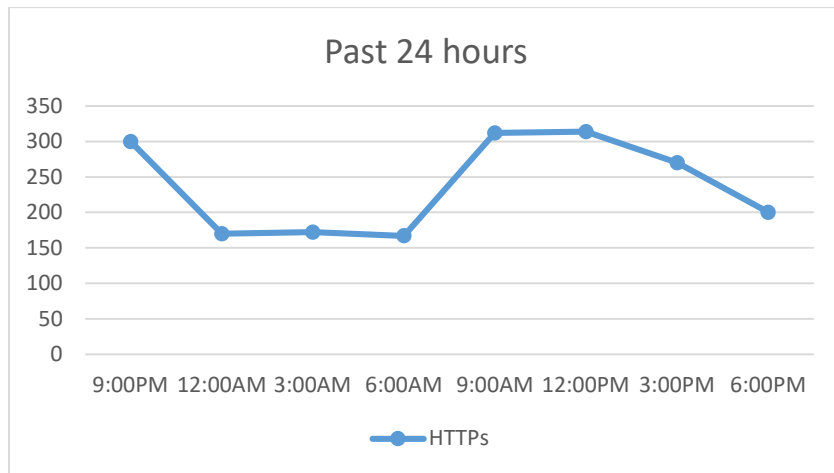

Figure 5. 13 Server bandwidth Usage for 24 hours when 10 users where connected to the application.
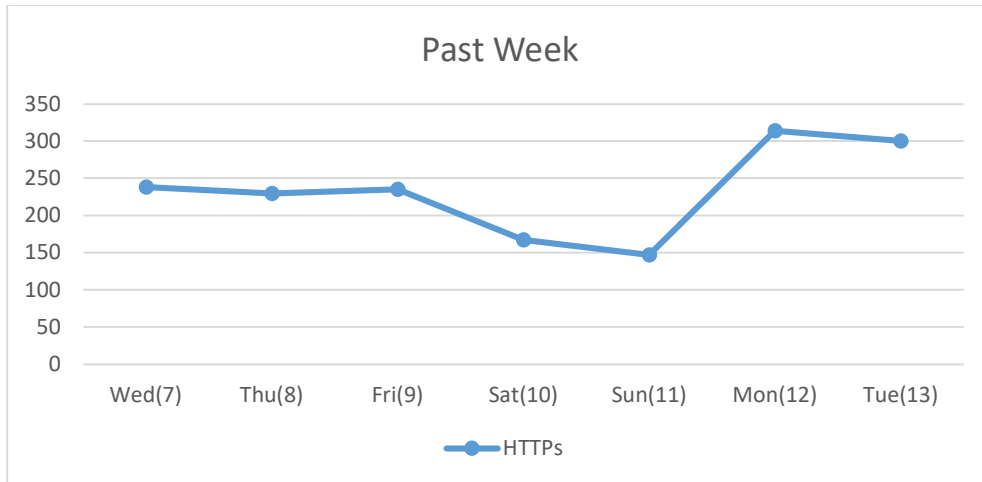
41

Figure 5. 14: server bandwidth usage for one week when more than 10 users where connected to the application.

5.4 Responds Time

There are a couple of rules that talk about application response time and the user experience. Response time that is below 100ms will be very fast on the user's device. Any response time that is up to one second(s) is adequate to the users. Mobile application testing is a sort of A/B testing wherein diverse user portions are given different assortments of an in-application experience to figure out which one initiates the ideal activity from them. Mobile application testing incorporates all capacities tests which run on the server-side, as well as permitting advertisers with the managers of item products to optimize the experiences in the end-to-end user interface.

A few models are considered to determine the tools for the cross-platforms to exhibit the examination. Most importantly, there is the accessibility of a PropertyCross usage utilizing the device. This doesn't confine the exploration, as most notable and regularly utilized cross-platform devices are upheld (Retrieved, 2012).

CHAPTER 6: CONCLUSION

The proposed application uses Geolocation and Biometric scanner inbuild inside the android phone for attendance and resource management system for easy use and management of attendance and resources with the school. The geolocation feature ensures each user is within the sector of the building to be able to have full access to the proposed application.

This application is adaptable to various industries in need of an attendance system and resource management. It is also cost-effective to build compare to another system that's already been deployed out there.

Devices, In light of the analysis of the performance, general finishes of which application developers ought to know while choosing a particular tool for cross-platform are drawn. Notwithstanding, utilization of cross-platform tools can affect explicit useful parts of the applications that are developed for mobile. Henceforth, the work that will be done in the future will contain the examining of these perspectives when estimating, such as, executing complex calculations, getting to devise assets, for example, sensors or steady memory, and correspondence with different devices.

A proper conclusion cannot be made without identifying some of the basic limitation to this thesis, the propose application has some dependencies on the mobile phone which are online movement tracking and online biometric scanner. These dependencies can be reduced if this research is been furthered base on my recommendations.

RECOMMENDATION

To upgrade this present system I would recommend inputting RFID tags or QR bar codes to various equipment and room entrance, so the mobile phone will scan those tags to either book attendance or assign equipment. The RFID tags or QR bar codes features can be implemented into the application interface by first creating a new database to hold the various RFID tags and QR codes number, secondly the RFID scanner modules will be writing into the application lines of codes i.e to check and confirm if the scanned ID are in the database. The datebase will be installed into the application so a SQL update function will be programmed into the application to update whatever inform that has been save in the phone datebase to the cloud/server database anytime the application is online. For further research it should be consider to add a knowledge

base and an inference engine in the section of resource management to enable the system have a vital connection with Artificial intelligent system to be a decision making system (Imanov and Daniel 2020).

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APPENDIX 1: Source codes

```
import { AppConstant } from './../../../shared/constant';

import { AssignRoomRequestModel } from './../../../model/room/room-model';

import { RoomService } from './../../../service/rooms/room.service';

import { AlertController } from '@ionic/angular';

import { FormBuilder, FormGroup, Validators } from '@angular/forms';

import { Component, OnInit } from '@angular/core';

import { ActivatedRoute, Router } from '@angular/router';

import { StorageServiceService } from 'src/app/service/shared/storage-service.service';

import { Geolocation } from '@ionic-native/geolocation/ngx';

import { } from 'google.maps';

/// <reference types="google.maps" />

import { } from 'google.maps'

import { Room } from 'src/app/model/room/room-model';

@Component({

  selector: 'app-view-room-info',

  templateUrl: './view-room-info.component.html',

  styleUrls: ['./view-room-info.component.scss'],

})

export class ViewRoomInfoComponent implements OnInit {


  constructor(

    private fb: FormBuilder,
```

```
    private geolocation: Geolocation,

    private roomService: RoomService,

    public  alertController: AlertController,

    private route: ActivatedRoute,

    private router: Router,

    private strogeService: StorageServiceService

  ) { }

    form: FormGroup


    currentPoint = { lat: 0, lng: 0 }

    loading: boolean = false;

    errorMessage = '';

   room: Room;

   distance = 0;

 async ngOnInit() {


    this.form = this.fb.group({

      hours: ['', Validators.required]

    });


    const id = this.route.snapshot.paramMap.get('id');

    this.loading = true;

      this.roomService.getRoom(id).subscribe(a => {
```

```
        this.loading = false;

        this.room = a.data;

      }, err => {

        console.log('retriveal error ', err);

      });



  await  this.loadLocation();



 const itemLocation = this.getLatLngFromUrl(this.room.mapLocation);

      let userLocation = new google.maps.LatLng({

        lat: Number( this.currentPoint.lat),

        lng: Number( this.currentPoint.lng)

      });

    const distance = this.getDistance(userLocation, itemLocation);

    this.distance = distance;

        console.log("distance", distance);

}



    async loadLocation() {

    const resp = await this.geolocation.getCurrentPosition();

      console.log("geo location",resp)

     const lat = resp.coords.latitude;

      const lng = resp.coords.longitude;
```

```
    this.currentPoint.lat = lat;

    this.currentPoint.lng = lng;

    this.initMap(lat, lng)

}

 initMap(lat, lng) {

  let map: google.maps.Map;

   map = new google.maps.Map(document.getElementById("map") as HTMLElement, {

    center: { lat: lat, lng: lng },

    zoom: 8,

   });

   const marker = new google.maps.Marker({

    position: { lat: lat, lng: lng },

    map: map,

  });


}

async submit() {


 if (this.currentPoint.lat == 0 && this.currentPoint.lng == 0) {

   this.errorMessage = 'location not found, ensure to turn on internet and enable location'

   return;

 }

 if (this.form.invalid) {
```

```typescript
    this.errorMessage = 'please fill all required information '

    return;

}

  if (this.distance > AppConstant.minDistanceInKm) {

  this.errorMessage = 'Sorry you are too far , from the building'

  return;

}


const hours = this.form.get('hours').value;

const userId =Number(  await this.strogeService.getItem('userId'));


  let model = {

    roomId: this.room.id,

    userId: userId,

    userLocation: JSON.stringify(this.currentPoint),

    allocatedHoursToUse: hours

  } as AssignRoomRequestModel;


this.roomService.AssignUser(model).subscribe(a => {

    console.log("result", a)

    this.alert("success, room assigned successfully");

    this.dismiss();

}, error => {
```

```
      this.errorMessage = error.error.data;

        console.log("errror", error)

      })



  }

  async alert(message) {

  const alert = await this.alertController.create({

    header: 'Alert',

    subHeader: 'Message',

    message: message,

    buttons: ['OK']

  });



    await alert.present();



  const { role } = await alert.onDidDismiss();

  console.log('onDidDismiss resolved with role', role);

  }

dismiss() {

  this.router.navigate(['/dashboard/rooms']);

  }



getLatLngFromUrl(mapurl) {
```

```
    const regex = new RegExp('@(.*),(.*),');

    const lon_lat_match = mapurl.match(regex);

    const lng = lon_lat_match[1];

    const lat = lon_lat_match[2];

    const point = new google.maps.LatLng({lat: Number (lat), lng: Number(lng)})

    return point;

  }


  getDistance(from: google.maps.LatLng, to: google.maps.LatLng) {

    console.log("from", from.lat(), from.lng());

    console.log("to", to.lat(), to.lng());


    let distance = google.maps.geometry.spherical.computeDistanceBetween(from, to);

    if (distance) {

      distance  = distance/1000.00

    }

    return distance;

  }

}

import { Router } from '@angular/router';

import { EquipmentsService } from './../../service/equipments/equipments.service';

import { Component, OnInit } from '@angular/core';

import { ModalController } from '@ionic/angular';
```

```typescript
import { AssignEquipmentModalComponent } from '../assign-
equipment-modal/assign-equipment-modal.component';

import { UseageModalComponent } from '../useage-modal/useage-modal.component';

import { EquipmentModel } from 'src/app/model/equipments/equipments-model';

import { EquipmentsUsage } from 'src/app/model/equipments/equipments-usage-model';


@Component({

  selector: 'app-view-equipments',

  templateUrl: './view-equipments.component.html',

  styleUrls: ['./view-equipments.component.scss'],

})
export class ViewEquipmentsComponent implements OnInit {

  constructor(public modalController: ModalController, private equipmentService:
EquipmentsService, private router: Router) {}

  equipments: EquipmentModel[] = []

  ngOnInit() {

    this.equipmentService.getall().subscribe(a => {

      this.equipments = a.data;

      console.log('equipments fetch result')

    })

  }

  doRefresh(event) {

    console.log('Begin async operation');
```

```
    this.equipmentService.getall().subscribe(a => {

      this.equipments = a.data;

      console.log('equipments fetch result', a)

    })

    setTimeout(() => {

      console.log('Async operation has ended');

      event.target.complete();

    }, 2000);

  }

  async allocate(id) {

    this.equipmentService.get(id).subscribe(a => {

      const data = a.data;


      if (!data.useage) {

        this.router.navigate(['dashboard/equipments/view/'+data.equipment.id])

       // this.showAssignEquipment(data);

      } else {

        this.showUsage(data);

      }

    })


  }
```

```
async showUsage(equipment: EquipmentsUsage) {

  const modal = await this.modalController.create({

    component: UseageModalComponent,

    componentProps: {

      equipmentUsage : equipment

    }

  });

  return await modal.present();

}

async showAssignEquipment(equipment: EquipmentsUsage) {

  const modal = await this.modalController.create({

    component: AssignEquipmentModalComponent,

    componentProps: {

      equipmentUsage : equipment

    }

  });

  return await modal.present();

}

}

<ion-content fullscreen>

  <ion-refresher slot="fixed" (ionRefresh)="doRefresh($event)">

    <ion-refresher-content    pullingIcon="chevron-down-circle-outline"    pullingText="Pull    to
refresh"
```

```
          refreshingSpinner="circles" refreshingText="Refreshing...">

        </ion-refresher-content>

      </ion-refresher>

    <!-- <ion-list>

      <ion-list-header>

        Equipments

      </ion-list-header>


      <ion-item *ngFor="let equipment of equipments" (click)='allocate(equipment.id)'>

        <ion-avatar slot="start">

          <img src="{{equipment.imageUrl}}">

        </ion-avatar>

        <ion-label>

          <h2> {{equipment.name}} | {{equipment.idNo}}</h2>

          <h3>{{equipment.description}} </h3>

          <p>In Room No {{equipment.roomNo}}</p>

          <p><b  class="uk-badge"  *ngIf="equipment.isInUsed">  Unavaliable</b>  <b  class="uk-
badge"

            *ngIf="!equipment.isInUsed"> Avaliable</b></p>

        </ion-label>

      </ion-item>


    </ion-list> -->
```

```html
<div class="uk-child-width-1-2@s uk-child-width-1-@m uk-grid-match uk-grid-collapse" uk-grid>

  <div *ngFor="let equipment of equipments">

   <ion-card (click)='allocate(equipment.id)'>

    <ion-card-header>

     <ion-card-subtitle>In Room No {{equipment.roomNo}}</ion-card-subtitle>

     <ion-card-title>{{equipment.name}} | {{equipment.idNo}}</ion-card-title>

    </ion-card-header>


    <ion-card-content>

      {{equipment.description}}

     <br>

     <b class="uk-badge" *ngIf="equipment.isInUsed"> Unavaliable</b> <b class="uk-badge" *ngIf="!equipment.isInUsed">

       Avaliable</b>

    </ion-card-content>

   </ion-card>

   </div>

 </div>


</ion-content>

on-header translucent>

  <ion-toolbar>
```

```html
<ion-title>Assign Room</ion-title>

<ion-buttons slot="start">

  <ion-button (click)="dismiss()">Back</ion-button>

</ion-buttons>

</ion-toolbar>

</ion-header>

<ion-content fullscreen>

  <div class="uk-card uk-background-muted uk-padding">

    <h3>Room Info</h3>

    <img  src="./assets/img/assign.svg"  class="uk-align-center"  style="height:  120px;  margin-
bottom: 10px;">

    <div>

      Room Name <br>

      <b>{{room?.faculty }}</b> <br>

      Room No <b>{{room?.roomNo}}</b> <br>

      Capacity <b>{{room?.capacity}}</b> <br>

      Current Useage <b>{{room?.currentUsageCapacity}}</b> <br>

      <a href="{{room?.mapLocation}}" target="_blank"> View Room Location</a>

      <a routerLink='/dashboard/rooms/report/{{room?.id}}'> View Useage Report</a>|

    </div>

    <form [formGroup]="form" (ngSubmit)="submit()">

      <div class="uk-form-stacked">

        <div class="uk-margin">
```

```html
<br>

<label class="uk-form-label" for="form-stacked-text"> How long (in hours) would you
use this room</label>

<div class="uk-text-danger">{{errorMessage}}</div>

<div class="uk-form-controls">

  <input class="uk-input" required formControlName="hours" type="number" max="48"

    placeholder="Allocate Duration in hours" />

</div>

</div>

<div class="uk-margin">

  <div class="uk-form-label">Your Location</div>

  <div>

Lat: {{currentPoint.lat}} <br>

    Lng: {{currentPoint.lng}}

<br>

You are {{distance}} Km from Equipment Location

<br>

<div id='map' class="uk-width-1-1" style="height: 250px;">

    <p>Loading Map please wait ......</p>

  </div>

 </div>

</div>

<div class="uk-margin">
```

```html
        <button        type="submit"        class="uk-button        app-bg-primary-color"
[disabled]='loading'>Assign

        Room

        <img *ngIf="loading" src="./assets/img/loader.svg" width="45" height="45">

        </button>

      </div>

    </div>

   </form>

 </div>
```

Appendix 2: How to create a mobile App

- Download Microsoft visual studio code
- Install the Microsoft Visual studio code on your C: drive
- Open the Visual studio code and create a new Project with any name of your choice
- Download local MySql server for database creation
- Link the database to your project you created
- Created various tables in your database as needed
- After completion of programming the Application, Download android studio
- Copy the completed project into android studio and compress to APK
- Install APK file on mobile app for testing.

Appendix 3: Similarity Report

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Appendix 4: Ethical Approval Letter

NEAR EAST UNIVERSITY

ETHICAL APPROVAL DOCUMENT

Date:02/08/2021

To the Graduate School of Applied Sciences

For the thesis project entitled "Design of NEU resource Management and Attendance system using geophysical location", the researchers declare that they did not collect any data from human/animal or any other subjects. Therefore, this project does not need to go through the ethics committee evaluation.

Title: Prof. Dr.

Name Surname: Fadi Al-Turjman

Signature: *F. Alturjman*

Role in the Research Project: Supervisor