



University of Diyala - College of Science
Computer Science Department

Student attendance registration system based on QR code

**This research was presented to the Council of the College of Science -
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requirements to get a bachelor's degree in Computer science**

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ABSTRACT

Smartphones are becoming more preferred companions to users than desktops or notebooks. Knowing that smartphones are most popular with users at the age around 26, using smartphones to speed up the process of taking attendance by university instructors would save lecturing time and hence enhance the educational process.

Our project is a mobile application that is based on a QR code, which is being displayed for students during or at the beginning of each lecture. The students will need to scan the code in order to confirm their attendance.

The application contains two sides, one side dedicated to students to record their attendance, and the other side is dedicated to the teacher who creates the lecture and displays its code for students so that the application displays all attendance and absence recordings with the possibility of distinguishing some of the students who participated in the lecture.

SUPERVISOR CERTIFICATION

I certify that the preparation of this project entitled
Student attendance registration system based on QR code

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was made under my supervision in the Department of Computer Science/College of Science/University of Diyala and it is part of the requirements for obtaining a Bachelor's degree in Computer Science

Signature :

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Date :

الاهداء

إلى النور الذي ينير لي درب النجاح (أبي)

و يا من علمتني الصمود مهما تبدلت الظروف (أمي)

إلى من يضيئون لي الطريق ويساندوني ويتنازلون عن حقوقهم لإرضائي والعيش في هناء
(أخوتي)

إلى من أنار لي الطريق وأمسك لي مشعل النور أستاذي الفاضل

د. برهان وجميع اساتذة قسم علوم الحاسبات،

إلى كل من أضاء بعلمه عقل غيره،

أو هدى بالجواب الصحيح حيره سائليه

فأظهر بسماحته تواضع العلماء

وبرحابته سماحه العارفين.

شكر وتقدير

اشكر الله العلي القدير الذي أنعم عليّ بنعمة العقل والدين. القائل في محكم التنزيل "وَفَوْقَ كُلِّ ذِي عِلْمٍ عَلِيمٌ" سورة يوسف آية 76.... صدق الله العظيم .

وقال رسول الله (صلي الله عليه وسلم): "من صنع إليكم معروفاً فكافئوه, فإن لم تجدوا ما تكافئونه به فادعوا له حتى تروا أنكم كافأتموه" (رواه أبو داوود) .

فبعد شكر المولى عز وجل ، المتفضل بجليل النعم ، وعظيم الجزاء.. يجدر بي أن أتقدم ببالغ الامتنان ، وجزيل العرفان إلى كل من وجهني ، وعلمني ، وأخذ بيدي في سبيل إنجاز هذا البحث .. وأخص بذلك مشرفي الذي قوم ، وتابع ، وصوب ، بحسن إرشاده لي في كل مراحل البحث ، والذي وجدت في توجيهاته حرص المعلم ، التي تؤتي ثمارها الطيبة بإذن الله ...

كما أحمل الشكر والعرفان لكل من أمدني بالعلم ، والمعرفة ، وأسدى لي النصيح ، والتوجيه ، وإلى ذلك الصرح العلمي الشامخ متمثلاً في جامعة ديالى ، وأخص بالذكر كلية العلوم ، قسم الحاسبات، والقائمين عليها , كما أتوجه بالشكر إلى كل من ساندني بدعواته الصادقة ، أو تمنياته المخلصة

أشكرهم جميعاً وأتمنى من الله عز وجل أن يجعل ذلك في موازين حسناتهم.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Recording the attendance of students in the classroom by the teacher in the usual way can take a long time from the lecture. And with the smart phones, this can be used to create an application that reduces the time of registration of attendance by 90%. This is what we did in our app.

Among the various types of attendance systems that have been developed, using punch cards, log books, fingerprint systems, and barcodes, still cause lots of problems such as providing incorrect information to the users. The purpose of the smartphone-based attendance system is to computerize the traditional way of recording attendance and provide an easiest and smart way to track attendance in institutions nowadays, the most common device that have been come into account in marketing and business are smartphone devices. Moreover, it comprises lots of them running Android OS.

This way, the system will save not only time but also efforts that were supposed to be put by instructors during each lecture. It will speed up the process of taking attendance and leave much time for the lecture to be given properly.

The system also takes care of preventing unauthorized attendance registration using multi-factor authentication. That is, it considers “Something you know”, “Something you have”, and “Something you are” to confirm the student identity.

1.2 The Problem

Taking students' attendance by university instructors during each class is a time-consuming process especially when classes are big. Some faculty policies require this task to be performed by the instructor in each lecture. In other words, out of the total hours that are assigned to a given course, which is typically forty-five hours per semester, up to eight hours may be lost to perform this process that usually takes around ten minutes per lecture.

Statistics in [1] shows that 42% of smartphone users have an average age of 26 years old. Thus, with the widespread of smartphones among university students, this project addresses the problem of such a waste in the lecture time and proposes a system that offers to reduce it by almost 90%. The proposed solution offers a QR code for the students to scan it via a specific smartphone application. The code along with the student identity taken by the application will confirm the students' attendance.

1.3 Project Objective

The aim of the project is to establish an integrated system in the Collage of Science, Diyala University, from which the teacher can take students' attendance using the QR code and give them in addition to their grades as a mark for their participation in the lecture

1.4 Project Scope

The project work focuses on enhancing the registration of student attendance process of lecturers for College of Science that is one of the more established Colleges in Diyala University. as well as to develop on-line lectures system that can be used to increase efficiency and speed of the registration of student attendance process of college of science.

1.5 Project Benefit

The benefit of this project is to provide support to College of Science in Diyala University to implement modernized techniques of College management especially in student absences and attendance of student's system. The attendance evaluation system in College of Science needs to change it from traditional or manual system to technical or automated system. Finally, this study is specific to assist College of Science to achieve their goals and strategy in reducing the time and efforts to provide unique products or services for their student and the teachers.

CHAPTER 2

LITERATURE REVIEW

2.1 Review of Related Literature

Class attendance facilitates learning in a variety of ways. Lectures supplement reading assignments. Classroom presentations present information differently than the text. Discussion and elaboration of topics provides current information that may not be found in the textbook. Hearing the comments and questions of others can answer your questions. Instructors can use class discussion to enhance critical thinking skills. They can pose questions that require students to make connections between concepts and relate what they are learning to real life. The more students analyze and examine material, the better their retention will be. As you can see, attending class on a regular basis gives you much more than just credit for attendance.

There are many proposals for Automatic Attendance Systems in the literature and in the market. Most of them do focus on applications to be installed on the lecturer device, whether a smartphone or a laptop. In the section, we will mention briefly few of these proposals.

Reference [2] proposes software to be installed in the instructor's mobile telephone. It enables it to query students' mobile telephone via Bluetooth connection and, through transfer of students' mobile telephones' Media Access Control (MAC) addresses to the instructor's mobile telephone; presence of the student can be confirmed.

Reference [3] is another example on a proposal that uses real time face detection algorithms integrated on an existing Learning Management System (LMS). It automatically detects and registers students attending on a lecture. The system represents a supplemental tool for instructors, combining algorithms used in machine learning with adaptive methods used to track facial changes during a longer period of time.

On the other hand, in [4], the proposal uses fingerprint verification technique. They propose a system in which fingerprint verification is done by using extraction of minutiae technique and the system that automates the whole process of taking attendance.

Since biometrics are concerned with the measurements of unique human physiological or behavioral characteristics, the technology has been used to verify the identity of users. It is becoming critical to be able to monitor the presence of the authenticated user throughout a session. Thus, another proposal [5], discusses a prototype system that uses facial recognition technology to monitor authenticated user or students. A neural network-based algorithm was implemented to carry out face detection, and an eigenface method was employed to perform facial recognition. The experimental results demonstrate the feasibility of near-real-time continuous user verification for high-level security information systems. [5]

We noticed that most proposals do involve applications being used by the instructor during class. Hence, if the attendance system requires some action from

the instructor, then the class time will be disturbed each time the instructor allows some late students into the class. On the other hand, our proposal does require the instructor to do nothing extra beyond presenting the slides of the course to the students. Hence, students may register their presence at any time they wish during the class, while having in mind that registration times are recorded.

2.2 QR code

QR code (abbreviated from Quick Response Code) is the trademark for a type of matrix barcode (or two-dimensional bar code) first designed for the automotive industry in Japan. Bar codes are optical machine-readable labels attached to items that record information related to the item. It was initially patented; however, its patent holder has chosen not to exercise those rights. Recently, the QR Code system has become popular outside the automotive industry due to its fast readability and greater storage capacity compared to standard UPC barcodes. The code consists of black modules (square dots) arranged in a square grid on a white background. The information encoded may be made up of four standardized types ("modes") of data (numeric, alphanumeric, byte / binary, Kanji) or, through supported extensions, virtually any type of data.

QR codes have become common in consumer advertising. Typically, a smartphone is used as a QR code scanner, displaying the code and converting it to some useful form (such as a standard URL for a website, thereby obviating the need for a user to type it into a web browser). QR code has become a focus of advertising strategy,

since it provides a way to access a brand's website more quickly than by manually entering a URL. [16] [17] Beyond mere convenience to the consumer, the importance of this capability is that it increases the conversion rate: the chance that contact with the advertisement will convert to a sale. It coaxes interested prospects further down the conversion funnel with little delay or effort, bringing the viewer to the advertiser's website immediately, whereas a longer and more targeted sales pitch may lose the viewer's interest.

A QR code, as shown in Fig.1 is read by an imaging device, such as a camera, and formatted algorithmically by underlying software using Reed-Solomon error correction until the image can be appropriately interpreted. Data is then extracted from patterns present in both horizontal and vertical components of the image. The QR features are listed in table 1. Figure shows a sample of an unencrypted QR code that will be needed by the proposed system.



Figure 2.1: Quick Response Code

2.2 Why Go to Smart Phone

There are a number of advantages to using a smart phone system to record students' attendance within the lecture.

1. Increase in Efficiency in the Data Collection Process

A paper-based system usually creates a lot of administrative workload. Before administering a questionnaire, a lot of preparatory work has to be done. With a phone-based system, data collection involves only the inputting of student and instructor data into the system. Such data, enormous in size though they may be, are already in electronic format and inputting them into the report system involves merely the conversion of a data file from one format into another .

2. Increase in Flexibility

An phone-based system with the processing power of its host computer allows much greater flexibility in a number of aspects .

3. No need to take time out of the lecture

We do not need time from the lecture to take attendance from the students, because the student can register the attendance at any time he wants during the lecture

4. Flexibility in data handling

After the lecture ends, the professor will have a full report on the lecture, the number of students attended, and the number of absences in the lecture. He can also print or save the entire report.

2.3 Proposed System

The proposed system for attendance-taking would be done individually by students via a smart phone device with android device. When students have their first day of classes, or perhaps a week of orientation, each one is enrolled into the system. Every students' email and password will be recorded. All other information of students will be recorded as well and whenever a student enters the lecture hall, he or she will be scanned to be counted present. A full history of all students, lecturers, departments and absence would be constantly available to be reported on. The proposed system would provide reports on attendance, absence and balances for each student. The proposed system would be cost effective in the sense that the cost of paper purchasing will be eliminated completely. The system will also be time effective because the calculations will now be automated. The reports that would be generated at the end of every semester would contain no errors and would be highly accurate as the data will be required.

2.4 Limitation of Previous Work

- Not User Friendly: The existing system is not user friendly because the retrieval of data is very slow and data is not maintained efficiently.
- Difficulty in report generating: We require more calculations to generate the reports.
- Manual control: All calculations to generate report were done manually so

there is greater chance of errors.

- Lots of paperwork: Existing system requires lot of paper work. Loss of even a single register/record led to difficult situation because all the papers are needed to generate the reports.

2.5 Database System Review

A database is an integrated collection of data records, files, and other database objects. A database system is a term that is typically used to encapsulate the constructs of a data model, database¹⁷ Management system (DBMS) and database. A database management system (DBMS) is a software package with computer programs that control the creation, maintenance, and the use of a database. A data captured by an information system is stored in files and databases. A file is a collection of similar records while a database is a collection of interrelated files. Database design is the process of translating logical data model into physical database schemas. A database schema of a database system is its structure described in a formal language supported by the database management system (DBMS) and refers to the organization of data to create a blueprint of how a database will be constructed (divided into database tables). A database system offers scalability, data sharing among user groups, balancing of conflicting user requirements, enforcement of standards, controlled redundancy, effective security, flexibility and data dependency.

2.6 Database Language Review

Data Languages are database languages used to create and maintain database on computer. There are large numbers of database languages like Oracle, MySQL, and MS Access. DBase, FoxPro etc. SQL statements commonly used in Oracle and MS Access can be categorized as data definition language (DDL) and data manipulation language (DML). Data Definition Language (DDL) describes the portion of SQL that allows you to create, alter, and destroy database objects. These database objects include schemas, tables, views, sequences, catalogues, indexes, and aliases. Data Manipulation Language (DML) describes the portion of SQL that allows you to manipulate or control your data. A popular data manipulation language is that of Structured Query Language (SQL), which is used to retrieve and manipulate data in a relational database.

In our current project, we used the databases provided by Google, known as Firebase, which are stored on the cloud, which will ensure that data is not lost and saved safely.

2.7 Project Building Tools

1. Flutter
2. Firebase as Database
3. Google Material

2.7.1 Flutter

is an open-source UI software development kit created by Google. It is used to develop cross platform applications for Android, iOS, Linux, Mac, Windows, Google Fuchsia, [24] and the web from a single codebase .

The first version of Flutter was known as codename "Sky" and ran on the Android operating system. It was unveiled at the 2015 Dart developer summit, with the stated intent of being able to render consistently at 120 frames per second. During the keynote of Google Developer Days in Shanghai, Google announced Flutter Release Preview 2, which is the last big release before Flutter 1.0. On December 4, 2018, Flutter 1.0 was released at the Flutter Live event, denoting the first "stable" version of the Framework. On December 11, 2019, Flutter 1.12 was released at the Flutter Interactive event.

On May 6, 2020, the Dart software development kit (SDK) in version 2.8 and the Flutter in version 1.17.0 were released, where support was added to the Metal API, improving performance on iOS devices (approximately 50%), new Material widgets, and new network tracking.

On March 3, 2021, Google released Flutter 2 during an online Flutter Engage event. This major update brought official support for web-based applications with new Canvas Kit renderer and web specific widgets, early-access desktop application support for Windows, MacOS, and Linux and improved Add-to-App APIs.

2.7.2 Firebase

is a platform developed by Google for creating mobile and web applications. It was originally an independent company founded in 2011. [21] In 2014, Google acquired the platform and it is now their flagship offering for app development.

Firebase evolved from Evolve, a prior startup founded by James Templin and Andrew Lee in 2011. Evolve provided developers an API that enables the integration of online chat functionality into their websites. After releasing the chat service, Templin and Lee found that it was being used to pass application data that were not chat messages. Developers were using Evolve to sync application data such as game state in real time across their users. Templin and Lee decided to separate the chat system and the real-time architecture that powered it.[23] They founded Firebase as a separate company in September 2011 and it launched to the public in April 2012.

Firebase's first product was the Firebase Realtime Database, an API that synchronizes application data across iOS, Android, and Web devices, and stores it on Firebase's cloud. The product assists software developers in building real-time, collaborative applications.

2.7.3 Material Design

Or (google material) is a design language developed by Google in 2014. Expanding on the "card" motifs that debuted in Google Now, Material Design uses

more grid-based layouts, responsive animations and transitions, padding, and depth effects such as lighting and shadows.

The main purpose of material design is creation of new visual language that combines principles of good design with technical and scientific innovation. Designer Matias Duarte explained that, "unlike real paper, our digital material can expand and reform intelligently. Material has physical surfaces and edges. Seams and shadows provide meaning about what you can touch." Google states that their new design language is based on paper and ink but implementation takes place in an advanced manner.

In 2018, Google detailed a revamp of the language, with a focus on providing more flexibility for designers to create custom "themes" with varying geometry, colors, and typography. Google released Material Theme Editor exclusively for the macOS design application Sketch. [23]

CHAPTER 3

SYSTEM IMPLEMENTATION

3.1 Development Environment

The environment for the development of the Student attendance registration system in this project has been tested by install it on more than 30 smart phones with android system. The system will operate in a single system environment under android system using the certain platforms.

3.2 Design of project

The application has several interfaces, for example, for logging in for students and teachers as well, and the interface for adding students and creating lectures and many of the interfaces will be explained in succession below.

3.2.1 Login Tabs

The application contains two tabs to log in, one for students and the other for professors, through which the professor can enter the administration panel to create new lectures and add students ... etc. Through which the student can log in with his personal account to log in to the lecture. The following figures show the login tabs for students and teachers.



Figure 3.1: login tabs for students and teachers.

3.2.2 Main Tab for teachers

The main tab appears for the teacher after he logs in correctly to the system. It contains all his lectures for all stages. It also contains several buttons that the teacher uses in his work, such as the Create Lectures button to add a new lecture, the Create accounts button to create student accounts in the class, and a button to log out of Teacher's account.

Each button will be explained with its function in detail with its function at the bottom, and the following figure is placed in the main tab for the teacher.

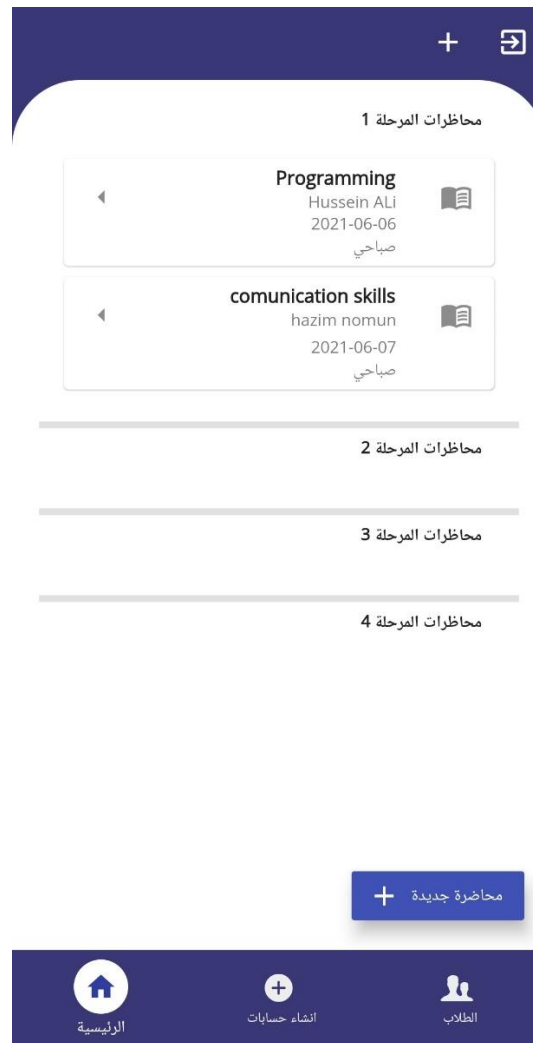


Figure 3.2: Main Tab for teachers

3.2.3 Attendance Tab

This tab appears when you click on the name of the lecture in the teacher's main tab. It contains all the students who have been registered to attend the lecture and all the students who did not attend the lecture. A green check mark appears in front of the student present in the lecture and a red balloon error mark in front of the student who did not attend the lecture. unfortunately, contains a button in the form of a printer icon that is used to save the document or print it. After pressing it, a

message will appear unfortunately telling the user that the file has been saved in the phone files in the form of an Excel file with a full report on attendance with the name and email of the students. The following figure shows this tab.

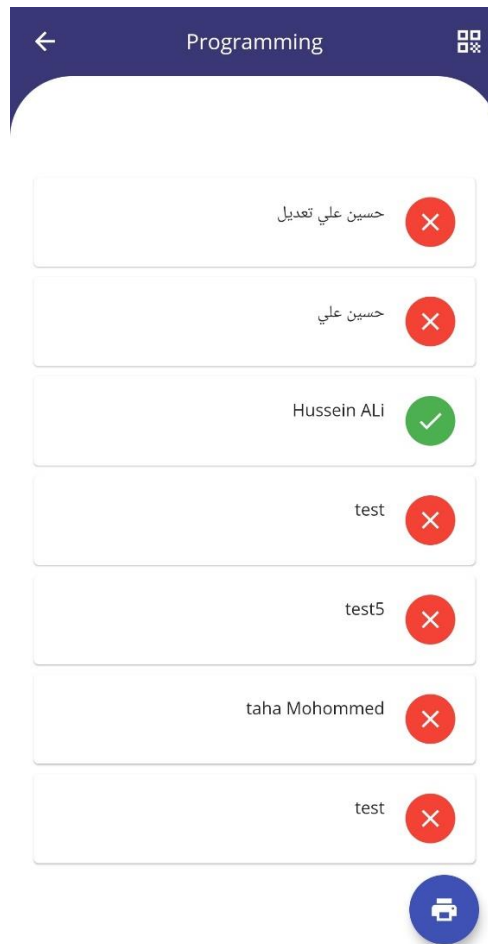


Figure 3.3: Attendance tab

It contains at the top an icon in the form of a QR code. When you click on it, a window appears through which the presentation of the QR code for the lecture is recorded. At the bottom, all students who have registered their attendance in the lecture appear with the possibility of adding an additional grade for each student who attended to participate in the lecture or make an event. As in the following figure.

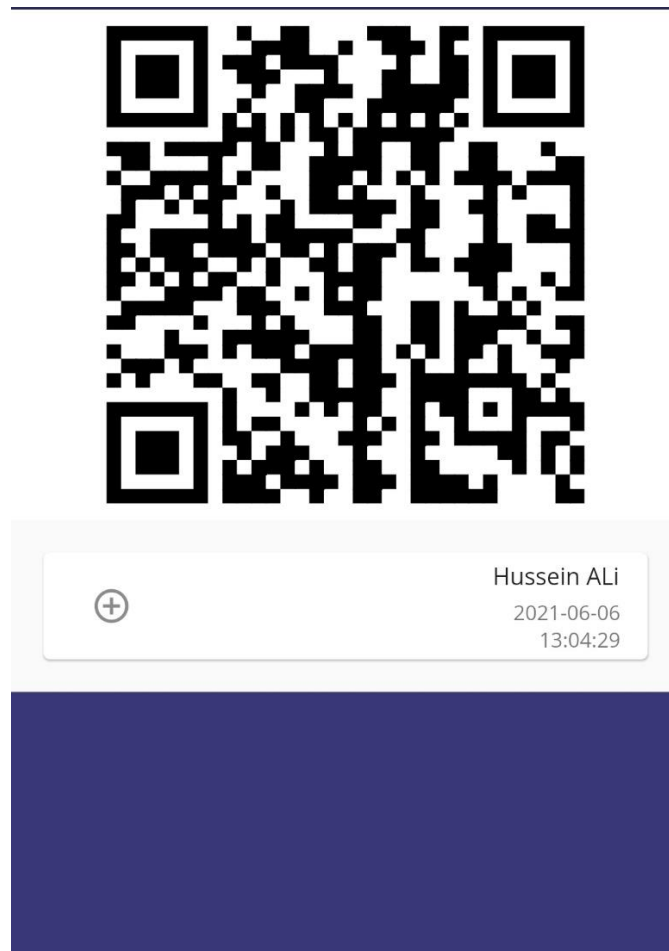


Figure 3.4: Tab that display QR code and adding a grade for the student

3.2.4 Lecture Creation Tab

This window is used to create a new lecture by the teacher. This window shows several options. The teacher chooses the section and stage, enters the name of the teacher and the name of the lecture, and then presses the Create New Lecture button to create the lecture. As in the following figure.

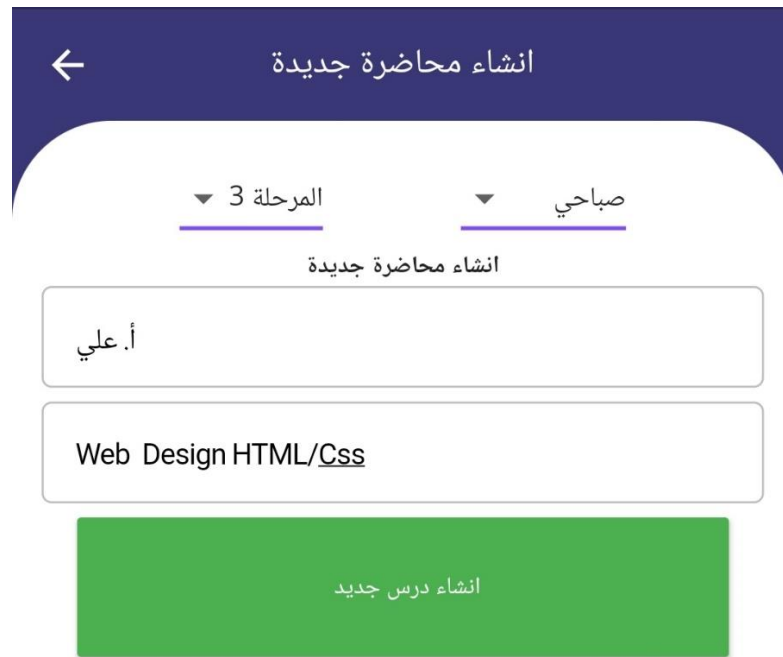
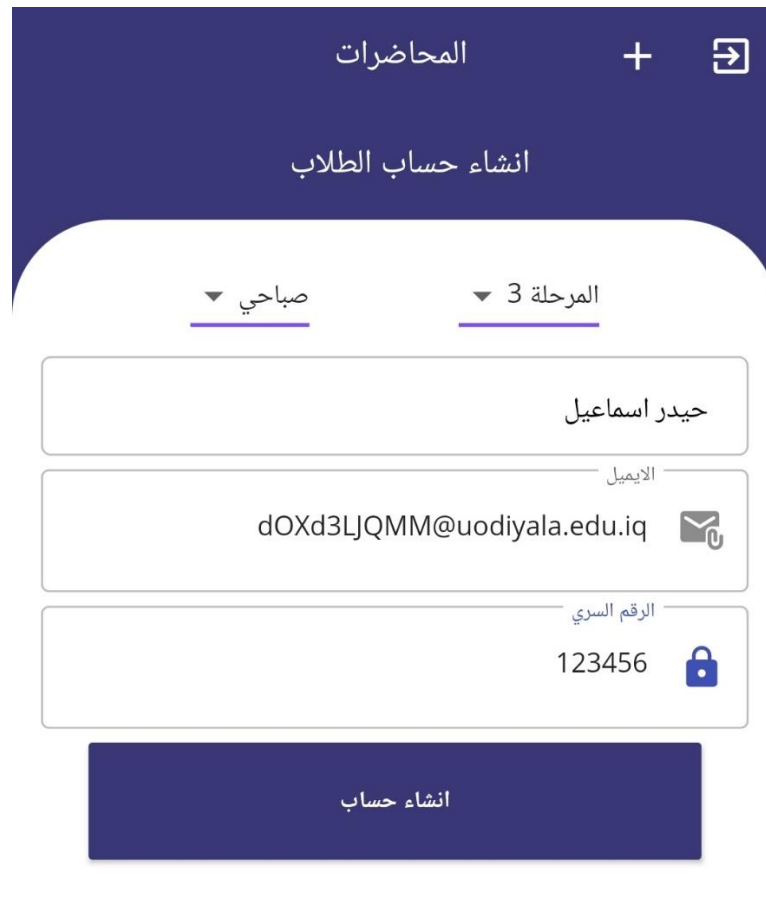


Figure 3.5: Lecture Creation tab

3.2.5 Student Account Creation Tab

Student account creation tab, through this tab, the teacher can create private accounts for each student, by choosing the student's stage and section, and entering the student's name and email with a new password. Thus, through this information, the student can log in and register attendance for lectures.

The application also contains the feature of creating a random email and password to facilitate the process of creating the account for the user by pressing the email icon or the password icon next to the input fields to generate a password and email randomly.



المحاضرات +

انشاء حساب الطلاب

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Figure 3.6: Student Account Creation Tab

3.2.6 Student View Tab

Through this window, the teacher can display all students in all stages by choosing the name of the stage from the options and choosing the type of study, whether it is morning or evening. All students will be shown with their names and e-mail in the stage chosen by the teacher. With the ability to save all the information in the form of an excel file by pressing "save the file in the excel format " button located at the bottom. As in the following figure.

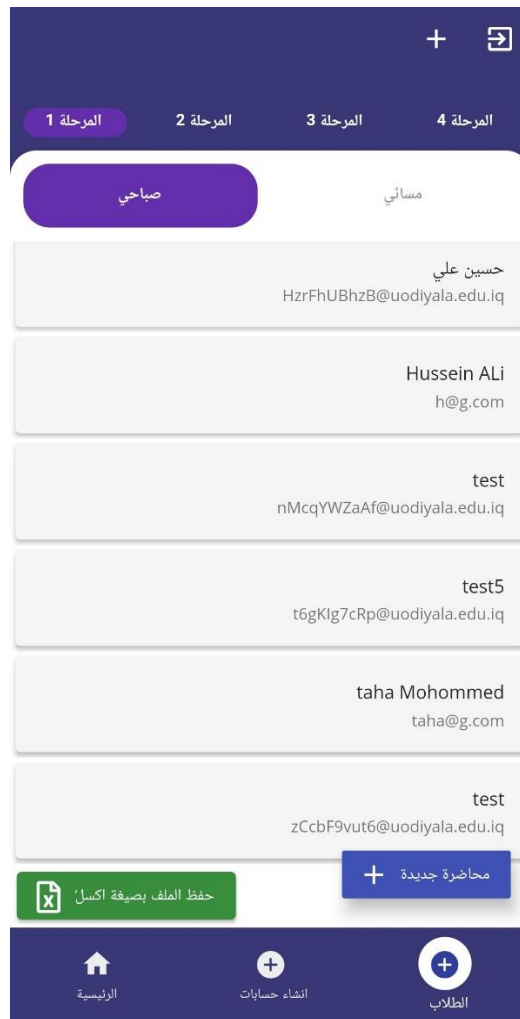


Figure 3.7: Student View Tab

3.2.7 Main Tab for students

This tab appears after a successful login process by the student and contains complete student information and a digital scan button at the bottom that the student uses to register attendance for the lecture and will be explained in detail at the bottom and also contains a button at the top used to log out after completing the attendance process from the student. As in the following figure.



Figure 3.8: Main tab for students

Any process of reading the QR code by the student will be rejected if the lecture time has expired with a message displaying unfortunately informing the student that the time has expired and attendance cannot be registered. This is one of the protections features in the application.

CHAPTER 4

CONCLUSION AND SUGGESTIONS

4.1 Conclusions

In this research we have built system for electronic Student attendance registration of the Lecture by Flutter Framework, Firebase as databases which added high flexibility in the process of storing data. Finally, our project is able to Collect all attendance processes by students for each Lecture with the possibility of adding grades for distinguished students, save the result of as excel form. And print the result. In the end, it is possible to use the system in College of Science to provide comfortable service to both student and management and save the time and efforts in attendance registration process.

4.2 Suggestions

Our suggestions for future work are

- We aspire to add new tools for security.
- We wish to adopt the system to be used in Attendance registration process at Science College.
- We hope to adopt the system in others college at University of Diyala.

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((إقرار المشرف))

أشهد بأن أعداد هذا المشروع الموسوم
نظام تسجيل حضور الطلاب بواسطة QR Code

والمعد من قبل الطالبان

حيدر اسماعيل ابراهيم

اسراء شدهان تلفان

قد تم تحت إشرافي في قسم علوم الحاسوب / كلية العلوم/جامعة ديالى وهي جزء
من متطلبات نيل شهادة البكالوريوس في اختصاص علوم الحاسوب

التوقيع:

الاسم:

المرتبة العلمية :

التاريخ :

الخلاصة

أصبحت الهواتف الذكية رقيقاً مفضلة للمستخدمين أكثر من أجهزة الكمبيوتر المكتبية أو أجهزة الكمبيوتر المحمولة. ونحن نعرف ان الهواتف الذكية هي الأكثر شيوعاً بين المستخدمين في سن 26 عاماً تقريباً ، فإن استخدام الهواتف الذكية لتسريع عملية تسجيل الحضور لطلبة الجامعة سيوفر وقت المحاضرات وبالتالي يعزز العملية التعليمية.

مشروعنا عبارة عن تطبيق للهاتف المحمول يعتمد على رمز الاستجابة السريعة او QR Code، والذي يتم عرضه للطلاب أثناء أو في بداية كل محاضرة. سيحتاج الطلاب إلى مسح الرمز ضوئياً عن طريق الهاتف الذكي الخاص بالطالب لتأكيد حضورهم.

يحتوي التطبيق على جانبين ، جانب مخصص للطلاب لتسجيل حضورهم ، والجانب الآخر مخصص للمعلم الذي يقوم بإنشاء المحاضرة ويعرض الكود الخاص بها للطلاب حيث يعرض التطبيق جميع تسجيلات الحضور والغياب مع إمكانية تمييز بعض الطلاب الذين شاركوا في المحاضرة بأضافة درجة مشاركة لهم.

جامعة ديالى – كلية العلوم
قسم علوم الحاسبات



نظام تسجيل حضور الطلاب بواسطة QR Code

بحث مقدم الى مجلس كلية العلوم – جامعة ديالى – قسم الحاسبات كجزء من
متطلبات الحصول على شهادة البكالوريوس في علوم الحاسوب

إعداد الطالبان
حيدر اسماعيل ابراهيم
اسراء شدهان تلفان

اشرف على البحث
د. برهان مولان صالح