



An-Najah National University

Faculty of Engineering & Information Technology
Department of Computer Engineering

Hardware Graduation Project:

Modern Smart School

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Dedication

Dedicated to my loving family and the dedicated doctors who have been my pillars of support and healing throughout this journey. Your unwavering love and expertise have made all the difference.

Acknowledgement

First of all, we thank God Almighty for this achievement. Praise be to God when it begins and when it end end. We thank Dr. Raed and Dr. Muhannad for their follow-up to us during this project and their support for ideas and assistance. Thanks to our families and friends and those who had a good impact during the completion of this project and our academic career.

Disclaimer

This report was written by Nada Abu Shanab and Isra' Awwad at the Computer Engineering Department, Faculty of Engineering, and An-Najah National University. It has not been altered or corrected, other than editorial corrections, as a result of assessment and it may contain language as well as content errors. The views expressed in it together with any outcomes and recommendations are solely those of the students. An-Najah National University accepts no responsibility or liability for the consequences of this report being used for a purpose other than the purpose for which it was commissioned.

Abstract

Due to the development of technology in the recent period of life in general, reliance on electronic devices and systems has become an essential thing, and the idea of adopting it in most aspects of life has become a basic and important requirement. However, our schools lack a lot of the necessary development to complete the educational process properly. Therefore, our idea was centered around schools in particular and technology in general. This school will be supportive of the idea of attendance and absence for students and teachers by fingerprint, and the classrooms will be supported by temperature sensors to control the temperature of air conditioning, other sensors for classrooms and corridors for fires, as well as an alarm for classes in an electronic way. And controlling the lighting of the corridors and classes, also due to the importance of the presence of secrecy somewhat with regard to the teachers' rooms, we will provide special cards for each teacher bearing a specific number used to open the door of the teachers' room through it or by the number, and other things, and this idea is not new in its presentation, but some additions make it more suitable with The present, and also there must be an application of it in other countries, but our schools there is a simple application for that, not completely.

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1 Introduction

1.1 Problem Statement

The attendance process is a worrying, expensive and exhausting matter for students and teaching staff. As for teaching staff, they cannot be able to monitor all students and teachers during work, so they can record their attendance and then leave without their absence being inferred, except that attendance is taken.

With large notebooks, they must be dealt with with high accuracy, and they are also expensive in terms of using papers

Also, at the end of the year, attendance is calculated manually and recorded, and this is very tiring.

Also, sometimes, due to the lack of means of protection, problems occur in schools without anyone's attention and can lead to bad results such as fires and thieves entering the school outside working hours.

1.2 Problem Objective

Creating a smart school through which the process of attendance and absence for teachers and students is monitored through a website and stored inside Excel Sheet by recording the time of entry and exit and providing it with safety and protection systems such as fire alarms, the occurrence of movement, opening windows during the period when there is no work, and systems to control doors and lighting via Use Blink program

1.3 scope of the work

In our project, the focus was on all Palestinian schools, whether governmental or private, or even refugee schools, because all schools in Palestine do not enjoy the minimum level of protection systems and electronic services.

2 Constraints and earlier work

2.1 Constraints

1. Lack of time due to registering the course in the summer semester
2. The motors that we used need a high current, and when used more than once, the internal gears are worn out
3. The attendance and absence process took us a lot of time and effort to link the fingerprint with each other and then to the web

2.2 Standards/ Codes

We use Arduino IDE to write code , blink app to make application that control in features of school.

2.3 Earlier Work

In our project, we applied security to the attendance process. Whoever logs in, whether a teacher or a student, must log out because this stores the times, so no one can leave the working hours.

We also used the Blink application to control, so no one who does not have the account or access to it can control or monitor any sensor

3 Literature review

The idea of a smart school is not a new idea, but what we added is the ability of the principal or school owner to be able to control the school remotely through the Blink application, and his presence inside the school is not required. The attendance process is facilitated by linking the fingerprint and RFID to a website through which entry and exit times are recorded, and it can also be extracted into an Excel sheet to facilitate the monitoring process. The control is divided into two parts, a mechanical section and a remote section through the application. It also monitors school conditions outside working hours by linking it to the RTC to give an alert if a window is opened outside working hours, for example. Also, for example, movements outside working hours are monitored through the motion sensor.

4. Methodology

4.1 Overview

This project includes many of the features that we have done, which is the first feature of attendance for students via RFID and for teachers by fingerprint. Thus, no one who is not registered on the system can register that he is present. The person who owns the card alone, attendance and absence are taken for him, as well as from his fingerprint that is not registered. Can be registered as present.

The other idea is to have doors that operate on the keyboard. If the password is entered, the doors open

There are gas, temperature and movement sensors that are alerted via a bell or via a program and the necessary reaction is made. For example, when the temperature rises, the manager turns on the fan.

SCHEDULE was done via RTC. Every 45 minutes, the bell will be activated, and mechanical control is also available for all features.

4.2 Implementation

1-Attendance

To record attendance for teachers, the process was done by fingerprinting, so each fingerprint is registered, then information about it is recorded in terms of the teacher's name, the time the work starts and the time it ends. Every day the teacher comes, he fingerprints twice, the first time for entering and the second time for leaving, and this information is recorded on the website and summarized on Excel Each teacher checked when he logged in and when he finished, and the same applies to students, but RFID was used with the same details

Result:

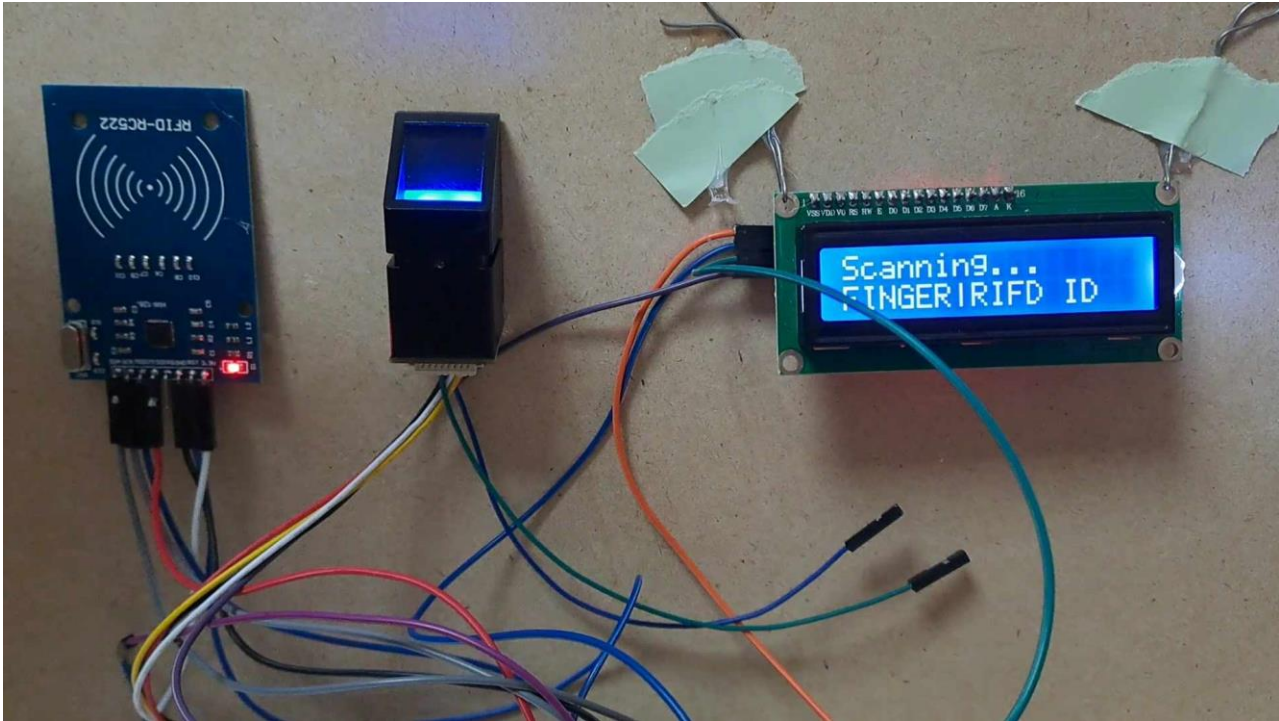


Figure 4.2.1:attendance1

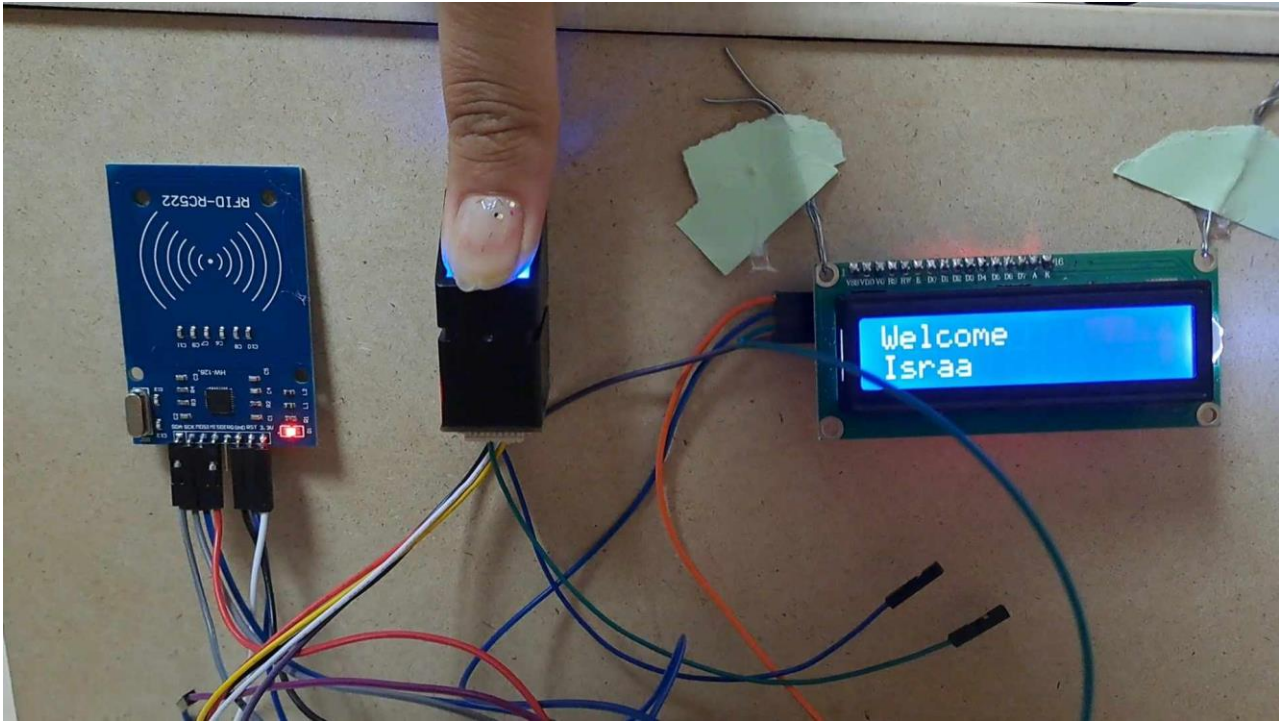


Figure 4.2.2:attendance2

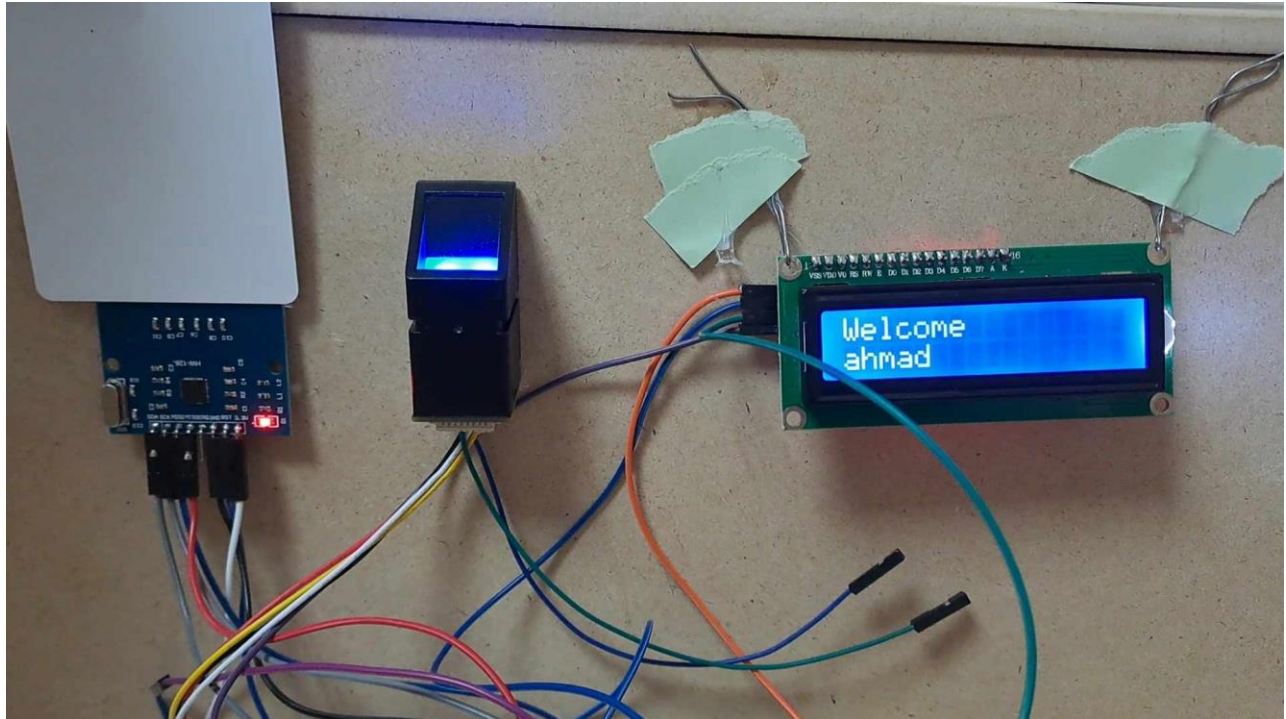


Figure 4.2.3:attendance3

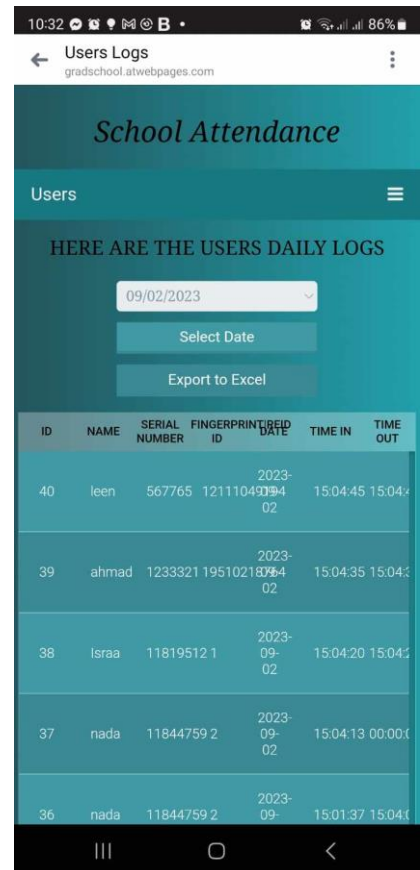
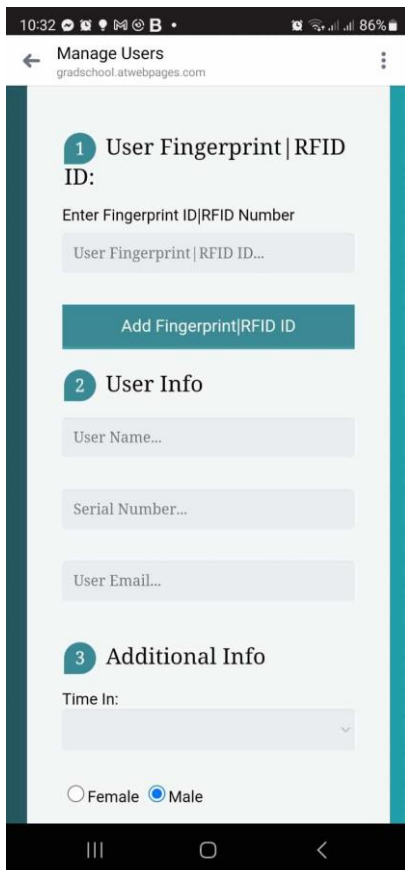


Figure 4.2.4:web_attendance

Component we used:

1-LCD SCREEN

: A liquid-crystal display (LCD) :

It was used to alert the user when he fingerprints or puts his card, you welcome him, and when the second fingerprint prints the goodbye, to know that the operation was completed successfully, so if you do not respond and do not print something, then either the fingerprint or the card is not registered, or there is something wrong

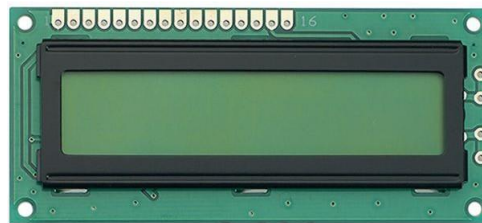


Figure 4.2.5:LCD

2-FingerPrint Sensor

An element that was used for the attendance and absence of teachers, as fingerprints were recorded for each teacher / teacher, as he recorded the entry and exit times for each teacher / teacher



Figure 4.2.6:fingerprint

2-RFID Sensor

An element that was used for the attendance and absence of students, as the “tag” card number and name were recorded for each student, as it recorded the entry and exit times for each student

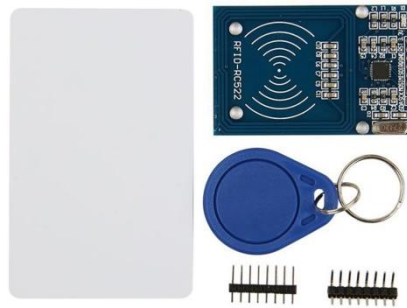


Figure 4.2.7:RFID

2-Sensors control

For control, I used the Blink application, whose working principle is based on the MQTT protocol, so what is the MQTT protocol?

MQTT, or Message Queuing Telemetry Transport, is a specialized messaging protocol designed for networks with low bandwidth and high latency, making it well-suited for IoT devices. It operates on the publisher/subscriber model, facilitated by a central broker, allowing data sources to publish information, which is then received by interested parties, or subscribers, based on specified topics. MQTT plays a crucial role in IoT and IIoT applications, even extending to connecting cloud environments.

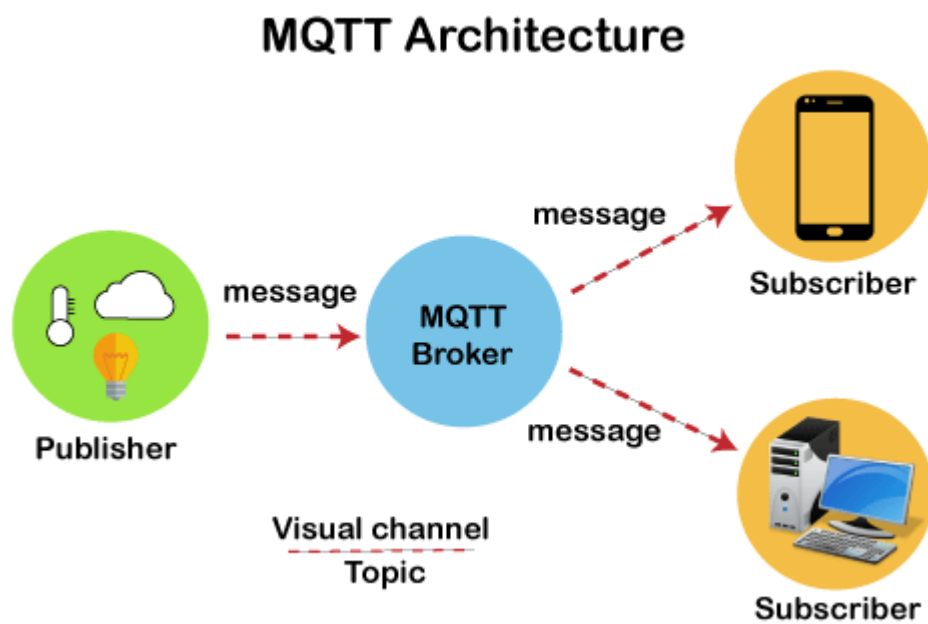


Figure 4.2.8:MQTT Protocol

I linked the sensors to the Blink application, which is based on the mqtt protocol, namely: the flame sensor, the motion sensor, the temperature sensor, and the magnetic switch.

I also control the doors through it and send the necessary alerts and operate the elements if there is a need. Below is an explanation

Components:

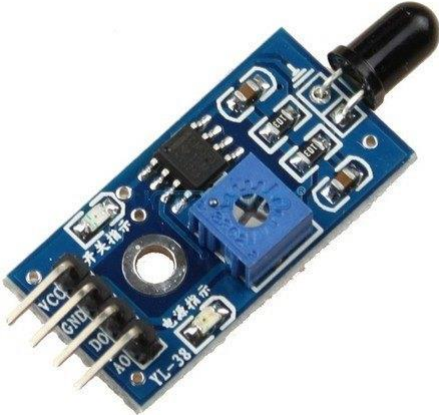


Figure 4.2.9:Flame Sensor



Figure 4.2.10:buzzer

Principle of work: If the sensor senses that there is a flame, there are two ways to alert the first, which is to turn on the bell, and the second is to send a notification to the school principal's phone

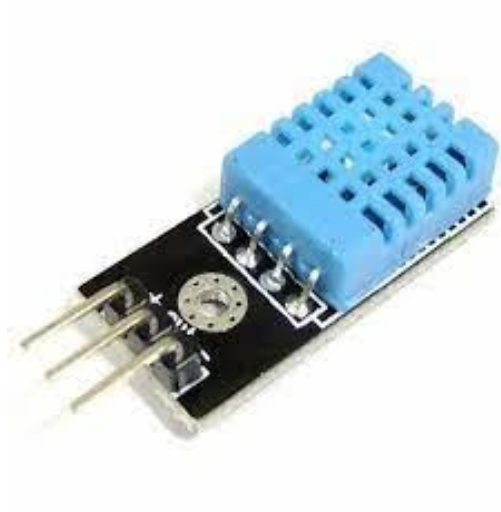


Figure 4.2.11: temperature sensor



Figure 4.2.12: Fan 5v



Figure 4.2.13: relay

Principle of work: If the temperature exceeds the normal range, the fan will automatically turn on, and the temperature will be monitored through the application. The fan can also be controlled from the application if the manager wants to ignite it without increasing the temperature.

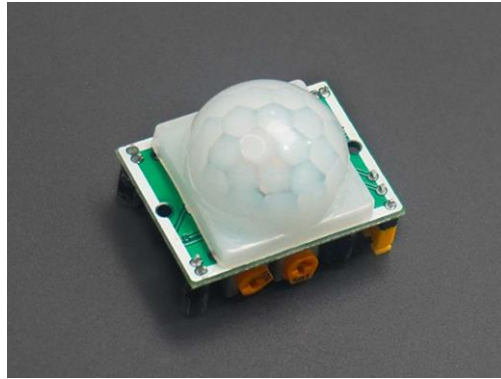


Figure 4.2.14: motion sensor



Figure 4.2.15: RTC

Principle of work: If there is movement outside the official working hours, a notification will be sent to the phone that there is movement



Figure 4.2.16: Magnatic Switch

Principle of work: It has been connected with RTC. If the window is opened outside official working hours, a notification will be sent to the phone



Figure 4.2.17: Lamp

Principle of work: It is connected to the relay and controlled through the application



Figure 4.2.18: Servo Motor

Principle of work: It is connected to the external door and only the manager can control it remotely. Through application, it is opened at the desired angle, from zero to 180.



Figure 4.2.19: 4*4 keypad

Principle of work: It has been connected to the door of the teacher's room and the principal, and it is opened by entering the password set only.



Principle of work: RTC has been connected with the buzzer and schedules the sessions, as the bell rings every 45 minutes for the end of the session, and 5 minutes later it rings again for the start of the second session

Blink Interfaces:

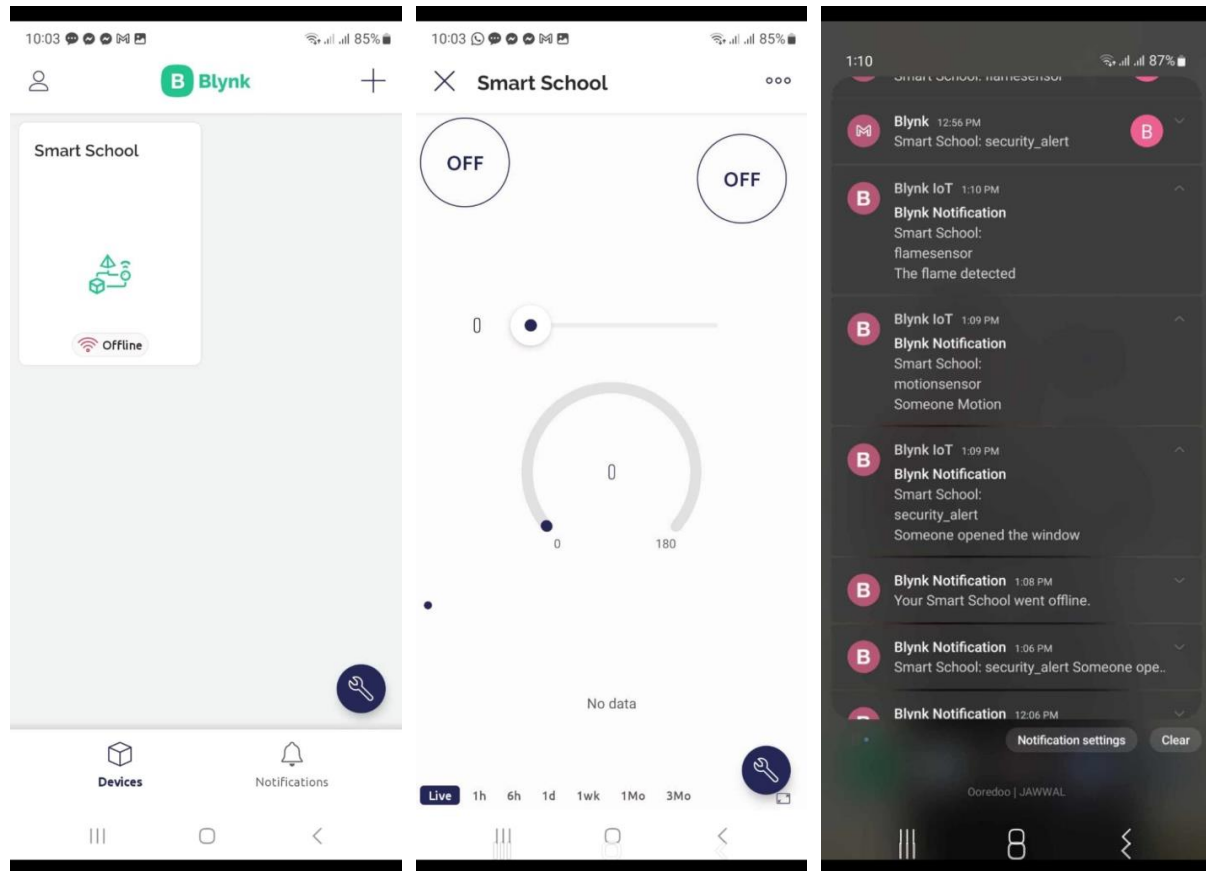


Figure 4.2.20: Blink interfaces

3-Parking



Figure 4.2.20: Ultrasonic sensor



Principle of work: Ultrasonic was used to sense if someone is nearby and then opens the gate by servo motor

Results:

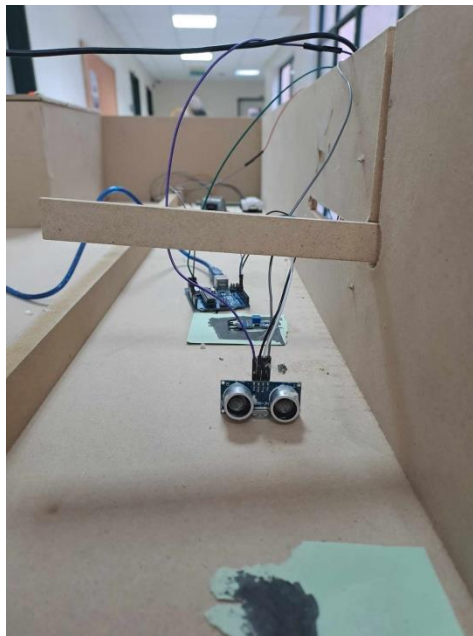


Figure 4.2.21: Parking close



Figure 4.2.22: Parking Open

Main Components:

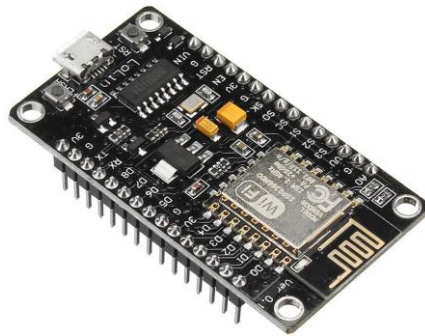


Figure 4.2.23: ESP NodeMcu



Figure 4.2.24: Arduino Mega

5.Results and Analysis

In this project, we designed a smart school that contains an attendance system and absence systems

Safety in terms of thefts, fires, secrecy, scheduling classes, a car park, and some features obtained through the Wi-Fi feature in esp nodemcu, and we used the Blink application that enhances the use of the MQTT protocol to get notifications and control some components

6. Discussion

In this project, we have solved the most important problem that schools face, which is the problem of attendance due to laziness and irregular working hours, and the difficulty of taking attendance daily in paper form and writing it down in large documents, as well as the problem of not realizing the presence of thieves until early in the morning, so when the notification is sent of the presence of movement outside working hours It makes the speed of realizing that there is someone inside the school increase, unlike what was in the past, and when there is a fire, the process of lighting the bell and sending the notification increases the possibility of speed in controlling the fire, and the presence of scheduling classes is one of the advantages of this application, as operating the school bell manually is not always correct Because it is possible that the one responsible for it is to forget, so the bell will ring automatically

7. Conclusion and Future Work

We have solved a major problem facing schools, but it has not been sufficiently highlighted. Schools in Palestine need development in terms of security, safety, and commitment to attendance. This is how we guarantee schools that are committed to all their cadres, including teachers, students, and employees.

Our project can also be developed by adding surveillance cameras that are connected directly to the school principal's phone and distributed in the yards and classrooms. Also, a complete website can be developed to serve the needs of the school, through which exams are submitted inside the school, but electronically, to ensure that fraud is prevented and at the same time to reduce the use of papers. During which the students' marks are stored to ensure that each student has integrity in the marks, and students are provided with tablet devices instead of paper books, and the entire curriculum is downloaded to them to enjoy the best teaching environment

8. References

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