AN-Najah National University
Department Of Computer Engineering

Smart Building

Student's Name:

Bara'a Bouzia
Noura Darwazeh

Supervisor:

Dr.Emad Natsheh

Augest , 2022

Dedication

we love to dedicate where we arrived to our family because they were the first supporter to us all the time and we thank them for their patience with us, and without them we would not have reached this stage. And to our friends who stood by us and encouraged us.

Acknowledgement

We thank God for what we have achieved so far,, We would like to thank Dr. Emad for his continuous support and assistance to us

Disclaimer

This report was written by Bara'a Bouzia and Noura Darwazeh at the Computer Engineering Department, Faculty of Engineering, An-Najah Na-tional 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.

Contents

List of Figures

Abstract

Modern technology has made great changes in our modern lives. Before technology, human did not know many modern means in their life, but rather relied on simple primitive tools. Then, over the years, these technologies gradually developed until we reached the height of technological progress. So in this project, we want to focus on the smart building with a smart entrance, as when the user reaches the entrance, he must enter a password through the keypad . and it also contains a smart elevator that allows entry to the residents of the building , the problem with the non-smart elevator is that payment of subscription is required to enter the elevator, and there are many users who use it, but there is a difference in the amount of elevator demand, so it does not make sense for all users to pay the same amount, so we want to solve that by using a card that the user purchases as it is charged with a certain number of steps. Whenever the user uses the elevator and ascends a floor, the number of steps decreases by one, and when the card becomes empty from steps, it gives a notice to its owner to know that it is empty and need shipping. On the other hand, there is a smart parking that allows residents to park their cars by using a mobile application , this parking is divided into two parts , one for the residents of the building to park their cars, and another for the guests so that the guest is not allowed to park his car in the resident's place . Another feature that informs if there is a gas leakage occurs in building without anyone knowing to prevent dangers

Chapter 1

Introduction

1.1 Problem Statement

In the past years, there were traditional residential buildings that did not contain any technology or privacy to protect them, but as the days progressed, people began to add technology to the buildings, and the technology added was not limited to extinguishing and lighting the buildings.
Our project contains a building with an entrance door opened with a password , inside it there is an elevator, the problem of which is that the number of times the user requests the elevator varies from user to user, so it is not logical that they all pay the same amount. The building also contains a garage, the problem is When someone wants to park his car, he found the parking is very crowded and there is no place for him. Another problem is when there is a gas leakage inside the building

1.2 Objective

To solve elevator's problem, by using a card that is charged with a number of steps so that the steps are reduced by the number of floors that the user moves, or in other words,payment process for charging the card is done by the amount of usage the elevator.

To solve parking's problem, by dividing parking in to two parts one for residents and other for guests. So, it becomes clear when a car is present or absent in a particular parking space with a high degree of accuracy, So that no car is allowed to enter if the garage is full, and this reduces collisions and congestion inside the garage.

To solve the gas leakage problem , a quick connection is made to the firefighting unit by the GSM module to prevent any danger to the residents.

1.3 scope of the work

It is dedicated For the residents of the buildings to achieve justice among the users, and its importance lies in reducing the occurrence of problems among the residents of the building.
This report with its chapters demonstrates our project and the work we did through the previous few months.

Chapter 2

Constraints, Standards/ Codes and Earlier course work

2.1 Constraints

The idea of the project includes more than one field, and this thing in itself was a challenge for us, as it includes the control of electronic parts through a mobile application, as well as how to control the elevator through clicks, so it was not easy, as it required memorizing and storing the old value of the click and this thing taking a lot of time to solve it, in addition to the large number of existing cases that must be taken into account, it requires a lot of focus and accuracy.

2.2 Standards/ Codes

We use Arduino IDE to write code , visual studio code in order to make application , tinker cad program that helps us build electronic circuits for the project when there are no electronic parts in our hands, to see the result virtually before applying it in reality to avoid burning electronic parts and so on.

2.3 Earlier course work

In our project, we applied the issue of security by not allowing entry to the building except through a password, as well as not allowing the elevator to enter without a card, in addition to the issue of using wireless Wi-Fi through the esp 32 piece, so the application will be available only to those who have the network name and password

Chapter 3

Literature Review

Building a smart elevator that includes a card is not something new, but the new feature that we added is charging the card with a specific number of steps to achieve justice between users within the building, as well as the parking, in previous projects it was only allowed for the residents of the building to park their car but in our project we added a feature which is allowing the guest also to park his car inside the garage, So that we divided the garage into two parts, a special section for the guest and a special section for the residents of the building in addition to an application to enter the garage.
On the other hand ,in previous projects, when a gas leak occurs, a bell rings only and the user calls a firefighter, while in our project, as soon as a gas leak occurs, a quick and automatic connection is made to the firefighter using gsm module

Chapter 4

Methodology

4.1 Overview

This report includes 4 features that we made, a building with an entrance with a password so that only the residents of the building can enter, when entering there is an elevator and a garage, the elevator can only be used if you have a card, and the garage can also be used only if you have the application for the system, in addition to notice if there is a gas leak inside the building and we will explain more about them later.

4.2 Implementation

1- Elevator

Our elevator contains 3 floors each floor has a button from out side , and there is 3 buttons inside the cabina in order to move between floors.

At the begining the user press the button from outside so that the elevator come to him ,we detect where the cabina is by using inductive sensor, when its arrived the user will enter then if he choose any button to go to floor he want,the elevator not respond until he put his charged card on the rfid reader , for example if the card charged with 3 steps and the user go from floor 1 to 3 , number of steps will decrease by 2 on other words, the card becomes charged with 1 step ,then if he want to go from 3 to 1 its not allowed because there are not enough steps (a led will alarm), at this case only one step is allowed.

Figure 4.2.1: elevator

Components we used :

1- Stepper Motor
to control the movement of the elevator we connect one coil of the motor with 1A and 1B pins of the A4988 Stepper Driver , and the other coil with 2A and 2B pins.

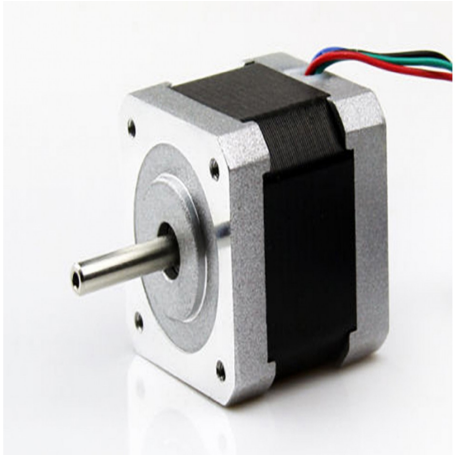

Figure 4.2.2: Stepper Motor

2- A4988 Driver:

the main pins are D(Direction) to control the direction of motor , S(Step) to control of the number of steps we want the stepper move and E(Enable)to run the motor.

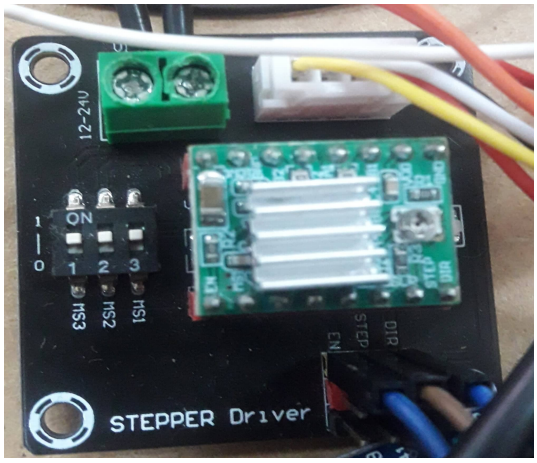

Figure 4.2.3: A4988 Stepper Driver

3-Arduino Mega

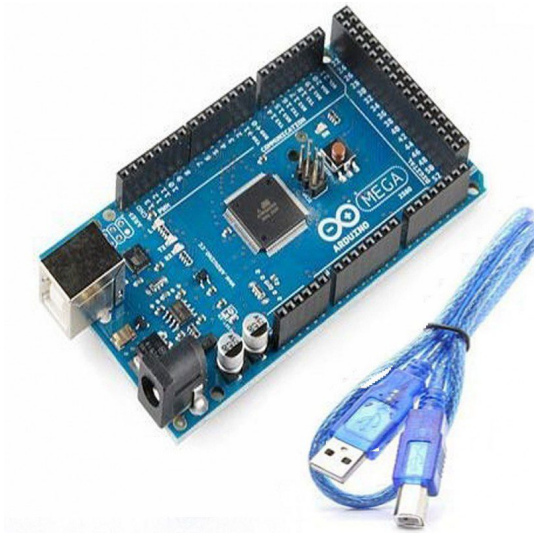

Figure 4.2.4: Arduino Mega 2560

4- LM 2596 DC to DC Buck Converter

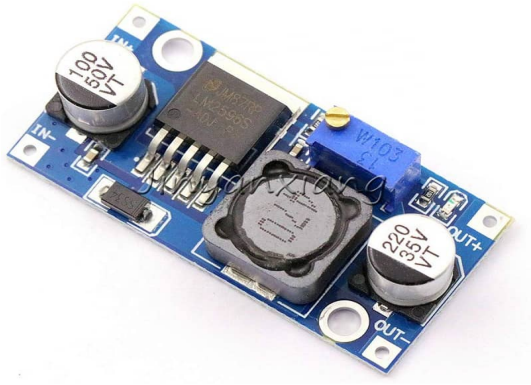

Figure 4.2.5: LM 2596 DC to DC Buck Converter

5- 12v Dc power jack

Figure 4.2.6: 12v Dc power jack

6- RC522 Rfid module

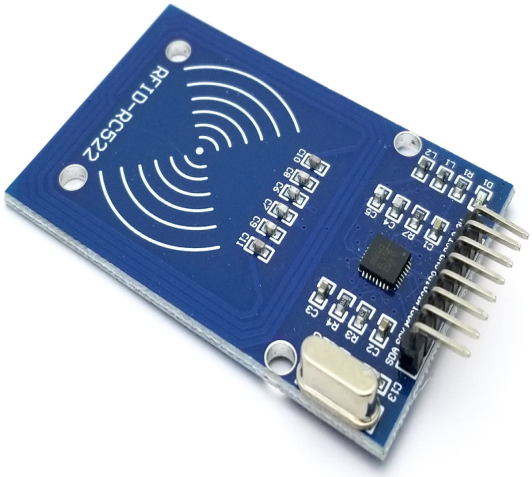

Figure 4.2.7: RC522 Rfid module

7- Rfid card

Figure 4.2.8: Rfid card

8-Inductive sensor

used to stop elevator at a specific floor according to user request , also used to know where the elevator is when someone request it from out side

Figure 4.2.9: inductive sensor

2- Parking System

parking in our building is smart, as the door opens through a mobile application. It is divided into two sections, a section dedicated to the resident of the building, and another section to the guest, so that if the guest parks his car in the place designated for the residents of the building, the buzzer will ring, and vice versa , there is an LCD screen that show the number of empty parking spaces(slots) as it increases if a car exits and decreases if a car enters through the application , and the LCD show if each slot is full or empty , another feature is if the parking is full of cars and there is no place for the person to park his car, the application will not allow a person to open the door through it , or more clearly if the person is guest and the guest's slots are full, the door will not open even if there is a slot empty in resident's place

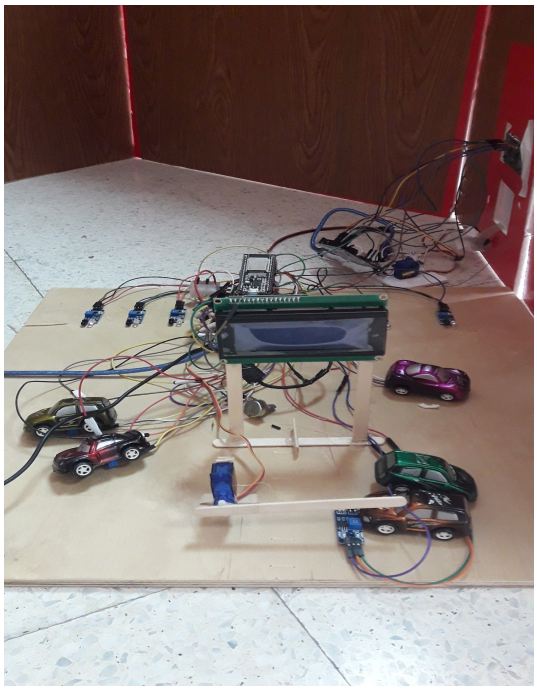

Figure 4.2.10: parking

Components we used :

1-Esp32 module

we choose it because we use a wifi in our application to be available to residents of building only

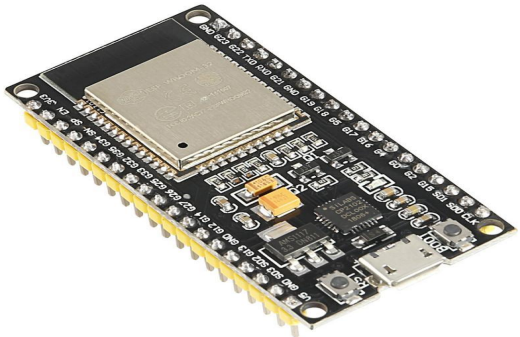

Figure 4.2.11: Esp32

2- IR sensor:

to detect if there is a car or not

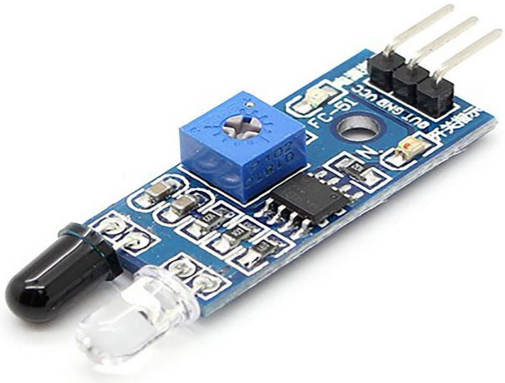

Figure 4.2.12: ir sensor

3- LCD:

Figure 4.2.13: LCD

4- Buzzer

used to alert if resident park his car in guest place and vice versa

Figure 4.2.14: 5v buzzer

3- Gas leakage detection

This smart building contains a gas leakage sensor, as when a gas leak occurs in the building, the sensor senses this leakage through the MQ gas sensor, an automatic quick connection is made with the firefighting through the gsm module, to alert the firefighter and prevent the occurrence of danger

Components we used :

1- Arduino uno

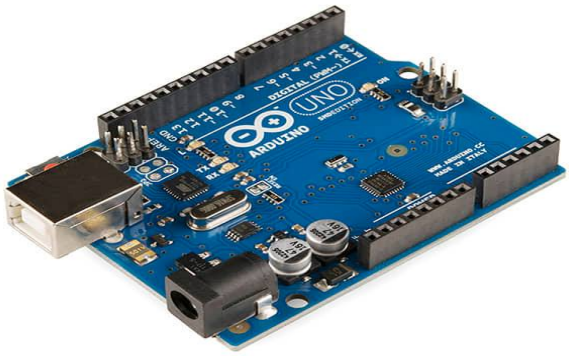

Figure 4.2.15: arduino uno

2- Gsm module:

we use it to make a contact with firefighter

Figure 4.2.16: gsm module

3- gas sensor:

Figure 4.2.17: gas sensor

4- Building entrance door

The entrance door of this smart building is very secure as it can only be opened through a password that the user enters through a keypad and it appears on the LCD screen. The door is opened only if the password is correct.

Figure 4.2.18: entrance

Components we used :

1- Key pad

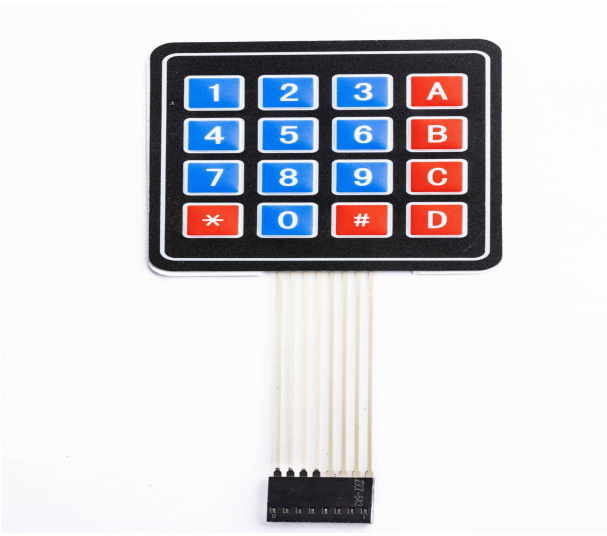

Figure 4.2.19: keypad

2- LCD:

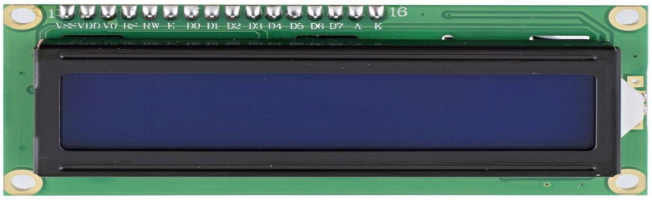

Figure 4.2.20: LCD

3- Servo motor:

Figure 4.2.21: servo motor

Chapter 5

Results and Analysis

In this project, we made a smart building that contains elevator and parking, which includes the security field in terms of entering the building and using the elevator through a card, in addition to the wireless field through the use of Wi-Fi in the Esp32 module in the parking, and also includes the idea of automatically calling the firefighters when a fire occurred in the building.
The data was taken through the residents of the apartment buildings, so that the residents who use the elevator infrequently were facing problems in equalizing the amount of subscription payment compared to the population who used the elevator frequently. And also through the desire of the residents to organize car parking for the arriving guests

Chapter 6

Discussion

In this project, we have solved many of the problems facing people in general, especially the residents of the buildings, so that the incidence of problems among the residents in the issue of using the elevator is reduced, or in other words, justice has been achieved among the residents so that payment is made according to use through the use of a card charged with a certain number of Steps so that the number of steps is reduced by the number of floors the user moves,
as well as in the parking, specific places were organized for the residents of the building and the guests ,
The problem of a gas leak in the building was also solved through a quick and automatic call to the firefighters, thus protecting the residents from any danger.
The security field has been added from the entrance to the building so that no one is allowed to enter unless he has the password, and this prevents a thief from entering the building

Chapter 7

Conclusions and Recommendation

In the end, we were able to make an elevator that helps solve the subscription payment problems facing the residents of the building, through the use of a card, as well as we were able to organize a garage appropriately to park the cars of residents and guests, and we were able to secure the building through a password on the door, we were also able to reduce the incidence of The danger to the residents of the building when gas leaks through contacting the firefighters , For the future, we can develop our project by adding a special mobile app to the user by creating an account on it and knowing how many steps there are, and able to charge a specific number of steps by filling in its information and through a Visa Card, add another mode when entering the elevator through the fingerprint in case the user forgets his card, Also, instead of using buttons for the elevator, it can work according to the sound, which determines which floor it wants, so it becomes smarter

Bibliography

[1] https://github.com/makertut/direction-ctrl-2

[2] https://www.youtube.com/watch?v=hxQYIwdZRng

[3] https://randomnerdtutorials.com/esp32-web-server-arduino-ide/

[4] https://roboticsbackend.com/arduino-write-string-in-eeprom/

[5] https://www.youtube.com/watch?v=53RGJKQ0bTg&list=PLCn2VC9ANZ7L5YeQPY2dQn95rjsmRLZoN&index=9

[6] https://miliohm.com/how-to-drive-a-stepper-motor-easily-using-a4988-and-arduino/

[7] https://electropeak.com/learn/interfacing-inductive-proximity-sensor-lj12a3-4-z-bx-with-arduino/