

An-Najah National University



Faculty of Engineering , Information Technology

Computer Engineering Department

Graduation Project 2 Report

Smart Home

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**A report submitted in partial fulfillment of the requirements for Bachelor
degree in Computer Engineering - Hardware Project**

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Abstract:

Since the last century ,technology has been an important part of our lives .This technology has good sides definitely but also has bad side like increasing home accidents like fires and gas leak , on the other hand technologies provide protection and decrease these accidents .

Our project (Save Home) is a smart home system provides **flame sensor ,gas sensor** and **temperature sensor DHT11** to measures temperature in order to control cooling and heating , we can determine the required temperature by a potentiometer .

And for security we have **RFID** to detect the correct card ,and a **reed switch** to detect if the door is open if it open while no correct card was entered an alarm will work , also we have **movement sensor PIR**, if any movement is detected without entering the correct card the alarm will work.

Also our project provides easy light controlling by mobile application ,and has **LDR sensor** when it gets dark a light will automatically turn on.

We have LCD to display some information .

We use Arduino mega and Arduino IDE for programming .

Chapter 1: Introduction

1.1 Statement of the problem:

One the most common accident those days is home accident many live die because of fires or gas leak we built our project to provide a safe house against house accidents like fires and gas leak also to protect home from theft incidents , finally it provide smart controlling for lightening and temperature .So we can have less house accidents , more security and easier controlling.

1.2 Project objectives

1. fire alarm ,using a **flame sensor** and a buzzer .
2. gas alarm ,using gas sensor **MQ-5** and a buzzer.
3. home security by using **RFID**, read switch ,and sense any movement in the house by **PIR sensor** and give an alarm if any movement happened in the house without entering the right card or if the door opened without entering the right card .
4. control the temperature: by sensing the temperature by **DHT11** and if it rises above specific degree a fan will work if it less a heater (here we use leds) will work.
5. control the lights by a mobile application also detect light by **LDR sensor** if it gets dark a light automatic will be on .

1.3 Scope of the work

As we know home accidents have increased recently ,by having a smart home system these accident surely will decrease and home will be the safest place as it should be.

1.4 Importance of the project

smart home system provide an easy control for home devices and as we mentioned before it provide saver and more secure homes .This system can also be applied on other places with some adjustment like companies and factories and so many others .

1.5 Organization

- Chapter 1: Take importance of this project.
- Chapter 2: Constraints, standards
- Chapter 3: Literature Review.
- Chapter 4: Methodology for the implementation of the project.
- Chapter 5: Result and Discussion.
- Chapter 6: summarize the report, and about future work.

Chapter 2: Constraints, Standards and Earlier Work

2.1 Constraints

1. We face some difficulty with finding the right connection since we are not familiar with connecting hardware components
2. We couldn't add more features since our budget and our time were limited

1.2 Earlier Academic Knowledge

we had some courses that were useful and helped us in this project like Digital Design, Microprocessor, Microcontroller, Microcontroller lab and CPU lab.

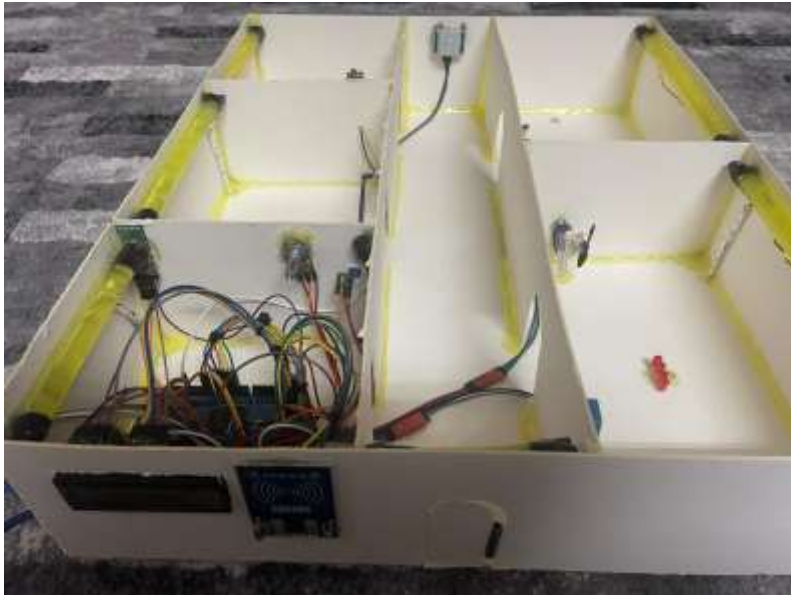
Chapter 3: Literature Review

There are many studies that have emphasized the importance of modern homes, as they are an integration between technology and services to improve life. There is a need for smart monitoring, remote control, and automation of daily home work remotely without user intervention in an easy and convenient way so that it saves cost and less energy consumption and provides security.

To connect between household appliances and the main unit, most applications employ wireless technology. Smart home designers are attempting to build a home that assists people in automating daily operations such as changing the house's temperature, ensuring appropriate daily illumination, and keeping the house safe. As a result, smart homes based on various technologies have been developed.

Chapter 4: Methodology:

We built our project using cardboard and silicon the project consist of Arduino MEGA connected with RFID ,LCD ,Flame Sensor, gas sensor(MQ-5) , temperature sensor(DHT11),move sensor (PIR), Reed Switch LDR , Bluetooth module ,2 potentiometers , leds , a fan , and heater Represented by 4 red leds.



4.1 Methods and Techniques:

4.1.1 Home components in details:

➤ Arduino MEGA

We use Arduino mega instead of Arduino UNO because it has more digital pins .

The Arduino Mega 2560 is an ATmega2560-based microcontroller board. It has 16 analog inputs , 54 digital input/output pins , a 16 MHz

crystal oscillator, 4 UARTs (hardware serial ports), a USB connection, an ICSP header, a power jack, and a reset button. It has everything you'll need to run the microcontroller.



➤ LCD

Liquid Crystal Displays we use it to display some information



➤ Potentiometer

we use it to change the temperature degree that we want,also another for the lcd



©Photo by Electronics

➤ Flame sensor

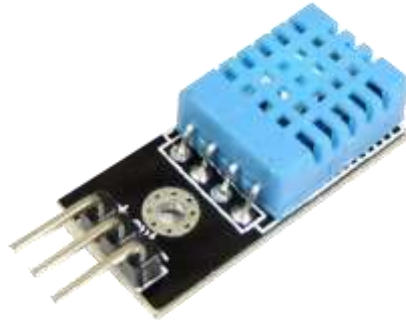
Detect infrared light which has wave length from 700nm to 1000 nm The infrared light convert into current changes by the far-infrared flame probe.

It HAS 3 PINS : VCC 3.3v_5v ,GND,DATA OR SIGNAL



➤ DHT11

ultra low-cost digital temperature and humidity sensor. It measure the temperature and the *humidity but here we use it for temperature only*
it has 3 pins :VCC , GND ,and DATA



MQ-05

- MQ-5 gas sensor can detect butane, methane , propane, and can detect methane It also sensitive of flammable gases, especially LPG(propane).
Has 4pins we use 3 for VCC, GND and signal.



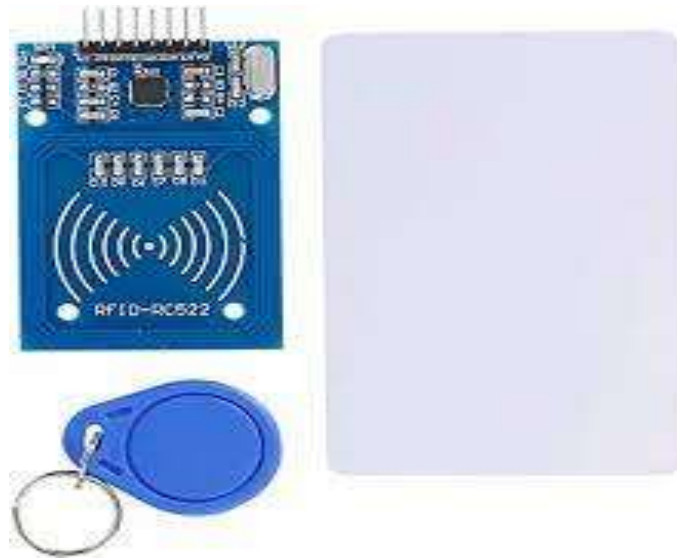
➤ RFID

The RC522 RFID Reader module is designed to communicate with RFID tags(ISO 14443A standard tags) by creating a 13.56MHz electromagnetic field . A 4-pin Serial Peripheral Interface (SPI) allows the reader to interface with a microcontroller at a maximum data

rate of 10Mbps. It also supports the I2C and UART protocols for communication.

But here we only use SPI communication

It has 8pins but we skip the interrupt pin



➤ PIR

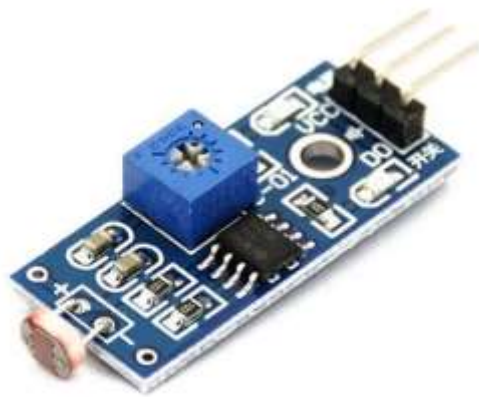
PIR is stand for passive infrared radiation. It is a sensor detects the motion and always used to determine whether a human has entered or exited the sensor's range. It is small, cheap, low-power, simple to use. As a result, it is often found in home and business appliances .

It has 3 pins (3.3-5V vcc ,Ground and Digital out)



➤ LDR

It stand for Light Dependent Resistor it can measure ambient brightness and light intensity, and its sensitivity can be adjusted (via blue digital potentiometer adjustment),need 3.3V-5V to operate the outputs for this sensor is digital switching (0 and 1) it has 3 pins (external 3.3-5V VCC ,external GND and digital output interface [0 and 1]) .



➤ Bluetooth HC-05

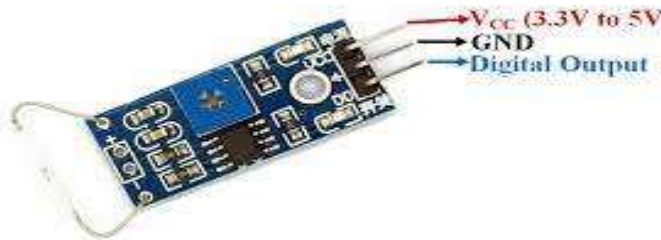
It's utilized in a variety of consumer products, including game controllers, wireless mice, wireless keyboards, and more. It has a range of up to 100 meters, depending on the transmitter and receiver, the atmosphere, and geographical and urban situations. It sends data over the air using frequency-hopping spread spectrum (FHSS) radio technology. It communicates with devices using serial communication. It uses a serial port to connect with the microcontroller (USART).



Bluetooth serial modules allow serial devices to connect with one another through Bluetooth. It has 6 pins (Key/EN,VCC,Ground,TXD,RXD and State)

➤ Reed Switch

The reed switch is a type of electrical switch that is activated by a magnetic field. It is made up of two ferromagnetic flexible metals. The contacts are normally open, closing when a magnetic field is applied, or normally closed, opening when a magnetic field is applied. A permanent magnet or an electromagnetic coil can be used to activate the switch, creating a reed relay. The contacts of the reed switch revert to their original position when the magnetic field is removed.



➤ Wire connecter with Arduino



➤ LEDES:

It use to light the rooms in the home



➤ Buzzer:

It is a simple device it produces beeps and tones.



4.1.4 : Software construction

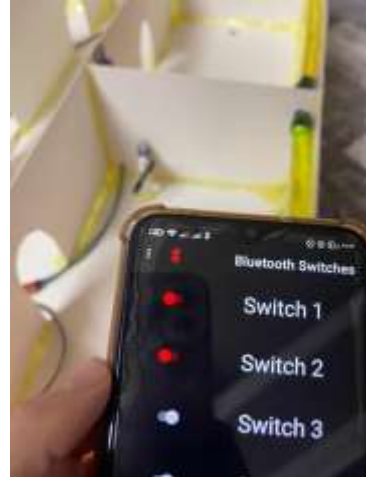
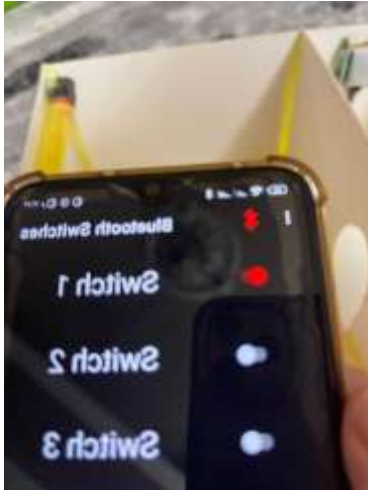
4.1.4.1 : Bluetooth Switches: Arduino Controller

We used this application after downloaded from google play to connect the project and send command by using Bluetooth . we chose this application because it has many features such as choose the number of buttons change values sent by buttons.



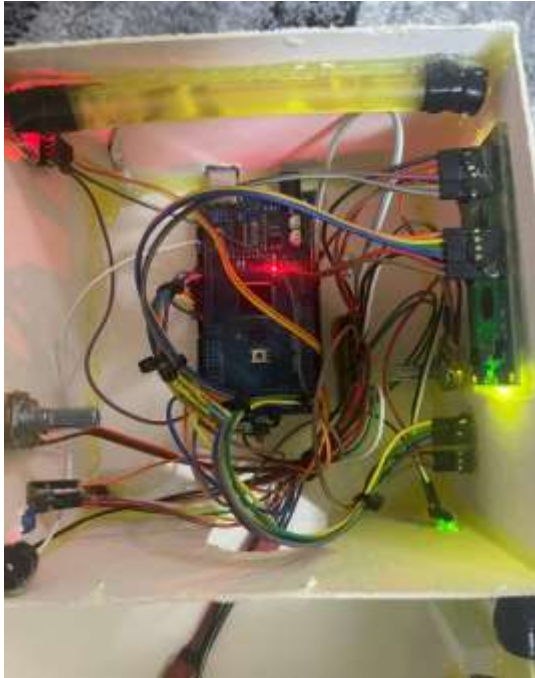
We used these switches to remotely control the the turn on and off of the rooms in the home as shown in the following figures :

When turn on the switch 1 the room1 lighted by orange color and when turn the switch 2 the room 2 lighted by green color an so on



Chapter 5: Results and Discussion

In this chapter we will show how our project (Save Home) and how it works .Here we put the Arduino MEGA and connected it with Bluetooth module ,lcd, RFID and the rest sensors.



First the lcd display "Enter Your card" and the temperature information



Here when we entered the correct card for opening



Here when we entered the correct card for closing



Here when we entered incorrect card.



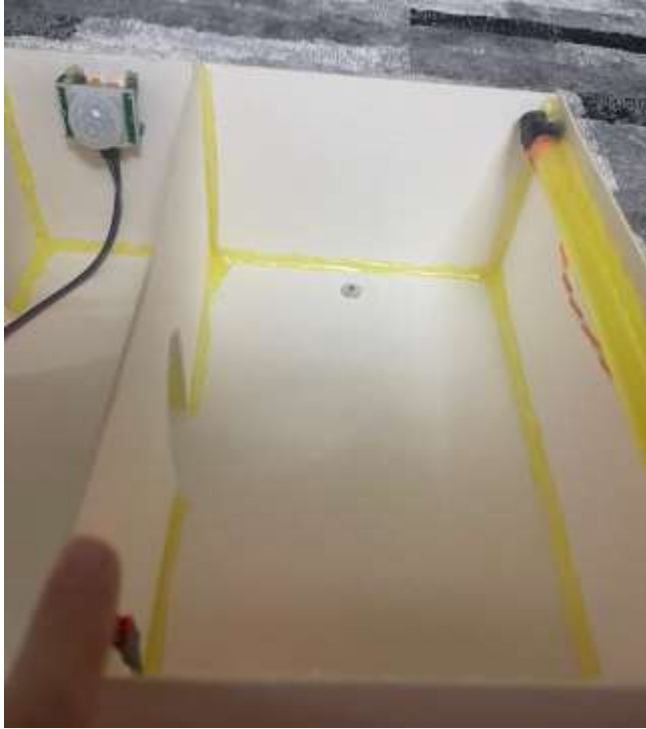
The flame sensor when it senses a fire an alarm will work.



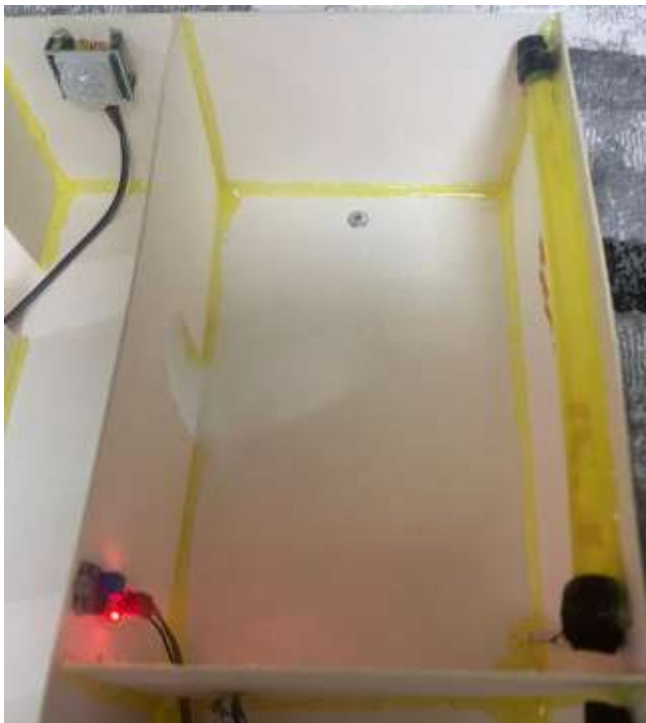
Gas sensor MQ-5 when it senses gas an alarm will work



LDR senses the light if it dark a light will turn on

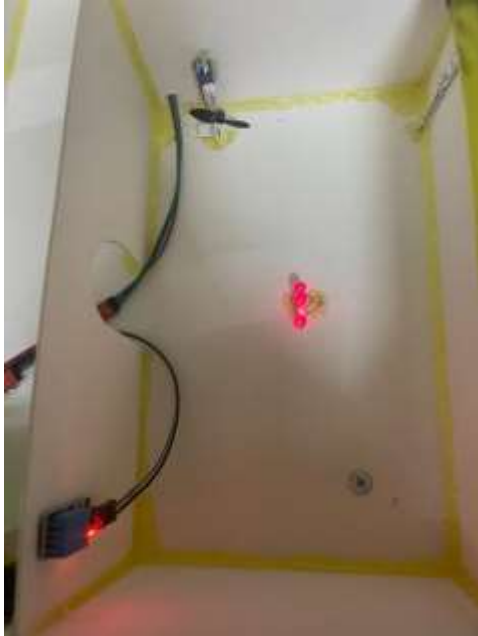


And when it not dark the light turn off



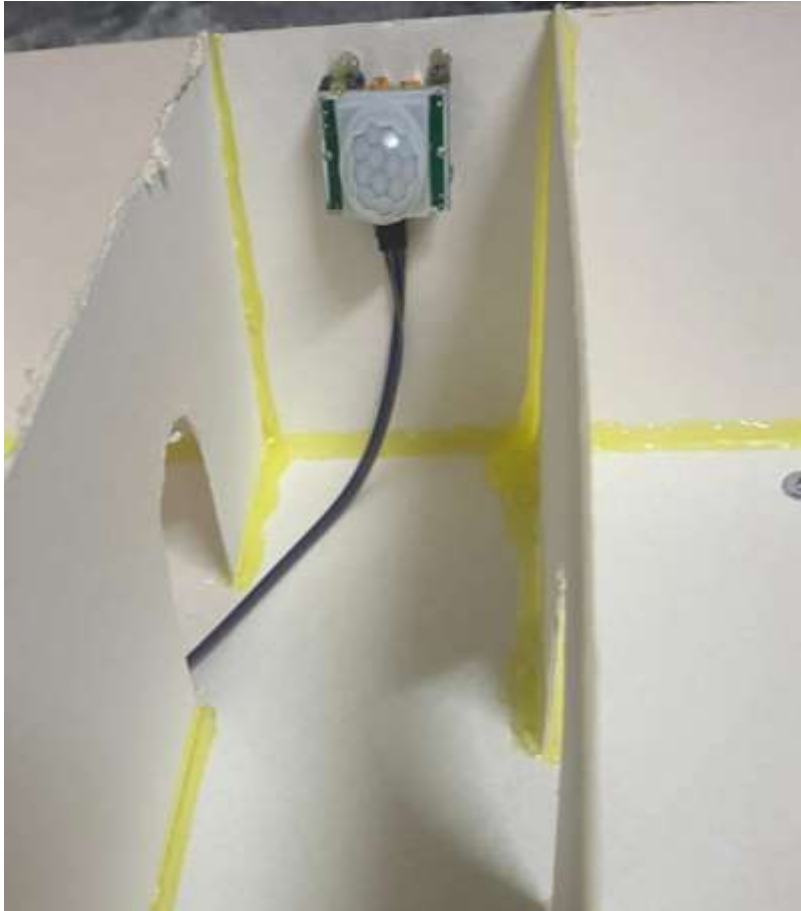
Here we have temperature sensor (DHT11) , a fan and 4 red leds represent a heater

When the actual temperature is less than the required temperature the heater will work as shown bellow



If the actual temperature is more than the required one , the fan will work





Here we have reed switch if the door is opened and no correct card entered the alarm will work and all the lights will flashing.



Here we turn on the light by the mobile application



Chapter 6: Conclusion and Future Work

6.1 : conclusion

We learned how to look for and discover solutions to all problems we encountered, as well as how to use hardware tools properly. We also learned how to use the Arduino chip and gained new knowledge about sensors and how to work with them.

6.2 : Future work

there is lot of features that could added to our project to be perfect home and more efficient for example add cameras and connect them with application on smartphone this cameras takes photo to any person enter the home and analysis this photo by use AI to recognize if he is member to this home or not.

