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SAGENDY & BISO

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Abstract

Initially, we intended to create a gas leakage monitoring system and fire alarm system. However, we later decided to expand and enhance the concept by integrating the project with a web page making it our first venture into the world of IoT (Internet of Things).

This integration allows us to connect the house to the internet and provides us with the ability to monitor and identify any issues or problems within the house remotely.

In addition, it enables us to have control over home appliances and functionalities through the web interface.

Contents

1 Introduction

1.1 Introduction

In today's world, prioritizing the safety and security of our homes has become paramount. With the escalating incidents of burglary, theft, and potential hazards like fire and gas leaks, homeowners are actively seeking reliable measures to safeguard their properties and loved ones. This project endeavors to tackle these concerns by introducing a comprehensive home security system that harnesses the power of technology and the internet. The primary objective is to establish a robust defense mechanism against fire and gas-related incidents while ensuring the overall security of the residence. By implementing state-of-the-art sensors, alarm systems, and monitoring capabilities, this project aims to provide homeowners with peace of mind and confidence in the protection of their homes.

1.2 Motivations

Safety and Protection: The primary motivation for the home security system is to ensure the safety and protection of your property, belongings, and most importantly, your family. By having a reliable security system in place, you can monitor activities in and around your home, and receive immediate alerts in case of any security breaches.

1.3 Project objective

We wanted to venture into the world of the Internet of Things (IoT) because we observed that most companies offering similar services, such as home automation and security, charge exorbitant prices. We believe this is due to the limited number of companies providing these services and the lack of awareness among the majority of people about such technologies. Our goal is to offer these services in a cost-effective manner, as all the components of this project are readily available and can be easily implemented. We aim to make these features accessible to everyone, as no one has previously offered them at affordable prices. Instead of taking the easy route of paying hefty fees to those companies, we want to provide an alternative solution that is both affordable and user-friendly.

1.4 Report outline

1.4.1 Project Hardware

What tools are used and what are their benefits in the project?

1.4.2 The method of work

The way the sensor works and the best way to use it to get the best performance.

1.4.3 Advantages

Features of the project.

1.4.4 Circuit idea

The idea of the work of the project in terms of use and method of work.

2 Project Layout

This is our circuit:

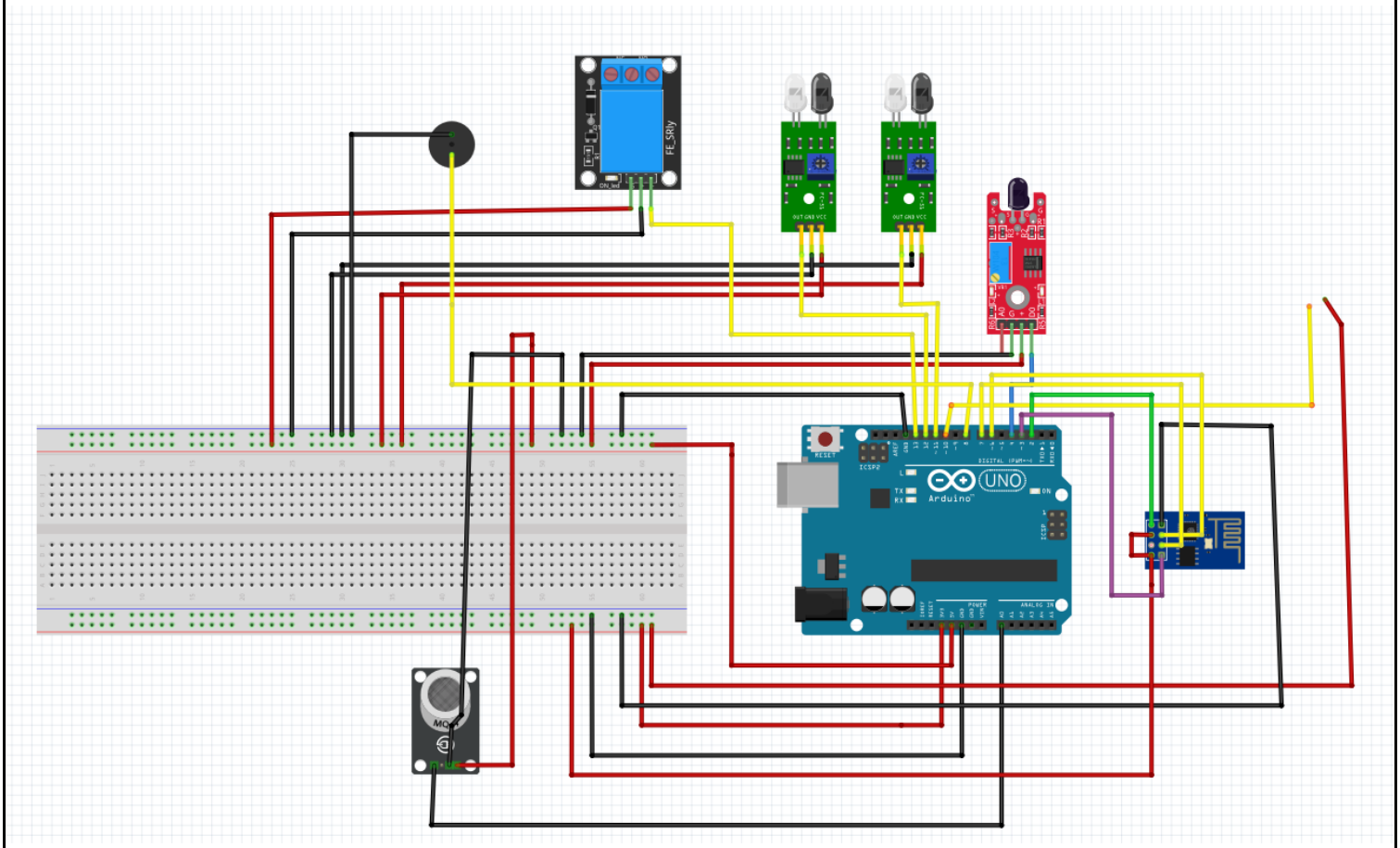

Figure 2 Circuit

Figure 1Our Webpage

Firstly, we have a **flame sensor** that provides us with a signal if there is a fire.

We also have an **MQ-5 gas sensor** that informs us about the natural gas level.

Furthermore, we have a 5V relay that controls the operation of the lights and can use it to turn them off if the house is empty.

Additionally, we have two IR sensors that work as follows: if a person passes in front of the sensor inside the house after that he pass in front of the sensor outside the house, it indicates that someone has left the house, and vice versa.

A temperature and humidity sensor to measure the temperature and the humidity inside the house .

We also have a buzzer that sounds an alarm if there is any problem in the house.

There are two wires that indicate the status of the windows: if they are connected so the circuit is closed, it means that the window is closed, and vice versa. If the house is empty and anyone open the window, the alarm will sound.

Moreover, we have a **mobile application** that displays all the issues in the house and allows us to control the alarm and lights. We can control it through a built in ESP 32 Wi-Fi module.

Finally, we have the ESP 32 module to connect all these components together.

3 Project Hardware

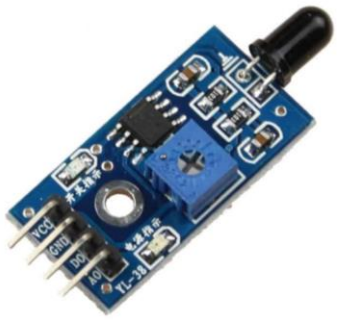

Figure 3 Flame sensor

The flame sensor plays a critical role in detecting the presence or absence of a **flame** or **fire**. Widely utilized in various applications such as fire detection systems, and industrial furnaces, this device ensures safety and efficient monitoring. With its primary function being the rapid and reliable response to flame presence. (Elprocus, Flame Sensor : Working, Types, and Its Applications, n.d.)

Figure 4: MQ-5 sensor

The MQ-5 sensor is a specialized gas sensor that is primarily utilized for the detection of **natural gas** (methane) and **LPG** (liquefied petroleum gas) in the surrounding air. Its application is prevalent in gas leak detection systems, gas alarms, and other safety-related applications.

The MQ-5 gas sensor operates based on the principle of gas conductivity. Additionally, its compact and portable design allows for convenient integration and usage in diverse gas monitoring scenarios. (Fut-electronics, n.d.)

Figure 5 IR sensor

An infrared (IR) sensor, also known as an **IR receiver**, is a device that detects and receives infrared radiation to enable various functions such as remote control operation, proximity sensing, motion detection, and object detection.

The key components of an IR sensor include a photodiode or phototransistor as the sensing element. These semiconductor devices are specifically designed to be sensitive to infrared radiation and convert it into an electrical signal. (WatElectronics, n.d.)

Figure 6 Piezo Buzzer

Piezo Buzzer is an **audio output** device used to produce sound or tones when controlled by an Arduino board. (Adafruit, n.d.)

Figure 8 ESP 32

ESP32 is highly-integrated with in-built antenna switches, RF balun, power amplifier, low-noise receive amplifier, filters, and power management modules. ESP32 adds priceless functionality and versatility to your applications with minimal Printed Circuit Board (PCB) requirements.

It can perform as a complete standalone system or as a slave device to a host MCU, reducing communication stack overhead on the main application processor. ESP32 can interface with other systems to provide Wi-Fi and Bluetooth functionality through its SPI / SDIO or I2C / UART interfaces.

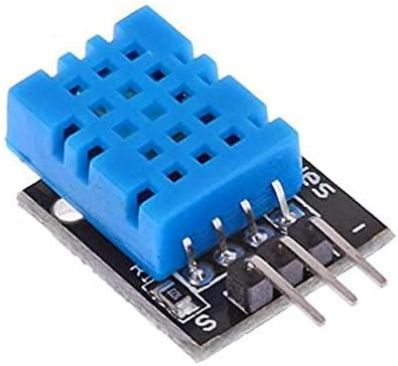

Figure 9 temperature and humidity sensor

A temperature and humidity sensor is low cost-sensitive electronic devices that detects, measures and reports both dampness and air temperature. The proportion of moisture noticeable all around to the highest amount of moisture at a specific air temperature.
It is one of the most important devices that has been widely in consumer, industrial, biomedical, and environmental etc. applications for measuring and monitoring temperature and humidity to a specific location especially in a data center or a sever room.
In most industries, temperature and humidity measurement is important because it played a role for a safety of all crucial equipment that may affect the whole operation.

Figure 7 Jumper wires

Jumper wire is an electric wire that connects remote electric circuits used for printed circuit boards and it has 3 types:

1. Male-to-Male (M-M) Jumper Wires: These jumper wires have male connectors on both ends and are used to establish connections between female headers or pins on components or boards.

2. Male-to-Female (M-F) Jumper Wires: These jumper wires have a male connector on one end and a female connector on the other. They are used to connect female headers or pins to male headers or pins.

3. Female-to-Female (F-F) Jumper Wires: These jumper wires have female connectors on both ends. They are commonly used for connecting components or boards that have female headers or pins.
(Wikipedia, Jump wire - Wikipedia, n.d.)

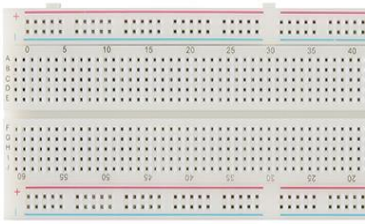

Figure 8 Breadboard

Breadboard, **solderless breadboard**, or **protoboard** is a construction base used to build semi-permanent prototypes of electronic circuits.

The main advantage of a breadboard is that it eliminates the need for soldering. Components can be easily inserted and removed from the breadboard, allowing for quick changes and modifications to the circuit. (Wikipedia, Breadboard - Wikipedia, n.d.)

4 The method of work

The ESP 32 plays a crucial role in our project as it serves as the central processing unit. It receives inputs from the sensors we have implemented and generates output signals to control various components. In essence, it acts as the brain of our system.

Additionally, we have a mobile application that displays all the issues in the house and allows us to control the alarm and lights. We can control it through a built in ESP 32 Wi-Fi module.

Figure 9 Our Home

Moreover, the ESP 32 also receives input from the server. This communication occurs via serial communication, allowing the module to relay user commands from our application to the ESP32. For instance, if the user desires to open or close the alarm or lamp remotely, the mobile application communicates the user's preferences to the ESP32.

The system also calculates the number of people entering the house, and when the house is found empty, it automatically turns off all lights to save electricity.

5 Mobile Application

SAGENDY - Home control and security system application

1 Introduction

SAGENDY is an innovative Android application developed as a comprehensive home control and security system. This report provides an overview of the app's features, functionality, and user interface. The report aims to showcase the application's capabilities and highlight its potential benefits to users.

2. Login page

The application starts with a login page where users can enter their email address to access the system. Login credentials are linked to a secure database to ensure data privacy and user authentication.

3. Home page

Upon successful login, users are directed to the app's home page. The home page prominently displays the clock, which acts as a central element to the app's functionality. The clock not only provides time but also serves as a control and security indicator for the home.

4. Control and security system

The icon on the home page changes color based on your home's security status. It monitors events such as theft, gas leaks, or fires. When any of these events occur, the color of the icon bearing the name gas changes from green to red if a gas leak occurs, to indicate an emergency. The same thing also happens when a fire or theft

occurs. The app prompts the user to contact the relevant emergency services depending on the specific event, including the police in the event of a theft, the fire brigade in the event of fires, or gas emergency services in the event of a gas leak.

5. Settings page

The settings page can be accessed by clicking on the three-dot menu icon. The settings page allows users to perform various actions, including logging out of the app, enabling or disabling dark mode, and changing language settings. These options provide users with customization and personalization options.

6. Additional pages

a. Home Display: The Home Display page allows users to control the lighting intensity of the home's LED lights. The app provides control of three LED lights, allowing users to adjust the light intensity according to their preferences.

B. History: The History page displays a comprehensive record of all past events and errors that have occurred in the home. It ensures that no event is forgotten or erased, keeping a complete log of incidents. For example, if a fire occurs followed by a theft, both events will be recorded, preserving the chronology of the incidents.

C. Edit Location: The Edit Location page provides information about the distance between the user's private home and the home control and security system project. This feature helps users track the location of the system and maintain an understanding of its proximity to their residence.

7. Conclusion

SAGENDY is a powerful Android app that combines home control and security features. Its intuitive user interface, coupled with its ability to monitor and respond to emergency situations, makes it a valuable tool for homeowners. With features like customizable lighting control, comprehensive event logging, and location information, SAGENDY provides convenience, security, and peace of mind to its users.

6 Advantages

6.1 Advanced Home Security:

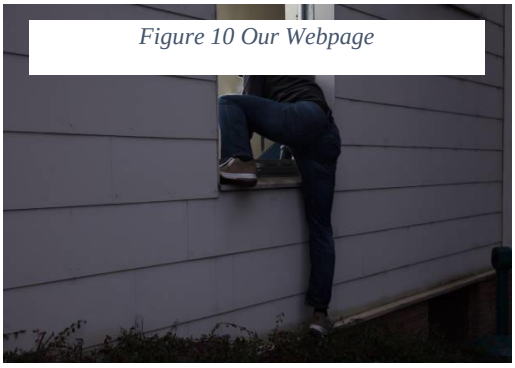

Figure 10 Our Webpage

Figure 11 Thieve enter window

With an emphasis on home security, our system is equipped to detect occupancy status and unauthorized access. It effectively identifies when the home is empty and raises an alarm if someone attempts to open or tamper with windows, ensuring a proactive response to potential intrusions. This feature grants homeowners the peace of mind that their property is secure even when they are away.

6.2 Remote Monitoring and Control:

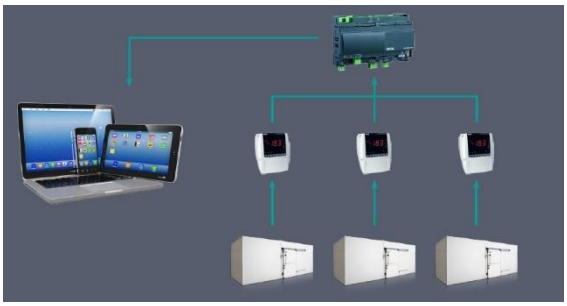

Figure 12 Remote monitoring system

Our project integrates seamlessly with web-based platforms, enabling homeowners to remotely monitor the security status of their homes. Through these platforms, users can access real-time updates on the system's activity, allowing for continuous surveillance and prompt responses to any detected anomalies. Additionally, users can remotely arm and disarm the security systems, providing convenient control and flexibility.

6.3 Energy Efficiency:

Figure 13 Saving energy

Recognizing the importance of energy conservation, our system promotes energy-saving practices. By detecting the absence of occupants, it automatically shuts off devices and lights that are not required, optimizing energy consumption and reducing electricity waste. This feature contributes to sustainable living and cost savings for homeowners.

These integrated features work harmoniously to provide a robust and reliable home protection solution. By ensuring prompt detection of potential hazards, proactive security measures, remote monitoring capabilities, and energy-saving mechanisms, our project delivers comprehensive protection, offering homeowners a sense of safety, convenience, and peace of mind.

7 Discussion

We conducted research on companies that offer similar services to ours, but we still with limited features as our project is still in its early stages. During our search, we came across a company and we found this

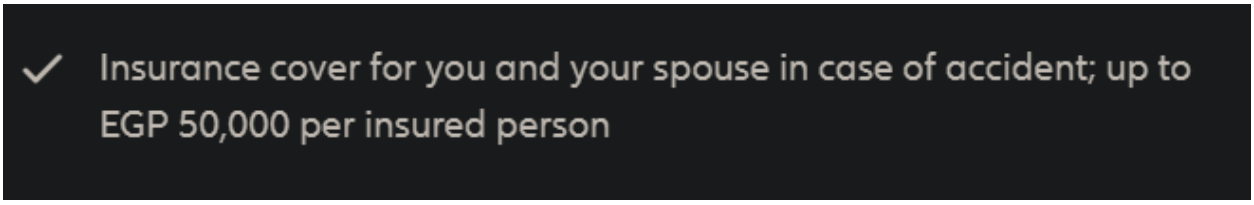

Figure 14 OMG

(المتكاملة, n.d.) that charges 50,000 pounds per person for their services. Considering that there are five people in our household, their total fee would amount to 250,000 pounds. This cost is significantly high for normal families and may even exceed the value of their homes. However, upon further examination of our materials, we discovered a stark difference in terms of affordability, let's see the difference:

Name of the component	The price
2 IR sensors	70 EGP
Flame sensor	35 EGP
MQ-5 sensor	50 EGP
Jumper wires	30 EGP
Buzzer	5 EGP
DHT11	45 EGP
ESP-32	330 EGP
Breadboard	30 EGP
Total Price	**595 EGP**

8 Conclusion

In conclusion, our project offers a range of advanced features that prioritize home security, remote monitoring, and energy efficiency. By incorporating innovative technologies and seamless integration with web-based platforms, we have created a comprehensive home protection solution.

One of the key advantages of our project is its emphasis on advanced home security. Through occupancy detection and window tampering alerts, homeowners can rest assured that their property is secure, even when they are away. This proactive approach to intrusions provides peace of mind and ensures a prompt response to potential threats.

The integration with web-based platforms allows for remote monitoring and control, empowering homeowners to stay connected and informed about their home's security status. Real-time updates and the ability to arm and disarm security systems remotely offer convenience and flexibility in managing home security.

Furthermore, our project promotes energy efficiency by automatically shutting off unnecessary devices and lights when the home is unoccupied. This not only reduces electricity waste but also contributes to sustainable living and cost savings for homeowners.

In addition to its advanced features, another noteworthy advantage of our project is it's cheap. While we researched other companies offering similar solutions, we found that their prices were exorbitant, making them inaccessible to normal families. This pricing model proves to be unaffordable for many households and may even exceed the value of their homes.

In contrast, our project offers a cost-effective alternative without compromising on quality or functionality. By utilizing readily available materials and leveraging our expertise, we have developed a solution that is both effective and affordable. Our aim is to make advanced home security and monitoring accessible to a wider range of homeowners, ensuring that they can protect their properties and loved ones without incurring excessive expenses.

By combining these integrated features, our project offers a comprehensive and reliable solution for home protection. The prompt detection of potential hazards, proactive security measures, remote monitoring capabilities, and energy-saving mechanisms ensure safety, convenience, and peace of mind for homeowners. With its advanced functionality and user-friendly design, our project sets a new standard in home security systems.

9 References

Adafruit. (n.d.). *Piezo Buzzer [PS1240] - Adafruit*. Retrieved from Adafruit: https://www.adafruit.com/product/160

arduino.cc. (n.d.). *Arduino Uno Rev3*. Retrieved from arduino.cc: https://store.arduino.cc/products/arduino-uno-rev3

Elprocus. (n.d.). *Flame Sensor : Working, Types, and Its Applications*. Retrieved from Elprocus: https://www.elprocus.com/flame-sensor-working-and-its-applications/

Elprocus. (n.d.). *What is a 5V Relay Module : Working & Its Applications*. Retrieved from Elprocus: https://www.elprocus.com/5v-relay-module/

Espressif. (n.d.). *ESP8266 Wi-Fi MCU I Espressif Systems*. Retrieved from Espressif: https://www.espressif.com/en/products/socs/esp8266

Fut-electronics. (n.d.). *Natural Gas Sensor MQ5 (Analog/Digital)*. Retrieved from fut-electronics: https://store.fut-electronics.com/products/gas-sensor-module-mq5-analog-digital

WatElectronics. (n.d.). *IR Sensor : Circuit, Types, Working Principle*. Retrieved from WatElectronics: https://www.watelectronics.com/ir-sensor/

Wikipedia. (n.d.). *Breadboard - Wikipedia*. Retrieved from Wikipedia: https://en.wikipedia.org/wiki/Breadboard

Wikipedia. (n.d.). *Jump wire - Wikipedia*. Retrieved from Wikipedia: https://en.wikipedia.org/wiki/Jump_wire

ل ج. المتكاملة, (n.d.). *جيانتس للتوريدات والتركيبات والحلول الهندسية المتكاملة*. Retrieved from جيانتس للتوريدات والتركيبات والحلول الهندسية المتكاملة: https://giantssecurityeg.com/ar