DESIGN AND IMPLEMENTATION OF ROBOT CONTROL MULTIPURPOSE SECURITY SYSTEM

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Computer Science and Engineering

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APPROVAL

This Project titled "Design and Implementation of Robot Control Multipurpose Security System", submitted by Suraiya Akter Jerin, Tania Afrin Somaya and Md. Talha Mohiuddin to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 26 January, 2023.

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We hereby declare that, this project has been done by us under the supervision of **Shah Md. Tanvir Siddiquee, Assistant Professor, Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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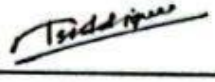

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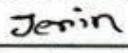

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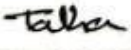

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ABSTRACT

Based on the findings of this research, the construction of a safety system for controlling robots is recommended. It is intended to make residential and business environments safer in the locations it is implemented. The motion of this robot may be controlled manually. The mobile robot and the control unit may now communicate wirelessly thanks to a WiFi module that was included into each of them. This module has a range that is more than one hundred meters. As a result, the use of this robot in the improvement of residential and commercial security is appropriate. The microcontroller may be found on the robot's motherboard, which is an ESP32atmega328 combination. During the course of the project, the essential software simulation, code writing, and microcontroller hex file burning were carried out with the assistance of Proteus 8.3 and mikroC. This particular kind of robotic security system has the potential to be upgraded for widespread deployment in industrial zones. The sophisticated robotic security system is a great tool for protecting a house or workplace from unauthorized visitors from the outside, gas explosions, fires, and other potential dangers.

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Chapter 1
Introduction

1.1 Introduction

Modern society requires a security system that serves multiple purposes. To make our life easier we can use a security system that can serve us a multiple works at a time. In light of this, a robot-based security project has been launched. Our proposed system can prevent unauthorized entry by foreigners, provide fire and gas explosion warnings, and protect residential or commercial space from such threats as these. It is possible to operate the advanced robotic security system manually.

1.2 Motivation

One of the biggest issues in our society is security. Security is necessary in every aspect of daily life, including the home, workplace, store, mall, and more. But frequently, we are unable to provide adequate security. Our security system is frequently breached by numerous incidents. And sometimes it becomes harmful for us and causes us death.

A fire explosion occurred recently on June 27, 2021 at the wireless gate of Moghbazar in Dhaka, resulting in 7 fatalities and tens of thousands of injuries. Gas leakage was the main cause of the issue. On September 15, 2021, some thieves broke into 18 homes in Shakhipur, Tangail, all at once. The thieves are unknown to the police. Additionally, fire accidents occur frequently in our society.

So, we're planning to develop a Robot Control security system to stop incidents of this nature.

1.3 Objective

1. In order to increase security in the home and office: In our country, various thefts occasionally occur when no one is home, including the theft of large sums of money and priceless gold ornaments. Therefore, we can prevent the occurrence or catch the robber if we possess a movable robot with a camera and a motion sensor that can detect the intruder and send us feedback about it.

2. Our robot will be equipped with various types of sensors that can warn us for various levels of security in order to prevent fire incidents, gas leakages, or any other incidents. such as a sonar sensor, a gas sensor, a temperature sensor, or a motion sensor. So, in the event of a fire or gas leak, our robot can assist us by providing feedback.

3. The robot can send us notifications or feedback via the internet on our smartphone device. The robot have a manual mood and we can control the robot in ours will. And if the robot notices any abnormalities, it will inform us of them via the internet on our mobile phone. Even though it will come with a camera, we will be able to track our location 24 hours. As our robot has manual mood so we can command the robot to move in the direction we want it to go if we want to see a specific area.

1.4 Expected outcome

- Our robot will be able to detect any gas leaks that might occur in our home.
- Through the use of a temperature sensor, our robot can measure the temperature.
- Using a motion sensor, our robot can identify nearby individuals or objects.
- An object can be detected by sonar sensors, which allows him to change direction.
- To detect the presence or absence of light, we also have LDR sensors that are frequently used.
- It will also have an ip camera so that we can keep an eye on the area 24 hours and view the footage from a distance.
- In our web interface, we have 4 control buttons so we can operate the robot. And to see a particular area, we can command it to move in the direction as we want.
- Through the internet, we will receive feedback or notifications.

1.5 Project Management and Finance

Project financial management is very important for making a project. A project should be planned according to a budget. So, at first we make a proper plan for our project from the initial to its termination and also set our goal that what we actually want to do. Then we make a list about which resource we would need for our project and make a proper cost plan. As we have limitation

on budget and can't expense a lot of so we have to plan properly according to our limited budget. Within this budget we try our best to make our project perfectly and in our satisfactory level.

1.6 Project Layout:

The project is divided into the 7 chapters listed below:

The project's introductions are covered in Chapter 1.

The Background is described in Chapter 2.

The requirements specification for this project is described in Chapter 3.

The Design Specification for this project is presented in Chapter 4.

The project's implementation and testing are covered in Chapter 5.

The project's impact on society, the environment, and sustainability are discussed in Chapter 6.

The project's conclusion and future scope are covered in Chapter 7.

Chapter 2

Background

2.1 Preliminaries

The following security tasks are intended to be carried out by robotic security systems. The gas and temperature sensor will alert you if there is any chance of a fire or explosion of gas. The transmitter and receiver, along with the system controller, are two of the security system's subsystems. Additionally, there is a system controller. The transmitter module makes use of a variety of sensors in order to generate data on the frequency of gas/fire explosions and unauthorized entry. The WIFI module is used to wirelessly connect the transmitter and receiver modules.

2.1 Related Research

That Is Related The K5 Autonomous Data Machine is a mobile robot that works as a safety and security guard for a variety of establishments, including companies, schools, communities, and so on. Knightscope developed this machine. The 300-pound, 5-foot-tall robot will be armed with a video camera, thermal imaging sensors, a laser rangefinder, radar, air quality sensors, and a microphone. Additionally, the robot will include air quality sensors. In order to ensure the safety of the grounds, it will move around the halls independently, following established routes. For reasons of safety and protection, the robots would be wirelessly connected to a centralized computer that would give them access to "big data." This would enable the robots to carry out face recognition and optical character recognition. The robots would be able to conduct functions such as face recognition and optical character recognition for the purpose of maintaining security since they would be wirelessly linked to a centralized computer that would have access to "big data."

Lobeco Fire and Security is the parent company of the venture and spin-off company known as Robot Security Systems. The quest for security expertise combined with an interest in developing cutting-edge technology led to the creation of Robot Security Systems. This curiosity resulted in the creation of a member of their Robot family known as SAM, which is a Security and Surveillance Robot. Secure Autonomous Mobile may also be abbreviated to "SAM," which stands for "secure autonomous mobile."

SAM is the first of a line of high-performance robots that will significantly improve safety and security solutions. These robots will follow in SAM's footsteps.

The Robot Security system is continuously developing and contributing improvements, new products, and new Robots for use in a variety of security-related applications. SAM offers an unbounded number of opportunities. End customers, guarding companies, and system integrators are all types of clients that Robot Security Systems serves with its Safety and Security services and products.[1]

Figure 2.1 SAM security robot [2]

Figure 2.2 Knightscope K5 security robot

2.3 Comparative Analysis

Our project has several features. Due to the fact that the C programming language as well as html, css, and java are used in the development of our web interface, we were had to do in-depth study on C, html, css, and java. Because of the substantial usage of sensors in our project, we were forced to do in-depth study on the functioning of each sensor as well as the sensor itself.

2.4 Scope of the problem

It is common knowledge that not everything in the world is in perfect working order. In addition, our robot has a few restrictions. Both the automation of the robot and the purchase of a high-quality IP camera are out of the question for us given our status as students. Because the robot is unable to move on its own, we have to manually control its movements. When faced with such a large number of obstacles, it is only normal for our robot to have feelings of confusion since it is a machine. Because of the obstacle, there is a possibility that we may have interference on occasion. Due to the fact that it is operated via our web interface remote control, its range is restricted, and it is unable to go very far.

2.5 Challenges

The idea of security systems that are operated by robots is still in its infancy in our nation. As a result, it is quite difficult for the people who live here to maintain our house. As a result of the country's status as a developing nation, very few people in the country are knowledgeable in the operation and maintenance of high-tech equipment such as robotic security systems. In addition to this, it does not possess its own independent defense system. As a result, it is prone to being stolen. We are unable to locate the robot because it does not have a GPRS tracker installed.

Chapter 3

Requirement Specification

3.1 Business Process Modeling

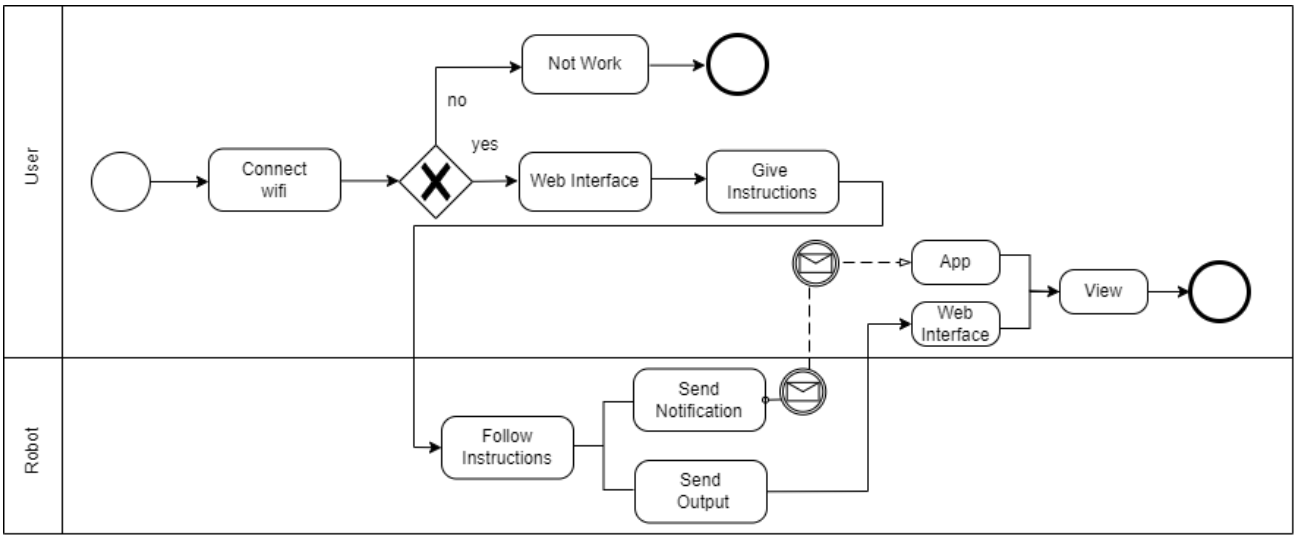

Figure 3.1 Business Process Model

At first the user will connect WIFI with his/her device. If WIFI will not connect, it don't work. After connecting, user will open web interface and give instruction to the robot. Then the robot follows the instructions. If it finds any suspicious thing using sensor, it will send notification in a specific app and also send output in web interface. Then user can see that.

3.1.1 Block Diagram

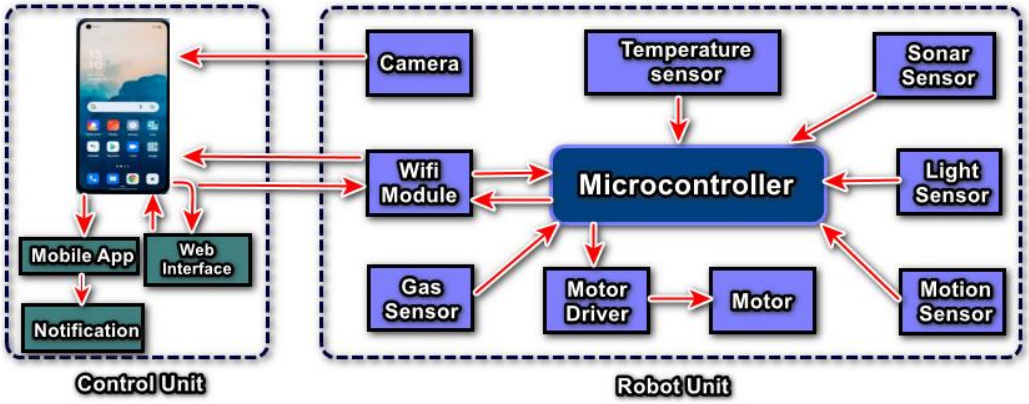

Figure 3.2 Block Diagram of Security Robot

In this block diagram, there are two types of units named Robot unit & Control unit. In robot unit, we can see what we use in robot. We used various kind of sensors like temperature, sonar, light, motion, gas sensor that are connected with micro-controller. Camera & WIFI module are connected with both micro-controller and device. And also use motor which is connected with both micro-controller & motor. In control unit, here has any kind of device like mobile, computer etc. which used for controlling robot and also has a specific app which received notification.

3.2 Requirements Collection and Analysis

The process of identifying requirements of the user for brand-new or modified implementation is called requirement engineering, also referred to as requirement analysis. The phrase "requirements gathering" or "requirements capturing" is frequently used in the context of software engineering. Maintaining, evaluating, and analyzing software or system requirements are some of the tasks involved in figuring out what conditions must be met for a new or modified product or project, documenting, and requirements analysis while considering the potentially conflicting requirements of various stakeholders. We have also gathered requirements for the robot we are building,

discussed them with the other members of our group, and compared the robot to projects already in existence.

3.3 Use Case Modeling and Description

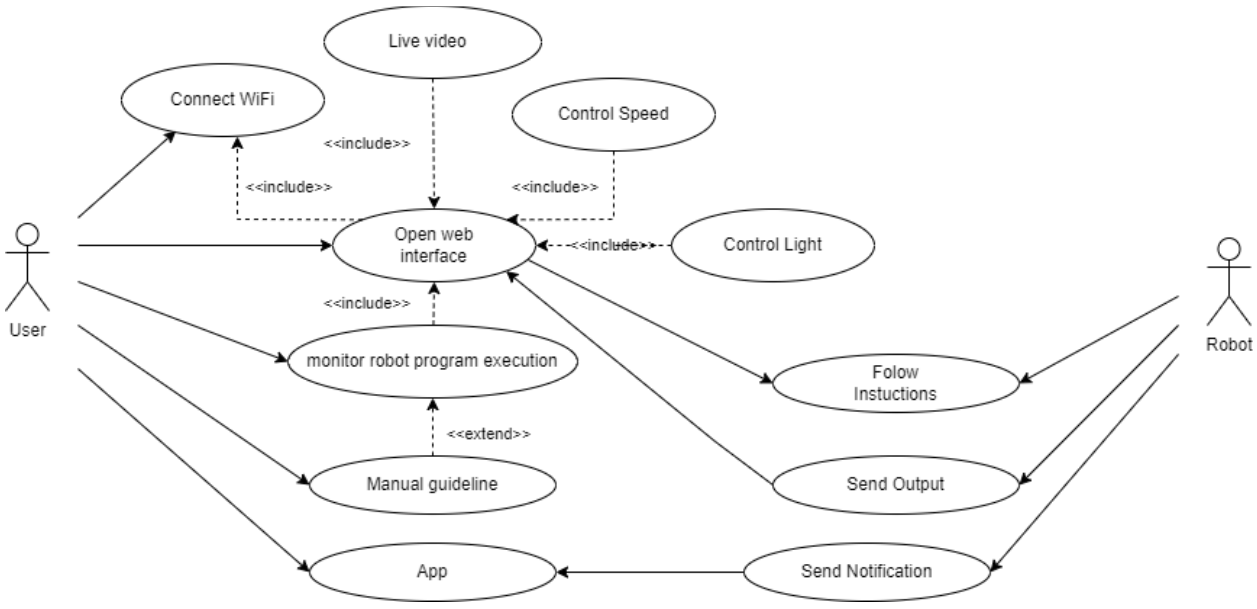

Figure 3.3 Use Case Diagram

This is our use case diagram. There are two actors named User and Robot. User can connect WIFI and open web interface in device. In web interface, at first, we can see live video which is happened in front of robot. After that there are two controlling system speed and light. User can monitor robot program execution and provide manual guideline. User give instruction to robot. Robot follow that instructions and send notification to app. User use this app to see the notification.

3.4 Design Requirements

3.4.1 Introduction

The following security tasks are intended to be carried out by robotic surveillance systems. The gas and temperature sensor will send notification in the event of any gas explosion or fire. The transmitter and receiver, along with the system controller, are two of the security system's subsystems. The transmitter module makes use of a variety of sensor devices to generate data about the occurrence of intrusion, fire or gas detonation. WIFI module is used to wirelessly connect the transmitter and receiver modules. The functional layout of the robot and every component used to construct it are both covered in this chapter. It as well as outlines all of the project's theoretical components.

3.4.2 Functional structure of Robot control security system

The robotic security system consists of two major subsystems for its functionality:

- Transmitter
- Receiver including controlling module

The primary duty of the transmitter is to gather data about occurrences like the entry of any foreign object, fuel detonations, and flames and transmit that data wirelessly to the transceiver component. The transceiver end provides an notification and a camera view after receiving various surveillance details from the transceiver.
WIFI wireless communication connects the transmitter and receiver.

3.4.2.1 Electrical Structure of the security system

The system detects various events, for example the entrance of an unauthorized people. As a result, various electronic sensor types can detect various security threats.

For this, the following sensor types are employed:

- PIR / Motion sensor
- Sonar sensor
- Gas sensor

- Temperature sensor
- LDR sensor
- Fire sensor

This distinct monitoring functional unit points out the events through the receiver (controller unit). such as:

- Web Interface
- Camera

The heart of the transmitter's security mechanism is a microcontroller that has been configured to perform the security function.

The transmitter subsystem contains a robot. With the use of a motor and a programmed instrument, a robot may move autonomously. The central system of the controller can be used to manually control the robot.

3.4.3 Functional components of the security system

The operational perspective divides the security system into two elements.

- Robot Body (including transmitter)
- Control Unit (including receiver)

3.4.3.1 Robot Body

The main element of the robotic security system is the robot body, which also includes the following useful parts.

- Microcontroller
- Sonar Sensor
- Gas Sensor
- PIR Motion Sensor
- Temperature Sensor
- LDR sensor
- Wifi Module

- Motor Driver
- Motor
- Camera

Microcontroller

A microcontroller including memory, programmable input/output peripherals, and a CPU core is a single-chip tiny computer (SoC) (SoC). In addition to a relatively tiny quantity of RAM, chips typically feature program memory in the form of ferroelectric RAM, NOR flash, or OTP ROM.

The microcontroller is the primary component of the robotic body in our project. The microcontroller is coupled to the sensors, camera, motor driver, and Bluetooth module. After receiving input from all sensors and the camera, the Bluetooth module receives output.

Sonar Sensor

The robot uses an ultrasonic sonar sensor to determine how far away a target object is. The microcontroller is attached to the sonar sensor. It delivers output to the microcontroller after measuring distance.

Gas Sensor

Gas sensor used to find poisonous fumes or smoke inside the workplace or home. The microcontroller is connected to a gas sensor. The output from measuring poisonous fumes or smoke is sent to the microcontroller. When poisonous gas or smoke is detected, it is transformed to voltage and sent to the microcontroller.

Sound Sensor

Sound sensors are used to listen for ambient sound. The microcontroller is linked to the sound sensor's output.

PIR Motion Sensor

The intruder's movement is detected using a PIR Motion Sensor. Movement is translated into output power, and the microcontroller receives the output. It is employed to detect movement in its immediate surroundings.

Temperature Sensor

The temperature of the room is measured using a temperature sensor. The room's temperature will be monitored and output sent to the microcontroller if it is abnormal.

LDR Sensor:

A light-dependent resistor, or LDR, modifies its resistance based on the amount of light striking it. According to the photo conductivity hypothesis, resistance rises with increasing light intensity and decreases with decreasing light intensity.

WIFI Module

All wireless devices that send and receive data over Wi-Fi are communicated with using WIFI modules or WIFI microcontrollers. They can also respond to commands transmitted via Wi-Fi. For device-to-device communication, Wi-Fi modules are employed. The Internet of Things is where they are most frequently used.

Camera

The robot uses a camera to show the image of the room. Additionally, it may record anything that occurs in the room. The camera captures everything constantly and outputs to the microcontroller.

Motor Driver

The motor is driven by a motor driver. It is a part of the microcontroller's network. Motor driver uses microcontroller input to drive the motor in this manner.

Motor

Robot movement is accomplished by a motor. The motor rotates the robot by receiving input from the motor driver. An attached motor has four wheels.

3.4.3.2 Control Unit

The control unit is a component where we can both view and control the output of our security robot. Mainly two parts make up the control unit. Those are:

- Camera Feed
- Web Interface

Camera Feed

The output of the camera is obtained using Camera Feed. All captured footage is viewable in real time on a computer via camera feed.

3.5 Features and technical specification of functional components

To accomplish this project precisely, various components have been utilized. This project could be constructed with better materials; however, these materials are readily available in our nation. The characteristics and specifications of utilized components are detailed in the following sections.

3.5.1 HC-SR04 Sonar Sensor

The ultrasonic range module HC-SR04 has a minimum non-contact measuring range of 2 cm and a maximum range of 400 cm. The maximum range accuracy is 3 mm. The modules are equipped with ultrasonic transmitters, receivers, and control circuits. The fundamental premise of labor. If the signal returns at a high level, the period between transmitting and receiving ultrasonic waves is the high output IO duration. Using IO trigger for at least 10 μs signal,

A single I/O pin emits an ultrasonic sound pulse that is louder than human hearing; the echo back pulse is then "listened" for. The sensor detects the time necessary for the echo return and provides this value to the microcontroller through the same I/O pin with a variable-width pulse.[3]

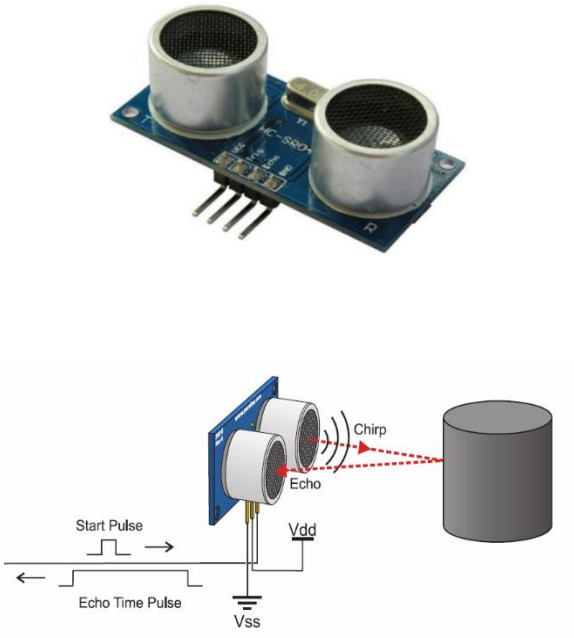

Figure 3.4 Sonar Sensor & working process

3.5.2 LM35 Temperature Sensor

The output voltage of precision integrated-circuit temperature sensors from the LM35 series seems to be sequentially proportional to the absolute temperature in degrees Centigrade. The LM35 device has an advantage over linear temperature sensors measured in Kelvin since the user can obtain convenient Centigrade scaling without having to subtract a sizable constant voltage from the output. The LM35 device offers typical accuracy of 14°C at room temperature and 34°C over the entire temperature range of 55°C to 150°C without requiring any external calibration or trimming.

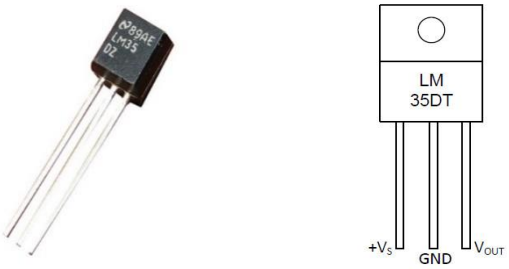

Figure 3.5 Temperature Sensor (LM35)

Advantages of LM35 Sensor:

• We are able to detect temperature more precisely than with a thermistor thanks to the LM35 Sensor.

• The sensor electronics are encased to prevent oxidation and decomposition.

• It may not be necessary to amplify the output voltage because the LM35 provides a higher output voltage than thermocouples.

3.5.3 PIR Motion Sensor

The ability to detect motion provided by PIR sensors is almost always used to determine whether a person has entered or left the sensor's field of view. They are affordable, low-power, easy to use, lightweight, and robust. Because of this, they are frequently found in equipment and appliances used in residences and workplaces. They are frequently referred to as PIR, pyroelectric, passive infrared, or IR motion sensors.[4]

Figure 3.6 PIR Motion Sensor

Features of PIR Sensor:

Each of the two slots in the PIR sensor is made of a unique substance that is IR-sensitive. We can see that the two slots can 'look' out over a certain distance because the lens being employed here

is not actually doing much (basically the sensitivity of the sensor). When the sensor is not in use, both slots pick up the same amount of IR, which is the background radiation coming from the room, the walls, or the environment. A warm body, such as a person or animal, first intercepts one half of the PIR sensor when it moves in front of it, which results in a positive differential change between the two halves. In the opposite situation, the sensor produces a negative differential change as soon as the warm body departs the sensing region. These change pulses are detected [5].

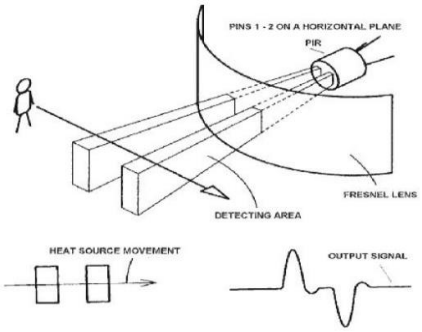

Figure 3.7 PIR Motion Sensor working process [6]

3.5.4 MQ2Gas Sensor

SnO2 (Scandium di Oxide), which has a lower conductivity in clean air, is the sensitive material used in the MQ-2 gas sensor. The conductivity of the sensor increases along with an increase in gas concentration when the target combustible gas is present. The MQ-2 gas sensor is inexpensive, versatile, and highly sensitive to LPG, Propane, and Hydrogen as well as methane and other combustible gases.[7]

Figure 3.8 Gas sensor (MQ2)

Features of MQ2 Gas sensor

- A wide range of excellent flammable gas sensitivity.
- Abnormally sensitive to LPG, propane, and hydrogenLong life and low cost
- Basic drive circuit [7]

Application

- Gas leak detector for homes.
- Detector for Industrial Combustible Gas.
- Hand-held gas detector. [7]

3.5.5 Light Sensor

A variety of optical qualities are utilized by photoelectric sensors to distinguish objects, surface condition changes, and other phenomena. The majority of a photoelectric sensor consists of an Emitter that generates light and a Receiver that receives light. When emitted light is absorbed or reflected by a detecting device, the quantity of light that reaches the Receiver varies. The receiver detects this change and converts it into an electrical output. The light source for the majority of photoelectric sensors is infrared or visible light, which is often red or green/blue for discriminating colors.

Figure 3.9 Light Sensor

3.5.6 Motor Driver

The purpose of a motor driver is to transform low-current control signals into high-current signals that can drive motors. It is a tiny current amplifier.

Figure 3.10 Motor Driver

Applications of Motor Drivers:

Motor drivers can be found in a wide array of applications including:

- Relay and solenoid switching
- Stepping motor
- LED and incandescent displays
- Automotive applications
- Audio-visual equipment
- PC Peripherals
- Car audios
- Car navigation systems [19]

3.5.7 ESP32 Microcontroller

The ESP32-CAM is a fully functional microcontroller with a built-in video camera and microSD card socket. It is practical for Internet of Things (IoT) devices that require a camera with advanced features like image tracking and recognition. It is also inexpensive and easy to use.[8]

Features

Since the ESP32-CAM is based on the ESP32-S module, it has similar features. It has these characteristics:

- 802.11b/g/n Wi-Fi
- Bluetooth 4.2 with BLE
- Multiple Sleep modes
- PWM interfaces, UART, SPI, I2C
- Clock speed up to 160 MHz
- 520 KB SRAM plus 4 MB PSRAM
- Supports WiFi Image Upload
- Computing power up to 600 DMIPS [8]

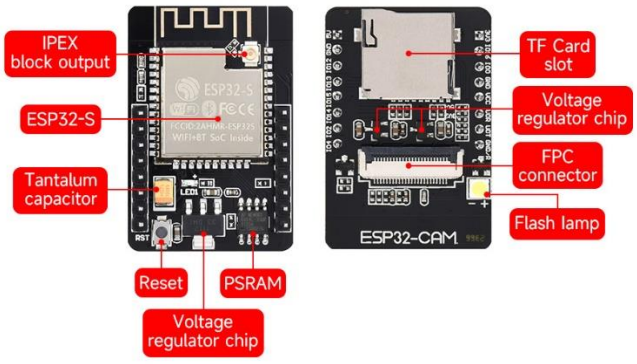

Figure 3.11 ESP32 CAM Microcontroller

3.5.8 DC Motor

Direct current electrical power is converted into mechanical power by any of a group of electrical appliances referred to as DC motors. The forces of the magnetic field are used by the majority of types. Nearly all types of DC motors have an internal electromechanical or electronic mechanism that enables them to sporadically change the direction of the motor's current flow. While the

majority of motor types produce rotating motion, a linear motor generates force and motion in a straight line. A DC motor drives the robot's motion. [3]

Figure 3.12 DC Motor

3.6 Summary

The functional analysis that was used to construct the robotic security system is presented in this chapter. In this chapter, the security system's specifics are introduced. The components' attributes and characteristics have been described.

Chapter 4
Design Specification

4.1 Front end Design

For our web interface we used:

- Html
- CSS
- Java Script

4.2 Back-end Design

For back-end design, we used three types of programming languages. They are C, C++. In back-end, here works two types process, they are:

- **Notification Process:** At first robot sense the data. If there is find any suspicious thing, it will send the signal to the micro-controller. Then microcontroller send the notification to the app.

- **Showing data process:** This process almost works like notification process. At first robot sense the data. If there is find any data, it will send it to the micro-controller. Then microcontroller send data to the web interface.

4.3 Interaction Design and User Experience

User experience or UX design is the process that a system should be user friendly. If the process is not user friendly then we call it a bad UX design. Our web interface is very user friendly. We make it very simple so that everyone can easily understand the whole thing. If anyone randomly see our web interface than for the first time he can operate the interface very easily without facing any difficulties.

4.4 Implementation Requirements

For implement the front-end design and backend design we use:

Arduino IDE:

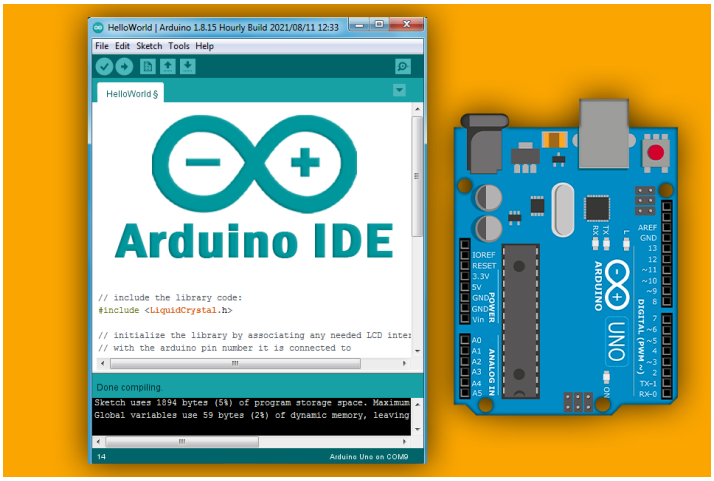

Figure 4.1 Arduino IDE

Putty:

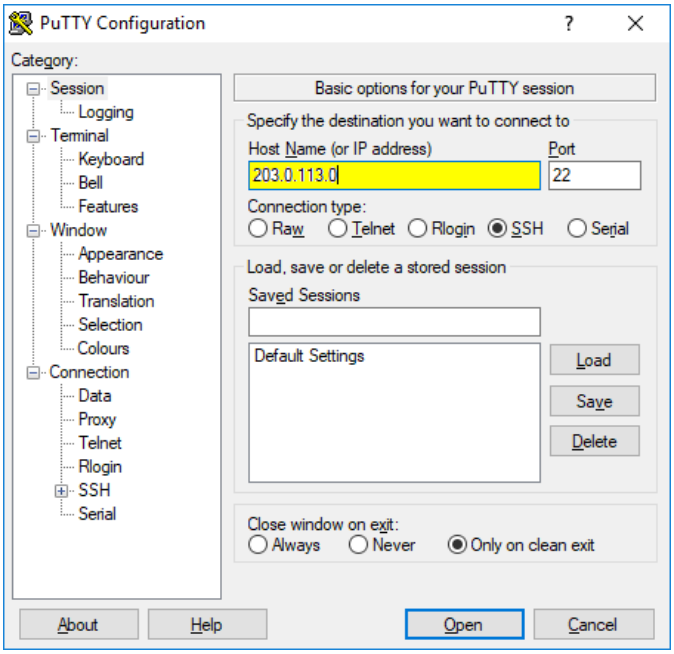

Figure 4.2 Putty

Chapter 5
Implementation and Testing

5.1 Implementation of Frond-end Design

This is our front-end design. When a user enters into the web interface he can see a view like this

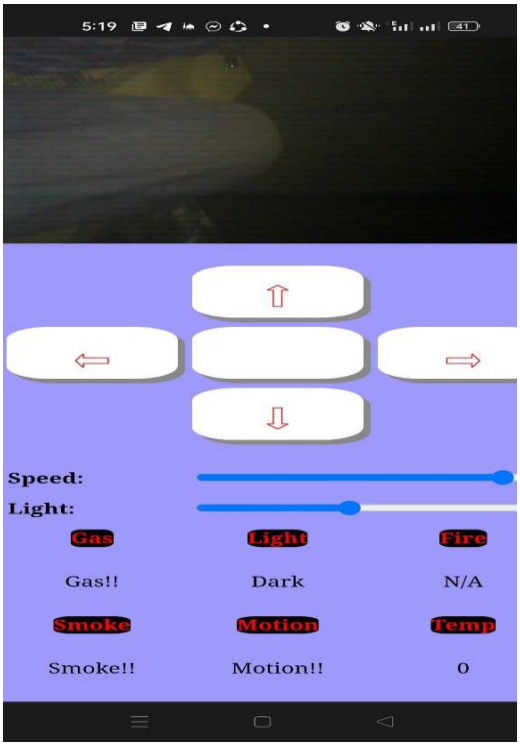

Figure 5.1 Full view of our web interface

Figure 5.2 Live Video Feed

In the figure 5.2 a user can see the live video feed of the robot. Our robot has a camera so we can see the live video through the robot camera.

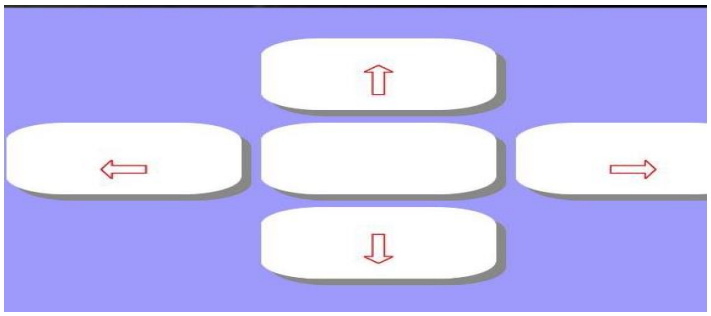

Figure 5.3 Control button of the robot

In the figure 5.3 we can see 4 buttons. We can control the robot in left, right, up and down in our will using these 4 buttons.

Figure 5.4 Control light and speed

In the above figure we can see that there are two controllers. One is for the speed and another is for controlling the light. We can control the movement speed of the robot and also can increase the light level.

Figure 5.5 Sensors

In the figure 5.5 we can see that there are 6 types of sensor. All the sensors give us feedback in the web interface and also send notification when something happened through internet in our mobile app.

5.2 Testing Implementation

Mechanical design can lead to the formation of the entirely new machine or it can lead to improvement of the existing machine. The efficiency of a machine depends on its mechanical design. In this project the hardware design and Implementation is the most important part. Here we describe the entire hardware design and implementation of our Robot control security system.

Transmitter of the Robot

Transmitter side of security robot is inside of the robot. The list of the components of transmitter part is given below

- Microcontroller
- WIFI Module
- Connecting wire
- Sensors

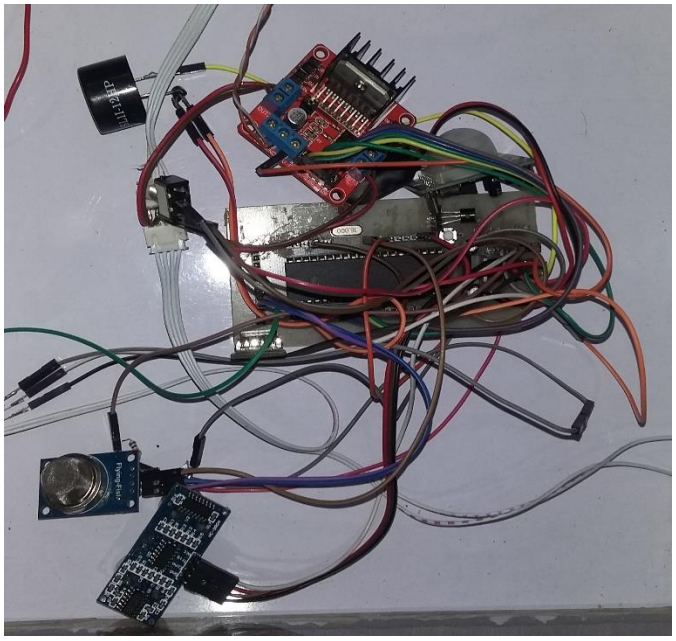

Figure 5.6 Transmitter side of the robot

Receiver of the Robot

Receiver side of security robot is the control unit. It contains with a web interface. Microcontroller is also in transmitter side. With this we can control the robot in manual mode and get data of sensors in web interface display.

The list of the components of transmitter part is given below

- Web interface Display
- Microcontroller
- WIFI Module
- Connecting wire
- Battery

Robot Moving Unit

Robot movement part contains with four wheels. Those four wheels are connected with four DC motor, which is connected with motor driver and microcontroller.

The list of the components of transmitter part is given below

- DC Motor (4 piece)
- Motor driver
- Wheel (4 piece)
- Battery

Figure 5.7 Robot's wheels

Entire Body of the Security Robot

Robot main body contains with power supply battery, Microcontroller, and all the sensors. Here is the view of our security robot's main body.

Figure 5.8 Main body of Robot

5.3 Test Results and Reports

Output: Our robot will give us notification at our mobile app.

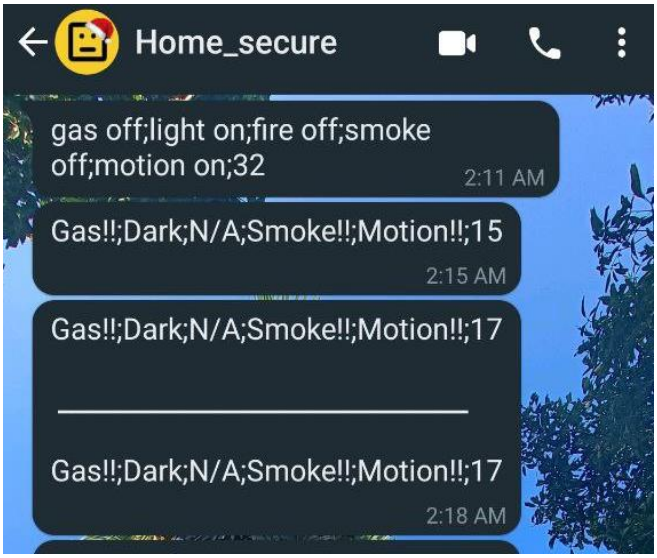

Figure 5.9 Notification result

Report:

Gas Detection	 Here we can see that gas is detected
Fire Detection	 Here we can see that there is no fire
Light Detection	 Here we can see that the room is dark and no light is detected
Motion Detection	 Here we can see that motion is detected
Temperature Level	 Here we can see that temperature is 0.

Table 5.1 Test result and report

Chapter 6
Impact on society, Environment and Sustainability

6.1. Impact on society

Our creation of a robot control security system will have a significant impact in society. It will inspire people in society if it functions well. And they'll use it to ensure security in their home. The security of our society will then be enhanced. It will decrease social crime and ensure our society's security.

6.2 Impact on Environment

The environment won't be significantly harmed by this robotic system. Even so, its beneficial effects will be more noticeable. To prevent environmental pollution, we used rechargeable batteries. There is no risk of sound pollution because it won't generate any noise. The sensors we utilize will generate some radiation, but not enough to cause environmental harm.

6.3 Ethical Aspect

In our home, our robot will maintain multi levels of protection. This robot will not be used to attack another person's privacy. The likelihood of any unethical act, like as theft or robbery, occurring in our home is extremely minimal because there is a camera here and we have access to it 24 hours.

6.4 Sustainability Plan

The power is provided by a battery in this robot. If the battery will die, our robot will not work. For that reason, we have a backup plan. Before dying, we charge the battery with adapter.

Chapter 7
Conclusion and Future Scope

7.1 Discussion and Conclusion

7.1.1 Discussions

Our project aims to provide better and more advanced security for households. The security robot has a manual mode of operation that enables controller control. This project makes use of a variety of sensors, including sonar sensor, temperature sensor, gas sensor, motion sensor, and LDR sensors, in order to gather the information needed to protect against intruders, gas explosions, and fires, among other hazards.

7.1.2 Conclusion

Technology is constantly evolving. The use of security robots will become more prevalent. A nation's development may benefit from the use of this robot. We have some restrictions in this system because of cost, availability, and time constraints. However, by expelling these limitations, this system can be improved. This proposal is the very beginning of work that may eventually change the security system. We intend to effectively carry out this project in the near future and disseminate this robot to the general public, which will play a significant role in humanity.

7.2 Scope for further development

There are numerous ways to enhance this project. This project can be created utilizing a GSM module and a GPS tracker.

7.2.1 Using of GSM/GPRS Module

A computer and a GSM-GPRS system can communicate thanks to the GSM/GPRS module. Most nations use the Global System for Mobile Communication (GSM) architecture for mobile communication. Global Packet Radio Service, a GSM addition, allows for faster data transfer rates (GPRS). A GSM/GPRS module is constructed from a GSM/GPRS modem, a power supply circuit, and computer connection interfaces (such as RS-232, USB, etc.). Such modules' soul is the MODEM. By using GSM/GPRS module in our project we can get sms in our mobile when there is a security breach.

7.2.2 Using of GPRS Tracker

We are able to monitor every movement of the robot makes in this project by using GPRS Tracker. As a result, we can locate our robot.

References:

[1] D. W. Payton, D. Keirsey, D. M. Kimble, J. Krozel, and J. K. Rosenblatt, “Do Whatever Works" A Robust Approach to Fault-Tolerant Autonomous Control,” 1992.

[2] “https://pbs.twimg.com/media/C0xKryPXcAAqgfc.jpg - Google Search.” https://www.google.com/search?q=https%3A%2F%2Fpbs.twimg.com%2Fmedia%2FC0xKryPXcAAqgfc.jpg&tbm=isch&ved=2ahUKEwjKm9Og2Kb8AhXL0qACHZqdCMgQ2-cCegQIABAA&oq=https%3A%2F%2Fpbs.twimg.com%2Fmedia%2FC0xKryPXcAAqgfc.jpg&gs_lcp=CgNpbWcQAzoECAAQQzoICAAQgAQQsQM6CwgAEIAEELEDEIMBOgUIABCABFCMDViDFWCfH2gAcAB4AIABaogBmAOSAQMxLjOYAQCgAQGqAQtnd3Mtd2l6LWltZ7ABAMABAQ&sclient=img&ei=G6exY4qiBMulg8UPmruiwAw&bih=577&biw=1280 (accessed Jan. 01, 2023).

[3] “Ultrasonic Ranging Module HC-SR04.”

[4] “HOW PIR SENSOR WORK - Hackster.io.” https://www.hackster.io/diy-partners/how-pir-sensor-work-9f76b6 (accessed Jan. 01, 2023).

[5] “PIR Motion Sensor | Adafruit Learning System.” https://learn.adafruit.com/pir-passive-infrared-proximity-motion-sensor/how-pirs-work (accessed Jan. 01, 2023).

[6] “working principle of PIR motion sensor | Download Scientific Diagram.” https://www.researchgate.net/figure/PIR-Motion-Sensor-working-principle_fig3_312559421 (accessed Jan. 01, 2023).

[7] “MQ-2 Semiconductor Sensor for Combustible Gas.”

[8] “ESP32-CAM - Getting Started & Solving Common Problems.” https://dronebotworkshop.com/esp32-cam-intro/ (accessed Jan. 01, 2023).

report

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