Iot Based Home Security System Using Arduino

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Abstract

As home security has become an important aspect in life and is necessary to be in every home due to the rising crime rates and robbery that is happening in out day to day life. In this work in progress paper we evaluate an application of home security system using Arduino. This project is based on the implementation in the IOT domain home security system which will allow to make homes secure from anywhere in the world. The main objective of this project is it should be cost effective and at the same time also secure, and this can be achieved by the use of IOT devices and other low cost electronic components and using them in such a way to build a secure home security system. This project was remove some of the limitations in the previous home security system applications. Home security is very useful application of the IOT domain and we will be using it to build a low cost security system that can be affordable by almost everyone.

Introduction

The sensors placed on the door informs the home owner as soon as the door is opened by sending a Push notification. The user will get this notification irrespective of whether the phone is locked or unlocked or even if any other app is opened at the moment. This was the main objective of the project, which is the user feels safe and not worry about any intrusion or break-ins when he is away from home. This setup can also be used in commercial offices where some areas are restricted for certain personnel, such a system will immediately inform the administrator of any unauthorized personnel trying to access such an area. Therefore the extensibility and applicability of such a system is only limited only by the imagination. Another important component of the project is the connectivity between the ESP8266 (WiFi module) and the Blynk server. The system successfully connected to the Blynk server using the authentication token and the Blynk libraries. As a result, we were able to get the notification on our smart phones as soon as there was any change in the status of the reed module sensor. Also the additional ability to control the alarm remotely is very beneficial and can be very useful in some unforeseen circumstances. It was also observed that the Blynk app worked smoothly and carried out all communication between the hardware and the app very accurately.

Literature Review

IoT refers to the infrastructure of connected physical devices which is growing at a rapid rate as huge number of devices and objects are getting associated to the Internet. Home security is a very useful application of IoT and we are using it to create an inexpensive security system for homes as well as industrial use. The system will inform the owner about any unauthorized entry or whenever the door is opened by sending a notification to the user. After the user gets the notification, he can take the necessary actions. The security system will use a microcontroller known as Arduino Uno to interface between the components, a magnetic Reed sensor to monitor the status, a buzzer for sounding the alarm, and a WiFi module, ESP8266 to connect and communicate using the Internet. The main advantages of such a system includes the ease of setting up, lower costs and low maintenance.

PROPOSED SYSTEM

The proposed application uses image processing for security by using ESP32 cam with Arduino microcontroller. ESP32 cam allow face ids to be added for the user for the authentication and access control for the door lock and security. Security being the main intent of the project, the most important application of this system is any domestic security. By using this project, a person will be intimidated about any incident likely to be caused by fire, theft, or LPG gas – REMOTELY. The main advantage of this system is that it is fully automated. Once installed, it does not require any kind of human interaction. Also, it is very cost-effective.

Before we begin connecting the hardware, we have to get the ESP8266 set up by flashing the latest version of the firmware available for the module. This is because the chip comes with an older version of the AT command firmware pre-installed out of the box which cannot communicate with the Blynk libraries efficiently and will give an error with our code. To flash the latest firmware, download the ESP8266 flasher tool and the latest firmware from the internet which would be in the bin format and set up the ESP8266 to the Arduino Uno as described below in figure. Once the ESP8266 has been flashed with the latest firmware, other components can be added to the configuration. For this we will need a breadboard to connect the microcontroller, reed sensor, buzzer and the ESP8266 using the jumper wires. The breadboard is used to interface between the various components available. It also makes it easy to connect multiple inputs to a single pin on the arduino board. Following sketch shown, which has been constructed using the Fritzing software shows how the components are supposed to be connected together using the breadboard and the jumper wires. The final configuration need not be identical to the given sketch, although the pins on each device needs to be connected to the same corresponding pins on the Arduino Uno board . The architecture diagram is shown in figure
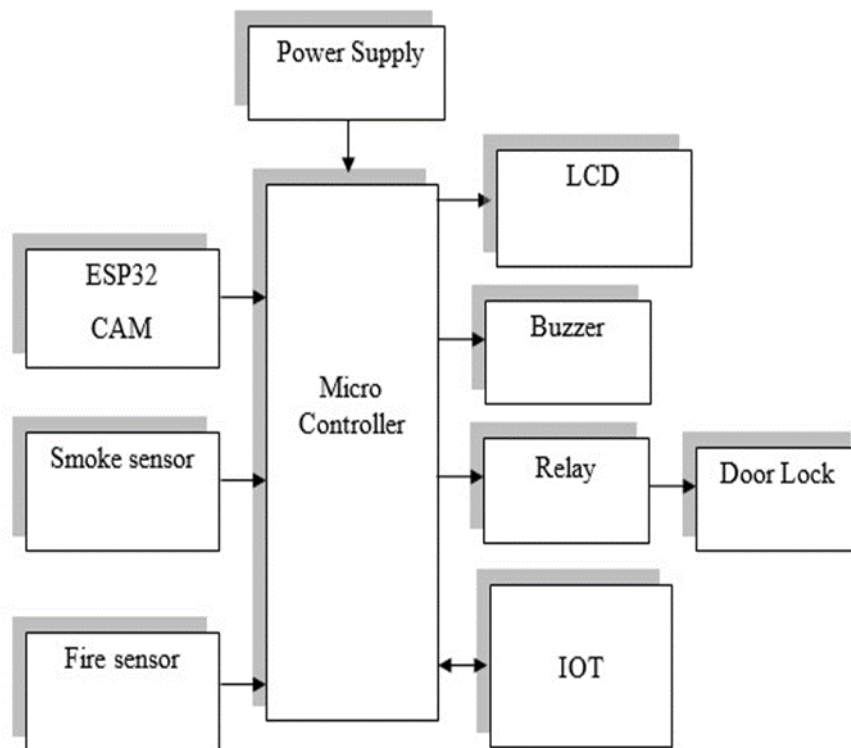
Figure 1 – Block Diagram of IOT BASED HOME SECURITY SYSTEM

The ESP32 microcontroller and is the brain of our project, it serves as the central processing unit, which receives data from various input devices such as the module, processes the data, and triggers the necessary actions to prevent any potential danger. The ESP32 is well-suited for IoT applications due to its built-in Wi-Fi and Bluetooth connectivity. This allows the microcontroller to connect to the internet and send data to remote servers or cloud-based platforms for further processing and analysis. several pieces of hardware are necessary. Table 1, has been provided to detail the required components, including their quantities and cost in Indian Rupees. The cost for the system is quite low, at a total of 2267 rupees. Figure 2 displays required components for building IOT based home security system.

Table 1: Required Components, Quantity, and price

EQUIPMENT	QUANTITY	PRICE (INR)
Power Supply	1	200
Relay	1	118
ESP32 CAM	1	900
16x2 LCD	1	199
Buzzer	1	20
DC Motor	1	55
Arduino	1	520

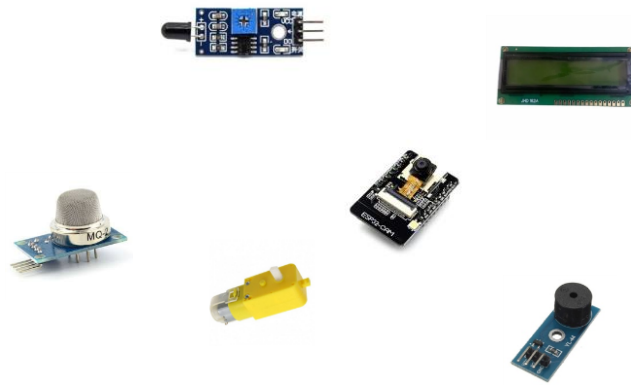| Fire sensor	1	55
Smoke sensor	1	200

TOTAL: 2267

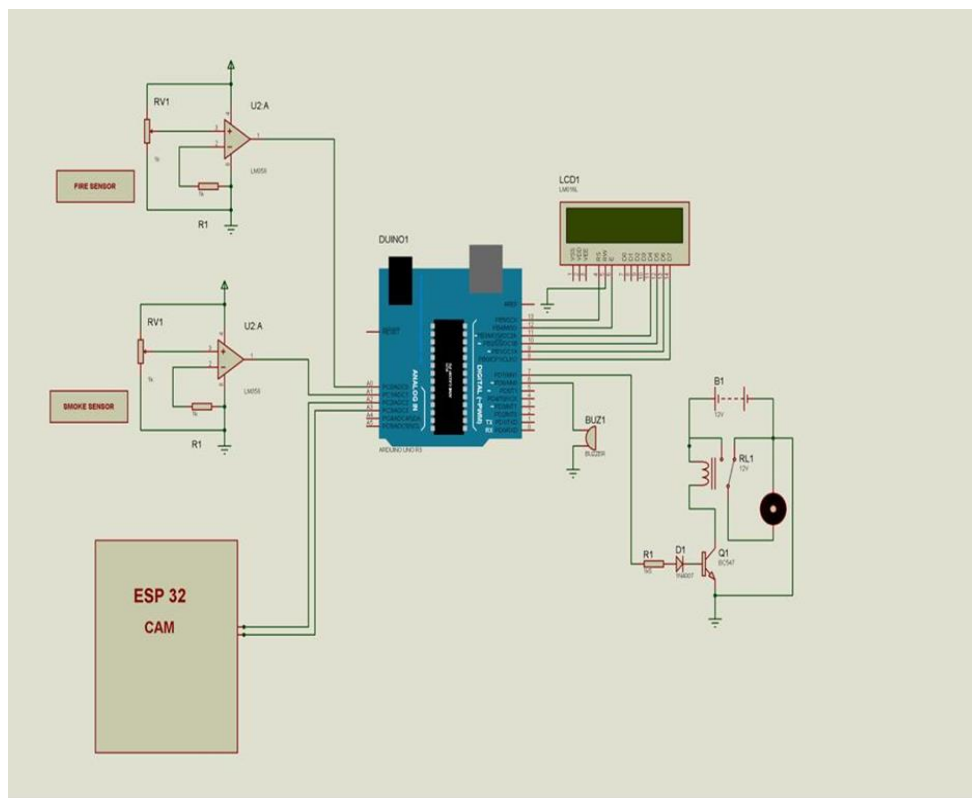**Figure 2** – Required Components for development

Figure 3 – Schematic Diagram designed using fritzing application

Future Work

Further developments and improvements on the IOT home security system Feature project have great potential. The following are some potential future research are as Enhanced Security Features: The system can be further improved by integrating advanced security features such as facial recognition, voice recognition, or biometric authentication to enhance the overall security of the home. Cloud Integration: By integrating the system with cloud platforms, users can access their home security system remotely from anywhere using mobile devices or web browsers. Cloud storage can also be used to store captured images and videos for later analysis or evidence. Machine Learning and AI: Implementing machine learning algorithms and artificial intelligence techniques can enable the system to learn and adapt to user behavior, detect anomalies, and provide more intelligent and accurate security alerts and notifications. Smart Home Integration: Integrating the home security system with other smart home devices and systems can create a comprehensive smart home ecosystem. For example, the system can automatically lock doors, turn off lights, or adjust the thermostat when security breaches are detected. Energy Efficiency: The system can be optimized for energy efficiency by implementing power-saving modes and intelligent scheduling algorithms to minimize power consumption while ensuring continuous security monitoring. Mobile Applications: Developing dedicated mobile applications for iOS and Android platforms can provide users with a user-friendly interface to monitor and control their home security system on their smartphones or tablets. Data Analytics and Insights: By analyzing the captured data, patterns and trends can be identified to gain insights into home security, allowing homeowners to make informed decisions about potential security risks and preventive measures.

Result
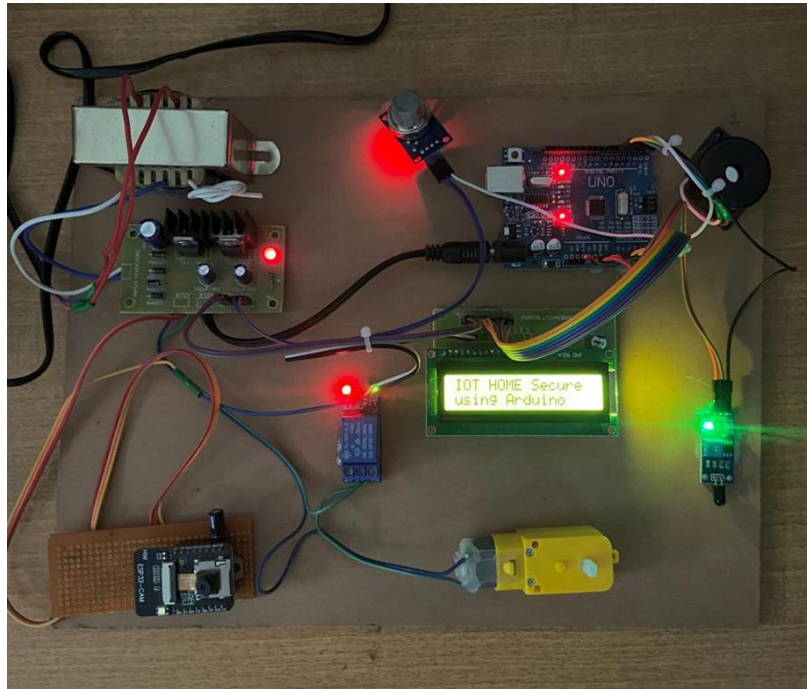
Conclusion

This paper proposes and discusses the design of the project **"IOT BASED HOME SECURITY SYSTEM "** has been successfully designed and tested. It has been developed by integrating features of all the hardware components used. . Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit. Secondly using highly advanced IC's and with the help of growing technology the project has been successfully implemented. By leveraging the Internet of Things (IoT), this system enables remote monitoring and control of your home security. The ESP32-CAM captures real-time video footage, which can be streamed and accessed remotely through a web or mobile application. This allows homeowners to keep an eye on their property from anywhere at any time, enhancing the overall security and peace of mind. The Arduino serves as the central processing unit, responsible for integrating and managing various components of the security system. It connects to sensors such as motion detectors, door/window sensors, and smoke detectors, among others, to detect potential threats or intrusions. When an event is triggered, the Arduino can send alerts or notifications to the user's smartphone or email, ensuring prompt response and appropriate action.

Enhanced Surveillance: The ESP32-CAM module enables image and video capture, allowing for real-time monitoring and recording of activities in and around the home.

Remote Access and Control: The system can be accessed and controlled remotely through a Wi-Fi connection, providing convenience and flexibility to homeowners.

Integration with Sensors: The proposed system can integrate with various sensors, such as motion sensors, door/window sensors, and temperature sensors, enhancing the overall security and automation capabilities of the system.

Customizability: The system can be tailored to fit specific project requirements, allowing for customization and expansion with additional devices and features as needed.

Cost-Effective: The components used in the proposed system, such as the ESP32-CAM and Arduino, are generally cost-effective, making the system affordable and accessible for homeowners.

Improved Notification and Alert Mechanism: The system can send notifications and alerts through Wi-Fi, providing timely information about security events or abnormalities.

Power Efficiency: The ESP32-CAM and Arduino can be powered by a power supply or batteries, ensuring continuous operation even during power outages.

Potential for Integration with Home Automation: The proposed system can be integrated with home automation platforms, allowing for seamless control and coordination with other smart devices in the home.

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