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HOME SECURITY SYSTEM USING IOT

¹ Akhilesh Prasad, ² Rishi raj sawaiyan, ³ Abhishek kumar, ⁴ Mehul kumar, ⁵ Piyush Vishwakarma

¹ Computer Science Engineering, Shri Shankaracharya Technical Campus, Bhilaichoudharyji2002@outlook.com

² Computer Science Engineering, Shri Shankaracharya Technical Campus, Bhilairishirajsawaiyan@gmail.com

³ Computer Science Engineering, Shri Shankaracharya Technical Campus, Bhilaiabhishekkumar2492002@gmail.com

⁴ Computer Science Engineering, Shri Shankaracharya Technical Campus, Bhilaikumarmehul652@gmail.com

⁵ Computer Science Engineering, Shri Shankaracharya Technical Campus, Bhilaipiyushvishwakarma9@gmail.com

ABSTRACT :

This paper presents the design and implementation of an intelligent home security system leveraging the Internet Of Things (IOT). The proposed system integrates various sensors (e.g., motion, door/window and camera) with a central processing unit to provide real-time monitoring and alerts. Data collected from the sensors are transmitted wirelessly via IOT protocols to a cloud platform for analysis and storage. Users can remotely access and contol the system through a mobile application, receiving instant notifications of potential security breaches and viewing live video feeds.

Keywords - pir Sensor, IoT, buzzer, iot module, Sustainable Development, Sensor Automation

Introduction

Home security has always been a primary concern for individuals and families. Traditional security systems such as mechanical locks, wired alarms, and CCTV cameras offer basic protection but lack smart features, real-time alerts, and remote accessibility. These systems often require manual operation and cannot alert the user immediately if any intrusion happens while they are away from home.

With the advent of the Internet of Things (IoT), technology has transformed the way security is handled in modern homes. IoT refers to the interconnection of devices and sensors via the internet, allowing them to collect, exchange, and act on data in real-time. By leveraging IoT, home security systems can be made intelligent, automated, and accessible remotely through smartphones or computers.

This project focuses on designing and developing an IoT-based smart home security system that uses a combination of motion sensors (PIR), magnetic door sensors, Wi-Fi-enabled microcontrollers (like NodeMCU or ESP32), and cloud services to detect suspicious activities and immediately notify the user. The system can also include a camera module to capture images or video upon detection of motion, enhancing the verification process.

System Design

Components Used:

- NodeMCU (ESP8266) Microcontroller with Wi-Fi
- PIR Sensor Motion detection
- Door Sensor Entry detection
- Buzzer Alarm
- Camera Module Captures intruder image
- Mobile App / Blynk / Firebase For alerts and control

Working:

- Sensors detect intrusion or motion.
- NodeMCU processes input and sends alert via Wi-Fi.
- Alert sent to user's mobile with timestamp and image.
- Buzzer triggers and image/video stored on cloud.

Implementation

The implementation of the IoT-based Home Security System involves the integration of hardware components, software tools, and cloud-based services to create a reliable and responsive smart security solution. The system primarily uses *NodeMCU (ESP8266)* as the microcontroller due to its built-in Wi-Fi capabilities and compatibility with IoT platforms like *Blynk* or *Firebase*.

Hardware Setup

The main components used in the system include:

- PIR Motion Sensor for detecting human movement.
- Magnetic Door Sensor for monitoring the open/close status of doors or windows.
- Buzzer for alerting locally when intrusion is detected .
- LED as a visual indicator of system activation or intrusion.
- NodeMCU ESP8266 as the central controller that processes input from sensors and sends real-time notifications.
- Power Supply to provide stable voltage to all components.
- All sensors are connected to the digital input pins of NodeMCU, while the buzzer and LED are connected to the output pins. The components are powered through the NodeMCU using a USB cable or an external power adapter.

Software and Programming

The software development is carried out using Arduino IDE, where the logic is programmed in embedded C/C++. The system logic is as follows:

- The PIR sensor detects motion within its range.
- The door sensor detects whether the door is open or closed.
- If any abnormal activity is detected (motion or door opening), the system:
 - o Activates a buzzer and LED as a local alert.
 - Sends a notification to the user via the Blynk App (or Firebase in an alternate setup).
- Once the situation normalizes, the system resets itself to the monitoring state.

The Blynk App is configured with a Notification widget that communicates with the NodeMCU using an authentication token and Wi-Fi credentials. When triggered, it sends instant alerts to the user's smartphone.

Result

The IOT-based home security system effectively integrates sensors, a central unit, and a cloud platorm for real-time monitoring and alerts accessible via a mobile app. It demonstrated accurate sensor performance, reliable remote control and customizable notifications, showcassing the potential of IoT for user-friendly and efficient home security.

Conclusion

The IoT-based Home Security system effectively uses sensors, cloud, and a mobile app for real-time monitoring, alerts, and remote control, offering a user-friendly and cost-effective security solution with potential for future smart home integration.

Daigrams



Figure 1. Diagram of the IoT-based home security system.



Figure 2. blockdaigram of the IoT-based home security system

Future Scope

The current implementation of the IoT-based home security system offers a solid foundation for real-time surveillance and alert mechanisms. However, the system can be further enhanced and scaled in the future through the following developments:

- Integration with camera (CCTV/ESP32-CAM)
- Use of AI/ML for face recognition and activity analysis
- SMS and call alerts using GSM module
- Smart lock system integration
- Battery backup and solar power support
- Cloud-based data logging and analytics
- Voice assistant support (Alexa, Google Assistant)
- Multi-zone home coverage with centralized control

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