International Journal of Applied Engineering & Technology

DESIGN OF IOT BASED ADVANCED HOME SECURITY SURVEILLANCE SYSTEM

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ABSTRACT
Security is an extremely important aspect of our daily lives. Everyone seeks to be as secure as possible. Knowing that our homes or businesses are safe gives us peace of mind. Unfortunately, theft has become a significant issue these days. In today's world, ensuring safety and security is an absolute necessity. As modern technology continues to advance, the demand for security systems is steadily increasing. Contemporary homes require smart systems that minimize the need for human intervention. With the rise of digital and wireless technologies, automated security systems have become more sophisticated. Surveillance cameras allow users to remotely monitor their homes, while sensor networks enhance security based on the types of sensors used. Integrating WiFi into these security systems allows for faster data transmission, enabling users to monitor and control the systems from anywhere in the world with the precision offered by devices like Raspberry Pi.

Keywords: Security, Safety, Digital, Wireless, Data transmission

I. INTRODUCTION

Surveillance, whether in homes or large industries, plays a crucial role in ensuring our security. Issues like burglary and theft have always posed significant challenges. In large industrial settings, personal safety often involves monitoring people's activities and behaviors to protect, manage, and influence personal information. Surveillance involves observing from a distance using electronic devices such as CCTV cameras. Everyone should have the right to live without fear and the confidence to conduct business without worrying about security.

The system developed in this study provides security while preserving individual privacy, as it allows only one person to view the surveillance footage. Additionally, it utilizes a simple circuit design. The system operates using a Node MCU, which enables the transmission of images to a smartphone. Traditional surveillance systems often face challenges and incur high energy costs. In contrast, an energy-efficient, portable system is preferable, as it can capture images during a burglary incident. This system helps individuals become more independent and feel secure in their daily activities. It also sends out an alert signal, making it more effective than current surveillance systems.

To ensure security, the homeowner or company can place a camera in a specific area that requires monitoring. The system allows users to access and monitor security from various locations, even remotely. With internet connectivity, the user can oversee the remote surveillance system using a smartphone. This system is particularly useful for projects focused on securing a specific location while monitoring from different, potentially distant, places. The primary goal of this study is to develop a security system that is both affordable and flexible in terms of location. The specific objectives include:

OBJECTIVES OF THE STUDY
a. **Design a Simple, Cost-Effective PIR Security System:** The primary objective is to create a security system based on Passive Infrared (PIR) technology that is simple, affordable, and easy to implement using existing technology.

b. **Remote Control of Workplaces and Homes:** The system will be designed for individuals who wish to control and monitor their office, home, or workplace from a distance.

c. **Fabrication of a Portable PIR Security System:** The goal is to develop a small, portable, and stand-alone PIR-based security system that includes its own power source, making it easy to implement. The system will also

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feature energy-efficient components that provide instant alerts, making it cost-effective for both residential and personal use.

Application of IoT in Security Systems

The Internet of Things (IoT) has gained significant attention with the advent of technological advancements and the Industry 4.0 revolution. IoT applications have been widely implemented across various sectors, including security systems, industry, agriculture, and healthcare. Numerous studies have explored IoT-based smart home systems, particularly in the realm of home security.

For instance, a previous study suggested the use of Raspberry Pi, ESP Wi-Fi modules, and reed sensors for home security. In that study, a reed sensor was placed at the front door, and users received a smartphone notification when the door was opened. However, this system still posed a significant risk of criminal activity due to its limited scope.

Another study focused on an IoT-based smart security and home automation system that utilized PIR sensors installed at the building entrance. When human movement was detected, the sensor triggered an input to the microcontroller, and the owner received a voice call notification. This system allowed the owner to take immediate action by turning on lights and alarms using a pre-programmed keypad button.

Moreover, previous IoT-based smart home systems, such as those using the Blynk Framework, consisted of three isolated sub-systems: relay module systems, GPS module systems, and temperature sensors. These systems also included PIR and ultrasonic sensors to measure water levels in connected tanks, all managed via Node MCU and Wi-Fi, with an interface through the Blynk App.

In contrast, smart home designs based on Ethernet systems can protect homes and monitor conditions such as humidity, temperature, gas leaks, and fire using sensors integrated with an Arduino Mega microcontroller and an Ethernet shield. However, these Ethernet-based systems are limited to local networks, which restricts their usability compared to more flexible IoT solutions.

The rapid growth of home automation systems has significantly enhanced our convenience, comfort, and overall quality of life, with a strong emphasis on security for all residents. As people have become accustomed to using automated devices, often referred to as smart devices, the constant advancements in technology have led to the creation of new devices almost daily. The Internet of Things (IoT) has played a pivotal role in making these smart devices even more intelligent and efficient.

In today's world, most homes contain electrical devices that are typically controlled manually. However, with the advent of IoT, these devices have become easier to operate through automation, simplifying daily tasks. Security has emerged as a primary concern, and IoT-based devices have proven to be effective in enhancing home security measures. These applications now support cloud-based solutions, and the devices themselves are interconnected with nearby devices, enabling seamless data sharing and improved functionality.

The Internet of Things is essentially the interconnection of all these devices, allowing them to communicate with each other to share data and perform tasks more efficiently. This interconnectedness has made these devices more capable of tasks that were previously impossible, particularly in the areas of home protection and surveillance.

In today's lifestyle, ensuring the security of living spaces has become crucial, as maintaining 24/7 monitoring and surveillance manually is challenging. The latest IoT technologies offer an effective solution to this problem. By utilizing IoT, homeowners can access critical information about security threats, receive alerts for potential damage or danger, and gain additional control over home appliances for greater convenience. IoT applications not only automate daily tasks but also enhance home surveillance, providing a comprehensive security solution.

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II. LITERATURE SURVEY

V.Krishnaveni et. al. designed an advanced electronic security system by using small PIR and IR sensors built around the Node MCU controller. PIR sensor sense the presence of intruder & Controller reads the signal from sensors and if intruder is detected, it compares the detected image with predefined images in the database then it turns on the buzzer as well as making a notification to predefined number. At the same time the video of intruder can also be monitored and make them anesthetic. [1]

Anitha et. al. prepared a "Home security system using internet of things" She developed a system that alerts the owner whenever there is an unauthorized entry or when the door is opened, by sending a notification to the user's device. Once the user receives this alert, they can promptly take the required actions. The system utilizes an Arduino Uno microcontroller to link the different components, a magnetic Reed sensor to track the door's status, a buzzer to emit an alarm sound, and an ESP8266 WiFi module to enable Internet-based communication and connectivity. [2]

Sruthy S et. al. The design and development of an IoT-based security surveillance system for buildings utilize the Raspberry Pi Single Board Computer (SBC) with WiFi network connectivity. Integrating wireless technology into embedded systems allows for capabilities such as global monitoring and control, as well as reliable data storage. This system features wireless sensor nodes and a central controller for surveillance purposes. Key aspects include remote user alerts, live video streaming, and portability.

The WiFi-enabled IoT module processes sensor events and communicates the status to the central controller. When an event notification is received, the controller activates the camera to capture the incident, notifies the user via email, phone call, and SMS, and streams the live video to a webpage. By incorporating the IoT module, the need for separate microcontrollers and wireless transceiver modules in the sensor nodes is eliminated, resulting in a more compact, cost-effective, and user-friendly system. [3]

Wadhwani et al. proposed a home automation and security system that integrates sensors with an Arduino controller. The system uploads the status of home appliances to a cloud platform via a wireless module, requiring the system and mobile device to be on the same wireless network. Users can control the sensors through the system, with a flex sensor responding to finger gestures for appliance control and a magnetic sensor enhancing door security against break-ins.

Taryudi et al. introduced an integrated home security and monitoring system utilizing Internet of Things (IoT) technology by combining Arduino Nano and Node MCU ESP8266 as controllers. This system includes an RFID reader, numerical code access for doors, and email notifications for users. It features a PIR sensor for intruder detection, a DHT-22 sensor for monitoring room temperature and humidity, a rain sensor for detecting rain, a fire sensor for stove fires, and LDR sensors for light conditions. Additionally, the system incorporates light bulbs and solenoid valves as actuators.

Ventylees et al. proposed an IoT-based smart home system that emphasizes user convenience. The system operates on a standard WiFi network and is implemented using the AllJoyn framework, with authentication managed through asymmetric Elliptic Curve Cryptography. A WiFi gateway serves as the central node, handling system initialization and authentication between IoT devices. It also provides a means for users to set up, access, and control the system through an Android-based mobile application. [6]

Pawar et al. concentrated on enhancing overall quality of life through IoT-based devices. Their system improves surveillance and energy management while also offering features such as direct messaging or SMS to nearby contacts, along with GPS location sharing and predefined messages with a single tap. All these functions are managed through a cloud system with active internet connectivity. [7]

Sarkar et al. proposed a smart wireless home security system that uses the Internet to send alerts to the owner in the event of a trespass and optionally triggers an alarm. This system can also be employed for home automation using the same sensors. A key advantage of this system over existing alternatives is its ability to deliver alerts and

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status updates via a WiFi-connected microcontroller to the user's phone, regardless of whether the phone is connected to the internet. The prototype uses the TI-CC3200 Launchpad board, which features an embedded microcontroller and an onboard WiFi shield, allowing for the control and management of all electrical appliances within the home. [8]

Medupu et al. designed a Home Security Surveillance System and Automation using Raspberry Pi, various sensors, and an IoT module. The system incorporates different types of sensors, such as Infrared (PIR) sensors, LPG gas sensors, and fire detection sensors, all connected to the Raspberry Pi. This compact yet powerful computer handles signal fetching and processing, and subsequently alerts the owner via email, text, or phone call.

Azlan et al. examined security challenges, requirements, and solutions in the context of smart homes. They investigated various security attacks that can affect smart home systems and evaluated their impact on overall system security. The study focused on identifying key security requirements and proposing solutions to address these vulnerabilities in smart home environments.. [10]

III. PROPOSED OBJECTIVES

Objectives of the Project

A. **Design Software For An Auto-Lock Security System:** Develop Software That Programs The Security System For A Room Door, Incorporating An Automatic Locking Feature.

B. **Demonstrate Computer Port Programming And Pc-Based Control:** Implement And Showcase The Concept Of Computer Port Programming, Enabling A Pc-Based Control System For Managing The Security Setup.

C. **Develop A User Interface:** Create An Intuitive Interface That Allows Users To Manage And Control The Security System Efficiently.

D. **Integrate Door System With Pc Using Communication Ports:** Connect The Door Security System To A Personal Computer Using Any Available Communication Port, Ensuring Seamless Interaction Between The System And The Pc.

E. **Design And Integrate Hardware For Alarm System Simulation:** Combine Hardware With Electronic And Electrical Components To Simulate The Security Features Of An Alarm System, Providing A Practical Demonstration Of Its Capabilities.

Proposed Implementation

The Plan Involves Using Raspberry Pi, An Open-Source And User-Friendly Hardware Platform, Which Is Portable And Can Connect To Laptops And Pcs Via Wifi. The System Will Monitor Unauthorized Entry By Placing The Setup Inside The Home. Once A Breach Is Detected, A Notification Will Be Immediately Sent To The Homeowner. Additionally, Video Footage Of The Event Can Be Monitored Through A Mobile Phone, Ensuring That The User Has Real-Time Access To The Security Feed.

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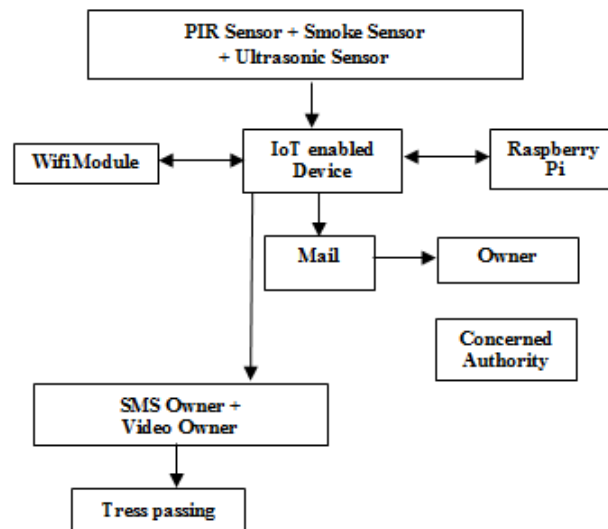**171**

IV. PROPOSED METHODOLOGY

Fig. 1 Block diagram of the proposed system

Preventing a break-in at your home can be easier than you might expect. By taking a few straightforward steps to make your property less appealing to potential criminals, you can often deter them from targeting your home. Most criminals tend to avoid additional effort, so even basic home security measures can be enough to discourage them. This is good news for homeowners because it means that installing a security system monitored by professionals is typically sufficient to keep burglars at bay. The risk of being caught on a property under surveillance is a powerful deterrent, helping to protect your home, valuables, and family.

Statistics show that homes without a security system are three times more likely to be broken into than those with one. However, a security system is much more than just a deterrent. Modern systems offer a wide range of features tailored to your home and lifestyle, including mobile apps and other tools that allow you to monitor and interact with your security setup in real-time. The presence of warning signs or stickers indicating that your home is protected is just the first layer of defense.

There are two main types of alarm systems: monitored and non-monitored. Monitored systems are what most people think of when considering home security. These systems are provided by a security company that monitors your property and contacts you and the appropriate authorities if an alarm is triggered. Many of these systems include two-way communication, allowing you to speak directly with a security professional who can assist in managing the situation. For added safety, some security companies offer alerts via text message or email to notify you of a potential security breach.

Additionally, depending on the system you choose, your security setup may include a battery backup to ensure it remains operational during a power outage. This feature ensures that your system will continue to protect your home, even in the most critical moments.

V. CONCLUSION

Modern homes are now designed with intelligent systems that require minimal human effort. Thanks to advancements in digital and wireless technologies, automated security systems have become increasingly sophisticated. By integrating surveillance cameras with IoT-enabled devices, users can remotely monitor their homes, and sensor networks provide additional security features based on the specific types of sensors used.

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Adding WiFi connectivity to these security systems allows for faster data transmission, enabling users to monitor and control the system from anywhere in the world. The precision offered by devices like Raspberry Pi ensures that users receive accurate and timely information through the system, enhancing overall security and peace of mind.

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