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COST EFFECTIVEIOT BASED INTRUDER DETECTION SYSTEM

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ABSTRACT
The proposed IoT-based Intruder Detection System (IDS) isintended to increase security in residential and commercial environments at affordable price range. The proposed system leverages a network of interconnected sensors, actuators, and communication devices to detect and respond to intrusions effectively. The core components of the IDS include PIR motion sensor, Node MCU and ESP8266 microcontroller which is equipped with wireless communication capabilities. Upon detecting suspicious activity, the sensors transmit real-time data to the CPU. In the event of a potential intrusion, the system triggers immediate responses such as activating alarms, sending notifications to designated stakeholders via BLYNK IoT app. Moreover, the system incorporates remote access capabilities, allowing users to monitor and control security settings from anywhere via smartphones or web interfaces.
Keywords:IOT (Internet of things), NodeMCU, Motion Detection, Wireless Communication, Real-time alerts.

INTRODUCTION
In recent years, the proliferation of Internet of Things (IoT) technologies has revolutionized various aspects of daily life, including security systems. With the increasing concern over safety and the growing complexity of security threats, there is a pressing need for innovative solutions that can effectively detect and prevent intrusions in residential and commercial environments. In response to this demandIntruder detection systems (IDS) based on the Internet of Things (IoT) have shown promise as a way to improve security. Traditional security systems often rely on static sensors and manual intervention, leading to limitations in detection accuracy, responsiveness, and scalability.
When a sensor detects movement, the microcontroller processes this information and sends an alert to the user's smartphones or computer via the internet. Simultaneously, the alarm is triggered to notify occupants and scare off intruders. Users can also access historical data through a dedicated mobile app or web interface, allowing for remote monitoring and management of the security system. An IoT-based intruder detection system harnesses interconnected devices to fortify security measures. Comprising sensors, cameras, connectivity modules, cloud infrastructure, and alarm systems, this technology enables seamless integration and real-time monitoring. Its advantages include remote accessibility, scalability, integration with smart home systems, and data analytics for predictive insights. With applications spanning residential homes, commercial buildings, industrial facilities, and public spaces, IoT-driven security systems offer a proactive defense against unauthorized access and threats.

LITERATURESURVEY
IoT technology for enhanced security and automation in smart homes,P and S Sultana [1], 2022. It likely covers sensor deployment, network communication, and automation features to detect intrusions, provide real-time alerts, and enable remote monitoring and control of home devices, contributing to a more secure and convenient living environment. Iyer Saikumar [2]et al., presented at ICAST 2020, likely outlines a system integrating IoT and GSM technology for intruder detection, featuring sensor deployment, GSM communication, and real-time alerts, offering an efficient security solution.Pranav Kumar Madupu and Karthikeyan B [3], introduces an IoT-based solution for smart home security, featuring automated service requests triggered by sensor data, enhancing

safety and convenience through proactive measures**.** Prithvi Nath Saranu [4] et al., likely describes a system employing PIR (Passive Infrared) sensors for theft detection. It probably covers sensor deployment, data processing, and alarm triggering mechanisms, providing an effective solution for detecting unauthorized intrusions and enhancing security measures**.** A. Anitha [5], Materials Science and Engineering, likely discusses a home security system leveraging IoT technology. It probably covers sensor integration, network communication, and data processing to enable remote monitoring and control of security devices, enhancing the safety and convenience of residential environments.

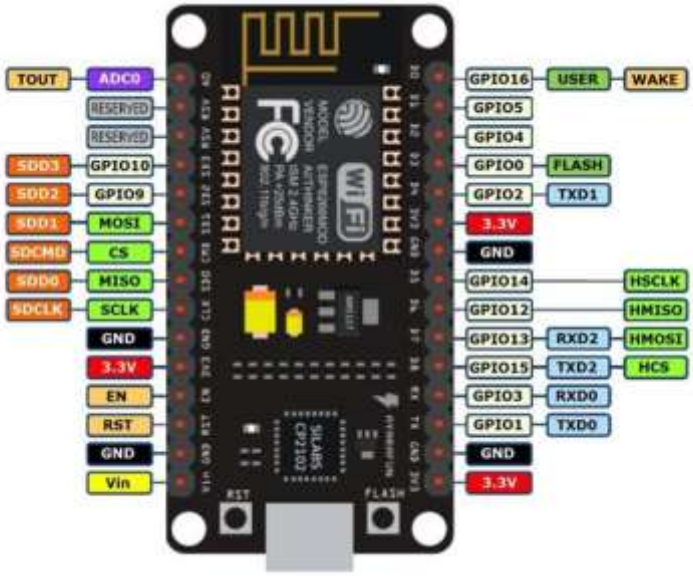
PROPOSEDSYSTEM

The proposed system integrates an ESP8266 microcontroller, PIR sensor, buzzer, and cloud connectivity for enhanced intruder detection. Upon detecting motion, the PIR sensor triggers the ESP8266 to activate the buzzer and establish a connection to the cloud platform. Real-time alerts are sent to the user's mobile device via the cloud platform, enabling remote monitoring and immediate response to intrusion events. Advanced features include customizable alert settings, user-friendly interface, and seamless integration with other smart home devices. The ESP8266 ensures efficient processing of sensor data, ensuring timely and accurate detection of intrusions. Cloud connectivity facilitates integration with other smart home devices and platforms, enhancing security and automation capabilities. Blynk IoT simplifies IoT project creation with its user-friendly mobile app and cloud-based infrastructure. Users design custom dashboards to monitor and control devices remotely using various widgets. Libraries and APIs support integration with popular hardware platforms for seamless device connectivity.

HARDWARE COMPONENTS

- **NODEMCU:**The Node MCU is a development board based on the ESP8266 Wi-Fi module. It's designed to facilitate IoT (Internet of Things) projects by providing an easy-to-use platform for building connected devices. The board includes a microcontroller unit (MCU) along with built-in Wi-Fi capabilities, which allows it to connect to the internet and interact with other devices and services.

Fig.1: NodeMCU



- **PASSIVE INFRARED SENSOR(PIR):** A Passive Infrared (PIR) sensor is a type of electronic sensor that detects motion by measuring changes in infrared (IR) radiation levels

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emitted by objects within its detection range. Unlike active motion sensors that emit energy to detect motion, PIR sensors work passively by detecting changes in the IR radiation emitted by objects in their field of view. PIR sensors are rather generic and for the most part vary only in price and sensitivity.

Fig.2: Passive Infrared Sensor(PIR)

METHODOLOGY

A Printed Circuit Board (PCB) is designed for the Intruder Detection System using EasyEDA Software and PCB router machine.Easy EDA's schematic capture feature offers an intuitive interface where users can design electronic schematics by dragging and dropping components. These connections are established by routing conductive traces on the surface of the PCB, allowing electrical signals to flow between components and enabling the circuit to function as intended.

Top Layer and Bottom layer of the designed PCB:

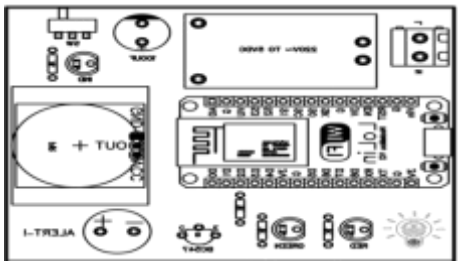

Fig.3: Top Layer

Fig.4: Bottom Layer

- Once the PCB layout is complete,a prototype of the PCB is prepared using a PCB router prototyping machine. Components are assembled onto the PCB board.
- Once the hardware is set up, we have programmed the ESP8266 to continuously monitor the sensors for any activity. When motion is detected by the PIR sensor or when the contact sensors are triggered (indication detected), the ESP8266 will send a notification or trigger the alarm.

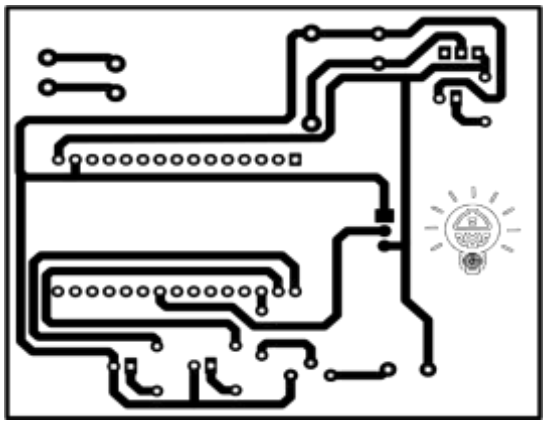

Fig.5: PCB with assembled components

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EXPERIMENTAL RESULTS

The designed IoT-based Intruder Detection System operates on the principles of sensor activation, detection of intrusion, communication, and user interfaces.The designed IoT-based Intruder Detection System provides effective security monitoring and alerting capabilities to help protect homes, businesses, and other premises against unauthorized access and intrusions.Analysis of an intruder detection system using the Blynk app involves assessing sensor accuracy, responsiveness to trigger events, reliability of real-time updates, and user interface effectiveness. Continuous monitoring and refinement ensure the system meets security requirements and user expectations.

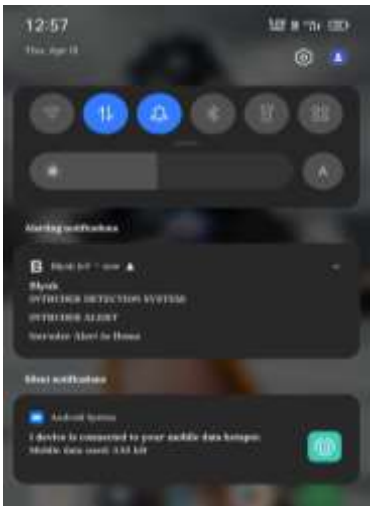

Fig.6: IDS sent an alert

Fig.7: Alert notification in Blynk

CONCLUSION

This paper describes the design and fabrication of cost-effective intruder detection systems using multiple technologies such as EasyEDA, Audino IDE, Blynk IOT, and others to make the system feasible for real-world applications.When it comes to the proper implementation and production of automated home protection systems, the most important factor is security. Such a device will give everyone in the house a sense of security and will also put their minds at ease.Intruder detection systems provide early detection of potential threats, allowing for timely response and intervention to prevent unauthorized access, theft, vandalism, or other malicious activities. It also helps to protect valuable assets, including physical property, sensitive information, equipment, and resources, by alerting security personnel or authorities to potential security breaches.

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