

IoT Based Smart Intruder Detection System For Smart Homes

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ABSTRACT

Article Info

Volume 8, Issue 4

Page Number : 48-53

Publication Issue

July-August-2021

Article History

Accepted : 01 July 2021

Published : 05 July 2021

The intruder detection system is targeted for the private areas, restricted areas and for the domestic home applications to notify the entrance of the intruder or any person to the specified areas. The intruder detection system eliminates the theft and entrance of the persons to the restricted areas by notifying the owner or the gardener through the registered application when the system detects an intruder in the locality. In this work an IoT based intruder detection system named Smart-IDS is proposed to avoid the entrance of the person without any special workforce for the target location. The proposed Smart-IDS detects the intruder using the Node MCU and Ultrasonic sensor and the cloud based Blynk application is employed to send the alert notification to the user. The experiments with the proposed Smart-IDS has performed more efficiently. Keywords: Intruder Detection, Node MCU, IoT, Blynk

I. INTRODUCTION

In these days, where living has been running towards advancement, the security to oneself and the privacy has decreased a lot. To get a secured place for human living has become so difficult, where we are getting many cases regarding thefts. Some criminal cases have been very brutal that for money the burglars had killed many residents [1]. Day to day these types of criminal cases are been increasing. These incidents are more in the private properties, small localities and in singly constructed areas. People choose some manual security methods like security guards system. But this resulted in failure has the burglars are entering the properties with dangerous weapons which are used for robbery which can kill people who tries to stop them. Many Security systems have

proposed and being used in the various environments to detect the intruder in the target environment.

The emergence of IoT has provided various solutions to enhance the different smart applications and smart environments and so on. Application of IoT has been widely implemented in every sector such as security systems, industry, farming, and medicine [2].



Figure 1 Intruder Detection System

In the IoT applications smart home is one the popular IoT application with all the electronic devices are connected to the internet and can be easily accessible. Several studies have been developed a IoT-based smart home such as home security system using internet of things. The advantages of IoT has motivated the researchers to apply the IoT technology to address the issue of intruders entering the homes and private places. In this work we designed a system called “Smart Intruder Detection System” (Smart - IDS) , which is is an automated system with the Microcontroller and Ultrasonic sensor. This will be attached at the entering point of any private places like house. Whenever any suspicious persons enters when no one are in the house, immediately a notification will be send to an owner’s mobile. This all setup will be connected to a power supply by a voltage regulator which is connected to arduino of gsm module. This notification will be sent through bylnk application to mobile phone. The proposed system does not require any person involvement.

The rest of the paper is organized as follows: section 2 discusses the related works that are available literature. The pros and cons of the existing work are investigated. Section 3 explains about the proposed system of this work and explain the system design and the components present in the proposed design. Section 4 discusses the experimental results and Section 5 concludes the works and gives the future direction to continue this work.

II. LITERATURE REVIEW

From the past decade several Intruder Detection Systems (IDS) have been proposed to address the security issue of Intruders entering the homes. These IDS’s are actively detecting the intrusion of unknown person or thief and acknowledging the owners of the house. Taryudi et. al [3] proposed an IoT based intruder detection and monitoring system using Arduino-Nano as controller to detect the motion

objects in front of the door. The PIR sensor is used to monitor the house. It allows only the authorized person, who have RFID access card to enter the house. Traditional home security systems, i.e., Closed-Circuit Television (CCTV) can only capture and record videos without the ability of giving warning feedback if there is any suspicious object. Therefore, an additional object detection and warning method is required.

Nico Surantha et. al [4] has proposed a design of detection system with motion sensor and Camera connected to Raspberry Pi and the SVM identifies the suspicious objects or the person entering near the door.

Wahyuni et. al [5] developed a solution for the detecting the theft with a Home Security Alarm system was built using WEMOS D1 and HC-SR501 Sensor with Telegram Notification. It help the community in dealing with the theft that enters the house. The pear sensor is used to detect the motion and the buzzer is connected to sound alarm if motion is detected and these sensor and buzzer was controlled by WEMOS D1microcontroller. The notification automatically enters into the Telegram Application when the motion gets detected. This system can monitor directly if anyone enters the house while being left. Anwar et. al [6] proposed a design for providing the security system with alarm using IoT devices that can access and control the house door remotely using smart phone. A PIR motion sensor and Camera module are used to detect motion and capture images respectively are dedicatedly make the security system alive as per the request. Electromagnetic door lock module operate the door accessibility, has been designed and developed.

Nwalozie et. al [7] has proposed an intruder detection system to enhance security of the house by sending an SMS to the house owner when the PIR sensor detects the motion in the entrance of the house.

Additionally a switch placed near the door is connected to the Microcontroller to display a message in LCD monitor fixed inside the house and SMS will send to the house owner.

Mrunal Khedkar, et. al [8] proposed a home security system in which the motion sensor triggers the digital camera only when the intrusion occurs. After triggering, camera gets switched on instantaneously and starts capturing the visual data. This recorded visual data is transmitted serially to the base station using Zigbee or Bluetooth transmission module. At the base station, the received information is decoded to obtain visual data.

Saikumar et. al [9] proposes a low cost intruder system which uses a combination of sensors and a microcontroller. The AVR atmega 8A has been used as the central processing unit and a GSM module will be used for effective communication with the application.

There were many security systems has been proposed to detect the intruder entering the house. Many systems used the motion sensor to detect the presence of any person or intrusion of anyone into the house. Later face recognition based intruder detection system was developed with camera sensors connected to the microcontroller. Still there is a need for enhancing the security of the house to avoid the intruders in the houses. In this work we deployed the IoT devices to detect the intruder and promptly send an alert notification to the house owner.

III. PROPOSED SYSTEM

The Smart-IDS system is proposed to enhance the security of the smart homes by detecting the intruders in the homes. The following figure 3.1 shows the system architecture of the proposed Smart-IDS system.

A. SYSTEM ARCHITECTURE

The detailed structure of the proposed system is given the following figure 2.

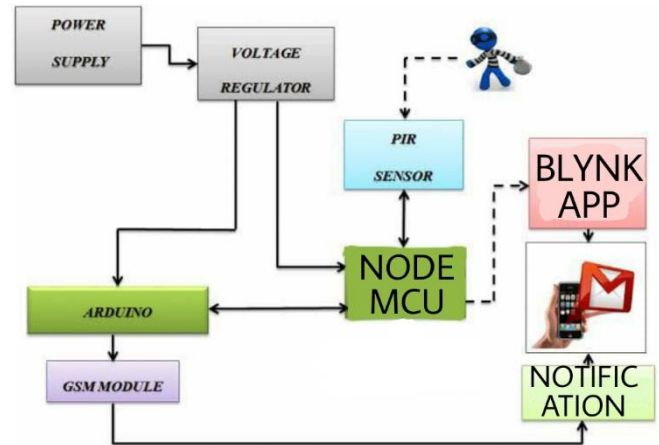


Figure 2 Architecture of the proposed Smart-IDS

Overall this block diagram of intruder detection represents the connection between the manual setup to owner’s mobile. As the power supply with voltage regulator connected to arduino with gsm module. This arduino is connected to node mcu with PIR sensor. As this mcu is a web based connected to a blynk application by wifi. When any intruder enters that will be sensed by nodemcu and by blynk notification will be sensed through gsm module.

B. Node MCU

The MCUboard comes with the ESP-12E module containing ESP8266 chip having tensilica xtensa 32-bit LX106 RISC microprocessor [9]. Microprocessor supports Real Time OS and operates at 80MHz-160 MHz with clock frequency. MCU has 128kb ram and 4mb of flash memory to store data and programs. Its high processing power with in-built wifi / bluetooth for ideal for iotprojects. MCU can be powered using micro usb jack.

C. Ultrasonic sensor

Ultrasonic sensors are also called as proximity sensors [10]. They can be found in automobile, self-parking technology systems. This sensor is used in robotic obstacle detection systems also in manufacturing technology. Also in IR devices in proximity sensing.



Figure 3. Node MCU Microprocessor

D. Node MCU

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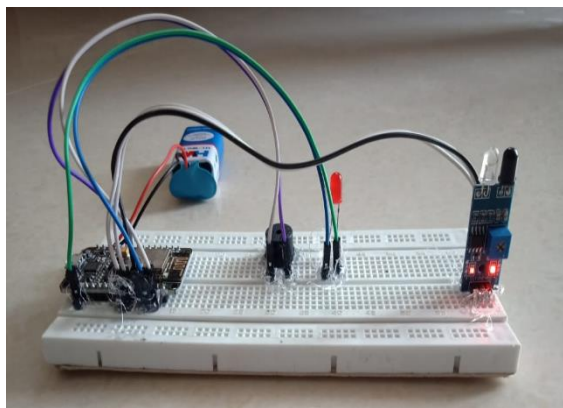
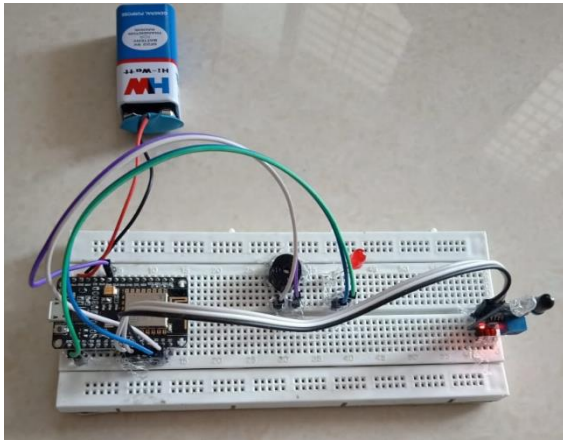


Figure 4. Arduino Board

IV. EXPERIMENTS AND RESULTS

Our proposed system intruder Detection system is an easy and understandable system to anyone. We have used IoT technology in our system. Now-a-days, IoT has become a booming technology that everyone are using it. Using the IoT devices we can make our home as smart home and interaction happens with the things to us. Like that our system interacts with the environment and using ultrasonic sensor the person or the intruder is detected at the entrance where we'll install our system. After that detection we've used an application to send the messages to user called 'Blynk'. With this application the detected intruder an alert will be sent to the user according to the message we write and also an alarm will ring in the house that notifies us that someone are at the entrance. This helps us to know about the persons who wants to enter into the house and notifies us about that via message. Most important thing for our proposed system is the internet. We have to connect both the system and the mobile to get the notification to Internet or to any Wi-fi module. Our system mainly works with the help of internet as we developed the system using iot which means Internet of Things.

In this proposed system, ultrasonic sensor works efficiently in detection of a person or an intruder. Also the Arduino and all the components are user friendly one can understand the working very easily. Blynk is an application supports IOS and Andriod apps which controls Arduino, Raspberry Pi and likes through the Internet. It's a digital dashboard we used to send the notification. Also the Internet is common now-a-days in everywhere and in every home. So, this is also fine for our system. So the results for our proposed system are effective and efficient. Our proposed system doesn't costs much and is budget friendly to a common man in India.



V. CONCLUSION AND FUTURE WORK

In this paper we have proposed a basic intruder detection system using IoT(Internet of Things). Our proposed Smart-IDS detects the intruder at the entrance of the door. The ultrasonic sensor detects that someone are at the entrance. This detection is sent to the user as an alert message. All these setup is connected to Node MCU which process the sensor signal and sends a notification via Blynk framework. The Smart-IDS consists of less components, so it is cost friendly and also easy to manage and use. The future scope of this work can extended with face detection using the camera and it can be monitored using the mobile phone. The camera live stream can be send to the near by police station for further action.

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Cite this article as :

K. Vijayaprabakaran, Priyanka Kodidela, Parinitha Gurram, "IoT Based Smart Intruder Detection System For Smart Homes", *International Journal of Scientific Research in Science and Technology (IJSRST)*, Online ISSN : 2395-602X, Print ISSN : 2395-6011, Volume 8 Issue 4, pp. 48-53, July-August 2021. Available at doi : <https://doi.org/10.32628/IJSRST218410>
Journal URL : <https://ijsrst.com/IJSRST218410>