Design and Construction of a Home or Office Security System for Intruder

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Abstract

The design and construction of a home or office security system for intruder detection is designed to detect and alert the homeowner or office personnel of any unauthorized entry into the premises. The system consists of several components, including sensors, a microcontroller, a Wi-Fi module, and a website. The sensors are installed at various locations throughout the building, and they detect motion of an intruder. The microcontroller processes the sensor data and sends alerts to the website via the Wi-Fi module and viewing activity logs. The website displays real-time data from the sensors and alerts the homeowner or office personnel of any intruder activity. The system is designed to be scalable, allowing additional sensors to be added as needed. The system provides a reliable and user-friendly security solution for homes and offices. It provides real-time data on intruder activity and sends alerts to the user via a website, enabling them to take appropriate action to secure their property. The software part which is the website is designed using HTML, CSS, PHP and MySql. And the hardware was designed using Arduino and C programming.

Keywords: Internet of things, Intruder, home automation, Smart Home, Security System.

1.0 INTRODUCTION

One of the major concerns of people is security and most importantly premise security either in the home or office. Protecting physical assets from burglary and vandalism is of topmost priority for many people. One's business also depends on physical assets such as computers, displays, servers, fax machines and everything that goes with them that you will need to replace if someone steals or destroys them (Brown, 2012). Same applies for homes where assets like fridges, washing machines and other valuables need surveillance even if one is not around to keep an eye on them. Today, the increase in demand of service over the internet necessitated the data collection and exchange in efficient manner. In this sense internet of things (IoT) has promised the ability to provide the efficient data storage and exchange by connecting the

physical devices via electronic sensor and internet(Mao J, 2018). The internet of things (IoT) paradigm refers to devices connected to the internet. Devices are objects such as sensors and actuators, equipped with a telecommunication interface, a processing unit, limited storage and software applications. It enables the integration of objects into the internet, establishing the interaction between people and devices among devices. The IOT has created the revolution all over the world and fascinatingly it has become integral part of life.

This paper becomes an area of research due to the security of home and office conditions. Previous studies shows that security of home and office, home appliances is less to be monitored when the owners is not at home. And the need to propose a new efficient system to ensure a high and easy monitor the condition of home and office can be easy monitor over the internet. Also by harnessing the power of IoTs at low-cost to provides flexible and scalable architecture for home/office security. This leads to the development of an IoT based Intruder Detector system.

2.0 Literature review

Every home and office is always concerned with the security of their possessions (Home theatres, fridges, computers, etc.) hence measures and systems have to be put in place to descry thieve and also burglars whenever they attempt to break into these homes and office. These systems will help prevent thieves and burglars from trying to break into homes and office whenever possessors of these places aren't around.

2.1 Security System

The most basic definition of any security system is found in its name. It is literally a means or a method by which something is secured through a system of interworking components and devices. In this instance we are talking about a home and office security systems, which are networks of integrated electronic devices working together with a central control panel to protect against burglars and other potential home intruders.

2.2 Intruder Detection system

An Intruder Detection System is a security system that is designed to detect and alert the presence of unauthorized individuals or intruders in a specific area or property. These systems typically use a combination of sensors and surveillance cameras to detect movement or other signs of intrusions.

The use of Intruder Detection System has become increasingly important in recent years as the need for security has grown in both residential and commercial settings. The increasing crime

rates, as well as the growing number of natural and man-made disasters, have made it necessary for individuals and organizations to take measures to protect their assets and people.

Types of Intruder Detection Systems

- Passive Infrared (PIR) Detection Systems

- Ultrasonic Detection Systems

- Microwave Detection Systems

- Dual-Technology Detection Systems

- Video Surveillance Systems

2.3 **Review of Related Projects (Design and Features)**

Programmable Home Security Alarm System: This project made use of some sensors which when triggered, the system dials the user specified phone number. This is made possible by a built-in DTMF (Dual Tone-Multi Frequency) generator; it is the basis for telephone systems. While the sensors of the system are triggered, there is an activation of high power audio alarm and lights. All these parameters thus the DTMF, audio alarm and lights are programmed through the RS232 interface. This control system also has menu-driven configurations options, self-tests, system report generators etc. The alarm for this system came with selectable configurations for police siren, fire engine siren and ambulance siren. This project focused on alerting either the police, fire service or hospital on an incident that has occurred relating to any one of them (Jayakody, 2010).

Integrated Network Security System: According to Abdul-Malek (2010), the main concept highlighted in this project is the zone based detection. If the intruder is detected in outside house area, the warning light will lit as a precaution. When the intruders enter the house compound which is the medium-risk zone, silent alarm will be sent informing the guard of the house or nearby neighbor about the situation. Finally when the intruders reach inside the house, the loud alarm will be triggered and its loud sound they produce scare off the intruders. For communication with the security module, two Bluetooth modules are required where one of it from "Sparkfun" which is called BlueSmirf Gold another one is Ezurio Bluetooth Intelligent Serial Module II (BISM II). To communicate with a Personal Computer (PC) via Bluetooth link, Bluetooth dongle from Ezurio is used.

RFID Based Home Security Systems: The Radio Frequency Identification is a system that uses radio frequency waves to transfer the data from a tag to a reader. The objective of the system is

to provide security to homes, offices, banks by using RFID system. The system uses various components like an RFID card, an RFID reader, a motor, a motor driver, a microcontroller, a LCD and a buzzer. The motor driver is used to drive the motor in various mechanical directions, and the motor is used to perform functions like opening and closing of door. The project is intended for building a security system that prevents the unknown persons from entering into security rooms of banks or houses by a radio frequency identification system. The RFID card used in this system consists of a tag with a set of unique numbers; an RFID reader reads this card information and sends the data to the microcontroller. The microcontroller checks the card to verify whether the data is correct or not, and if the data matches with the original information that has been stored in the microcontroller, then it allows the person to enter into the room by rotating the motor that opens the door (Agarwal, 2014).

3.0 Methodology
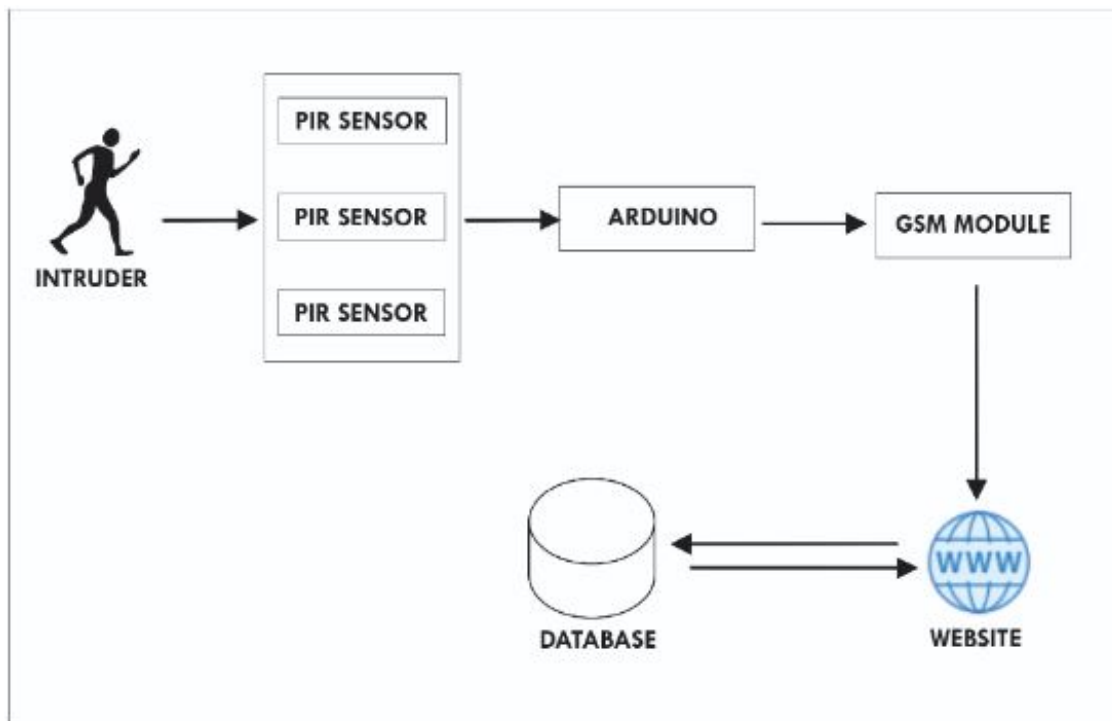
A. System Achitecture

Figure 1: System achitecture

B. Component of the designed Hardware: The hardware component is made up intruder detector system are the following:

- Sim800 GSM Module
- Atmega328p

- 28 pin IC Socket
- 16Mhz Crystal Oscillator

- PIR(Passive InfraRed sensor)
- Header Pins
- Led (Light-Emitting Diode)
- Vero board

- Arduino Uno Programmer
- Connecting Wires
- 4 x 4 Patress box
- 3 x 3 Patress box

PIR (Passive InfraRed sensor) A device used to detect motion by receiving infrared radiation. When a person walks past the sensor, it detects a rapid change of infrared energy and sends a signal. PIR sensors are used for applications such as automatically turning on lights when someone enters a room or causing a video camera to begin operating. This passive method is not as reliable as "active" motion sensors that either bounce back a radar signal or transmit light to a photodetector in the distance.

Figure 2: PIR

28 pin IC Socket*:* It is a socket with 28holes, An IC socket, or integrated circuit socket, is used in devices that contain an integrated circuit. An IC socket is used as a placeholder for IC chips and is used in order to allow safe removal and insertion of IC chips because IC chips may become damaged from heat due to soldering.

Figure 3: 28 pin IC Socket

SIM800 is a miniature cellular module which allows for GPRS transmission, sending and receiving SMS and making and receiving voice calls. Low cost and small footprint and quad band frequency support make this module perfect solution for any project that require long range connectivity.

Figure 4 SIM800L

Veroboard: Veroboard is a printed circuit board that's designed with rows of copper tracks with holes drilled in then for electronic components to be soldered to construct electronic circuits.
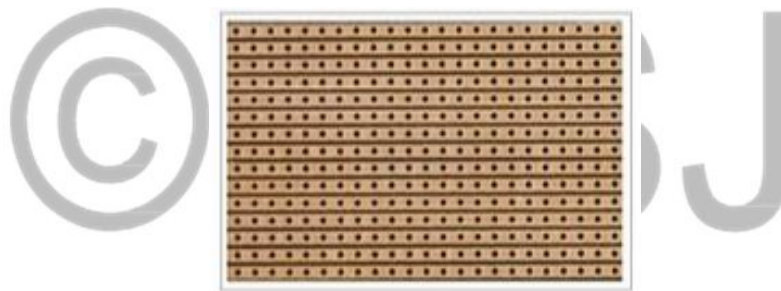

Figure 5: Veroboard

4.0 RESULTS

Intruder detector system was designed to enhance security of the home/office by sending notification to the home/office owner through the website when the PIR sensor detects the motion in the strategic place where the device is placed in the home or office.

Figure 6: Constructed Intruder Detector System

4.1 LOG PAGE

This page is used by the user to monitor the data from the hardware device(intruder detector). The page contains the topic of the project, timestamp, the status of location 1, location 2 and location 3 etc.
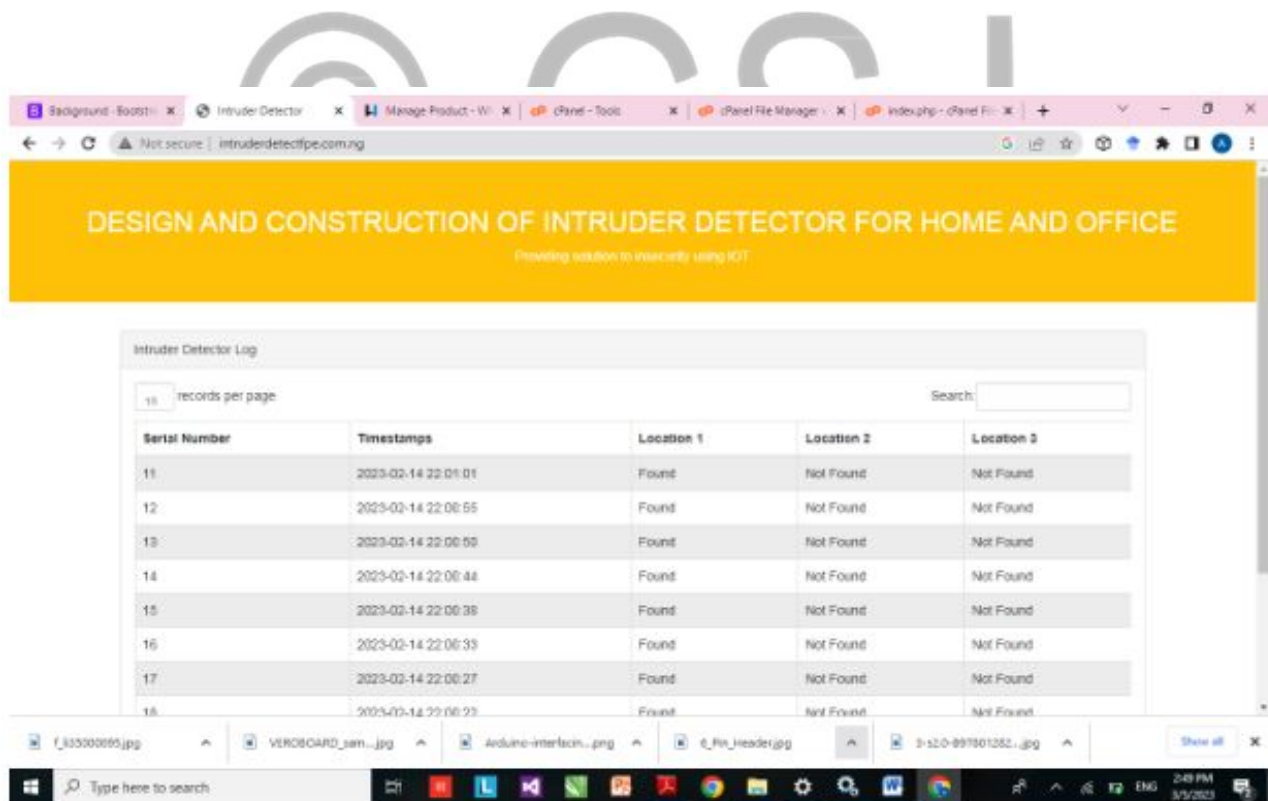

Figure 7: Activities Log Page

5.0 CONCLUSIONS

In this paper we have Design and Construction of Intruder detection system for home /office use that serve has a security solution that detects and alerts users to potential threats of unauthorized entry into their properties. The system typically consists of sensors placed at strategic points around the home and sends the data to the website whenever an intruder was detected. The system is user friendly and easy to interact with. It was found helpful in protecting of crime and properties by notifying them on time through the additional website feature. The future scope of this work can extended with camera for picture and video surveillance feature on the system.

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