MICROPROCESSORS AND MICROCONTROLLERS

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Affiliated to ANNA UNIVERSITY, Chennai

SUBJECT CODE: EC19411

IoT BASED BURGLARY DETECTION SYSTEM

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ABSTRACT

The **Burglary Detection System** is a security system designed to detect and alert homeowners or security personnel to any unauthorised entry into a property. This project presents a detailed analysis and design of a burglary system that uses advanced sensors and an alarm system to sense intrusion and alert authorities if necessary. The primary objective of the project is to design a reliable, cost effective, and user-friendly burglary system that enhances home security.

The key components of the burglary system include sensors, alarm systems, monitoring services, and response teams. The sensors detect movement or any other signs of intrusion and trigger the alarm system, which subsequently alerts the monitoring service and/or the homeowner. The monitoring service verifies the threat and takes necessary action, which may include contacting the authorities or dispatching a response team.

Different types of sensors are available for use in the burglary system, including infrared, motion, acoustic, and smoke sensors. Smartphone apps and other connected devices are also integrated to allow homeowners to monitor their homes remotely using **IoT**, control the alarm system, and receive alerts in case of an intrusion.

The project uses a thorough analysis, design, and rigorous testing to ensure the system's reliability, cost-effectiveness, and efficient operation. The designed system's advantages include capability to detect intrusions accurately, alarm triggering and notification within few seconds, and remote monitoring and control using smart phones.

INTRODUCTION

Burglary is a significant problem faced by people worldwide. Every year, millions of homes and businesses fall victim to burglaries, causing significant financial and psychological damage to the affected individuals. As a result, there has been an increasing demand for improved security measures that can help to minimize the frequency and severity of burglaries. One of the most effective ways of enhancing security is by installing burglary systems. This project aims to design and develop an advanced burglary system that will provide a reliable, cost-effective, and user-friendly solution to the problem of break-ins and theft.

PROJECT OBJECTIVES

The primary objective of this project is to design and develop an advanced burglary system that will be effective in detecting and alerting the homeowner or security personnel in the case of any unauthorized entry into the property. The system will be designed to include the latest sensor technology that will be able to detect movement or any other signs of intrusion quickly. The system will be built to trigger an alarm immediately when an intrusion is detected and will notify relevant parties. Furthermore, the system will incorporate advanced monitoring and response features to ensure that any threats to the security of a property are resolved promptly.

SYSTEM DESIGN

The burglary system designed will consist of four main components: sensors, a triggering system, monitoring services, and response teams. The sensors will be strategically placed at doors, windows, and areas of high traffic within the protected property to detect any motion or signs of break-ins. The sensors' data will trigger the alarm system, which will alert authorized personnel (home owner) immediately, warning them of the breach. The authorized personnel can use IoT to trigger various

alarm systems integrated to the system to alert the burglar to fall back or silently trigger the alarm to the police or any other governing agency so that the burglar would be caught red handed.

The monitoring service will be responsible for verifying the threat and taking the appropriate action, which may include contacting the authorities or dispatching a response team to the location. The response teams will comprise security personnel, law enforcement, or fire fighting units, depending on the situation. They will be responsible for investigating the situation and taking the necessary action to ensure that the property and occupants are safe. In addition, the response team will be responsible for securing the property, notifying relevant persons or authorities, or escorting the homeowners to a safer location.

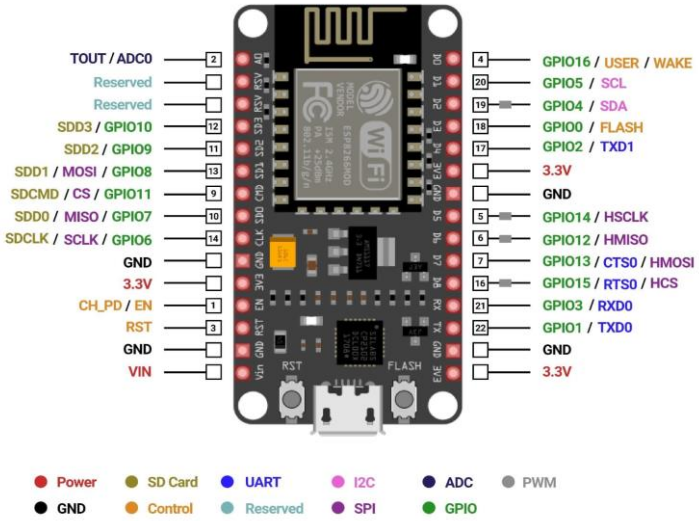
COMPONENTS REQUIRED

- ESP8266 Microcontroller
- PIR Sensor
- DC power regulator (3.3V or 5V)
- DC power source (12V AC to DC converter / power bank / LiPo Battery)
- Breadboard (400 Pin)
- Jumper wires M-M x 3
- LED (1.7V-5V)

HARDWARE

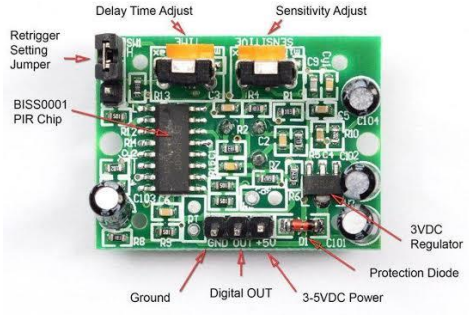
ESP8266 Microcontroller (NodeMCU)

- Clock Speed : 80 MHz
- Operating Voltage : 3.3V
- Flash Memory/SRAM : 4MB/64KB
- WiFi Built-in : 802.11 b/g/n



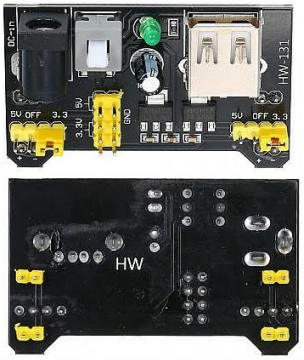
PIR Sensor

PIR sensors are commonly called simply "PIR", or sometimes "PID", for "passive infrared detector". The term *passive* refers to the fact that PIR devices do not radiate energy for detection purposes. They work entirely by detecting infrared radiation (radiant heat) emitted by or reflected from objects.



Power Supply

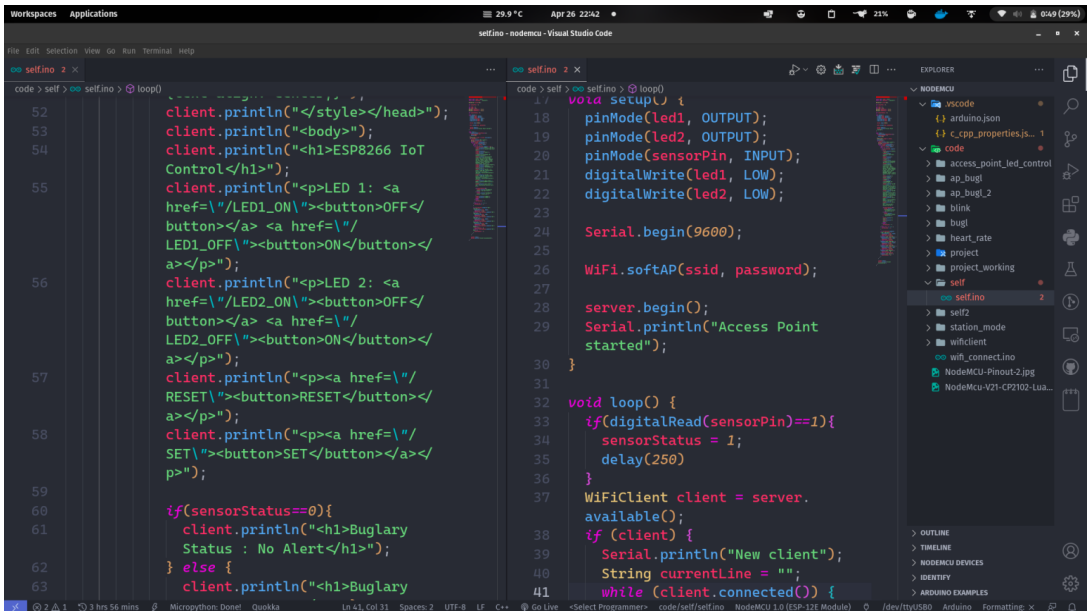
- Model : HW-131
- Input Voltage: DC 6.5-12V or USB power-up
- Output Voltage: 3.3V, 5V regulated switchable
- Max. Output Current: <700mA



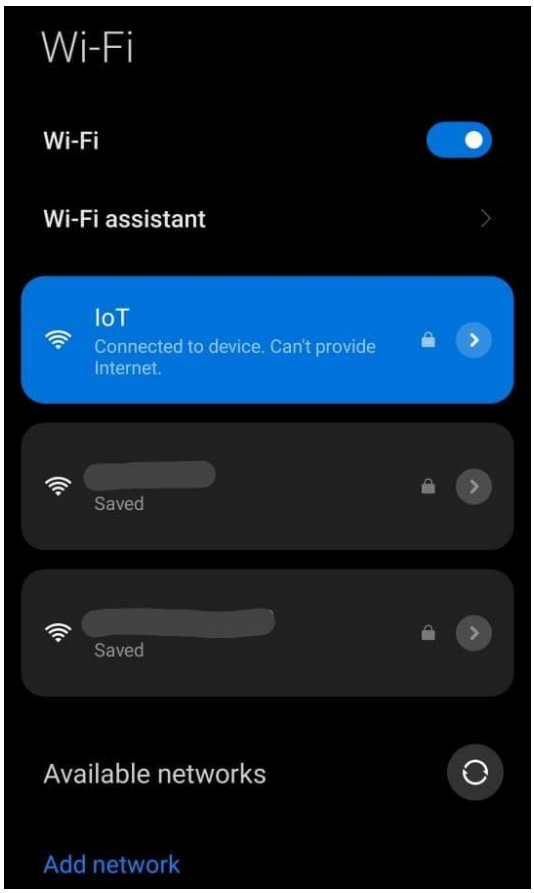
Jumper Cables & Bread Board

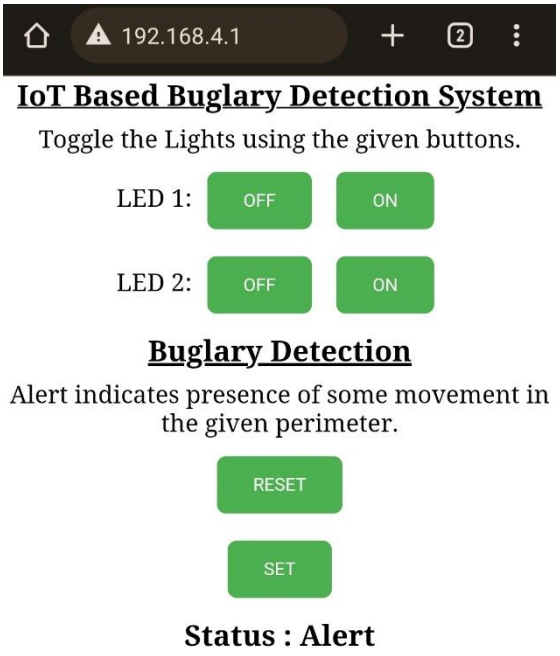
SOFTWARE

- IDE Used : Visual Studio Code
- Language Used : Arduino Programming Language (C/C++ Derivative)

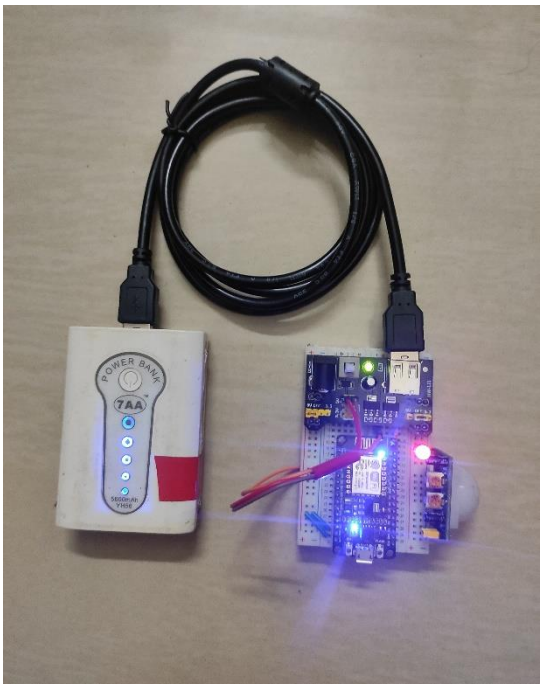


WiFi 2.4GHz Connectivity and UI Interface – Web Based Layout

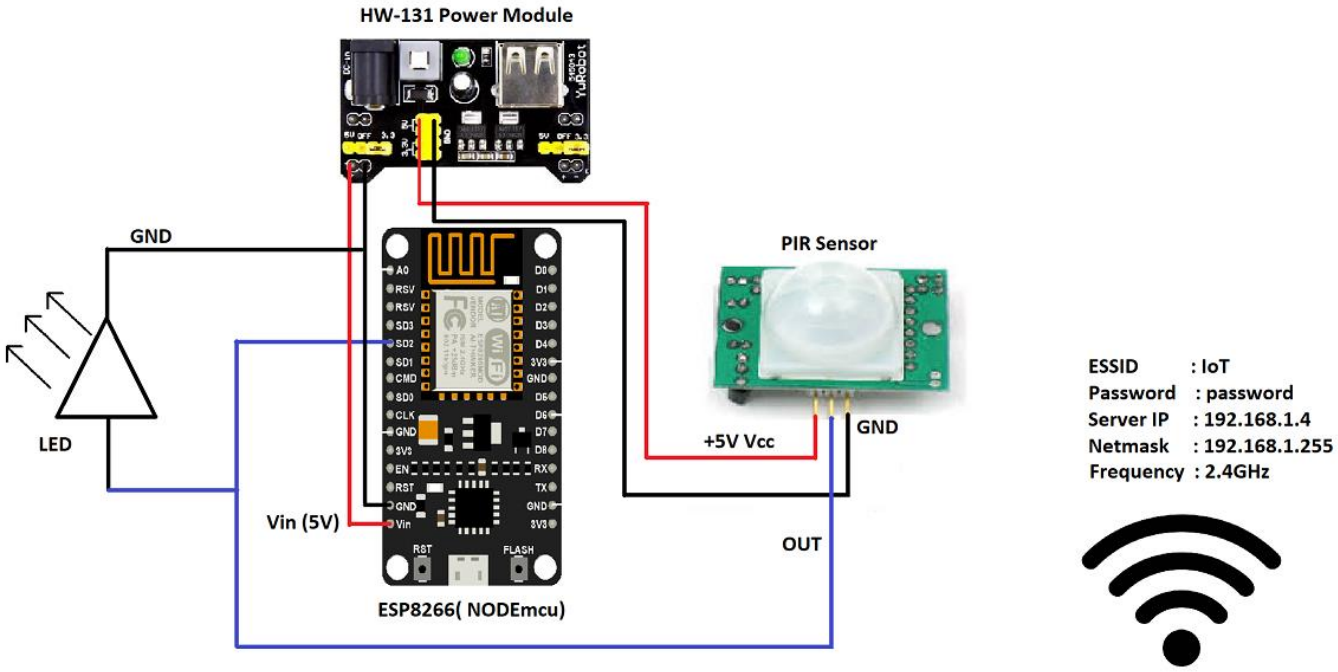




Project Model



Circuit Diagram



Program

```
#include <ESP8266WiFi.h>

const char* ssid = "IoT";
const char* password = "password";

WiFiServer server(80);

int sensorPin = 9;

int led1 = 2;
int led2 = 16;
boolean led1Status = false;
boolean led2Status = false;

int sensorStatus = 0;

void setup() {
  pinMode(led1, OUTPUT);
  pinMode(led2, OUTPUT);
  pinMode(sensorPin, INPUT);
  digitalWrite(led1, LOW);
  digitalWrite(led2, LOW);

  Serial.begin(9600);

  WiFi.softAP(ssid, password);
```

```
  server.begin();
  Serial.println("Access Point started");
}

void loop() {
  if(digitalRead(sensorPin)==1){
    sensorStatus = 1;
    Serial.println("Detected Movement");
    delay(250);
  }
  WiFiClient client = server.available();
  if (client) {
    Serial.println("New client");
    String currentLine = "";
    while (client.connected()) {
      if (client.available()) {
        char c = client.read();
        if (c == '\n') {
          if (currentLine.length() == 0) {
            client.println("HTTP/1.1 200 OK");
            client.println("Content-type:text/html");
            client.println();
            client.println("<html>");
            client.println("<head><title>IoT Buglary System</title>");
            client.println("<style>button {font-size: 2em;text-align: center; margin:
0.5em; padding: 1em 2em; border-radius: 0.5em; color: white; background-color:
#4CAF50; border: none;}h1,p{text-align: center;}");
            client.println("</style></head>");
            client.println("<body>");
            client.println("<h1><u><b>IoT Based Buglary Detection
System</b></u></h1>");
            client.println("<p>Toggle the Lights using the given buttons.<p/>");
            client.println("<p>LED 1: <a href=\"/LED1_ON\"><button>OFF</button></a> <a
href=\"/LED1_OFF\"><button>ON</button></a></p>");
            client.println("<p>LED 2: <a href=\"/LED2_ON\"><button>OFF</button></a> <a
href=\"/LED2_OFF\"><button>ON</button></a></p>");
            client.println("<H1><u>Buglary Detection</u></H1>");
            client.println("<p>Alert indicates presence of some movement in the given
perimeter.</p>");
            client.println("<p><a href=\"/RESET\"><button>RESET</button></a></p>");
            client.println("<p><a href=\"/SET\"><button>SET</button></a></p>");
            if(sensorStatus==0){
              client.println("<h1>Status : No Alert</h1>");
            } else {
              client.println("<h1>Status : Alert</h1>");
            }
            client.println("</body>");
            client.println("</html>");
            break;
          } else {
            currentLine = "";
          }
        } else if (c != '\r') {
          currentLine += c;
        }

        if (currentLine.endsWith("GET /LED1_ON")) {
          digitalWrite(led1, HIGH);
          led1Status = true;
        } else if (currentLine.endsWith("GET /LED1_OFF")) {
```

```
          digitalWrite(led1, LOW);
          led1Status = false;
        } else if (currentLine.endsWith("GET /LED2_ON")) {
          digitalWrite(led2, HIGH);
          led2Status = true;
        } else if (currentLine.endsWith("GET /LED2_OFF")) {
          digitalWrite(led2, LOW);
          led2Status = false;
        } else if (currentLine.endsWith("GET /RESET")) {
          sensorStatus = 0;
        } else if (currentLine.endsWith("GET /SET")) {
          sensorStatus = 1;
        }
      }
    }

    client.stop();
    Serial.println("Client disconnected");
  }
}
```

REQUIREMENT ANALYSIS FOR A BURGLARY SYSTEM

In this phase, the system's functional and non-functional requirements are defined, and the project's scope is established. The following are some of the key requirements that must be identified and addressed in the development of an effective burglary system:

1. Sensor Technology: The system must include advanced sensor technology that can detect motion or any other forms of intrusion. These sensors must be installed strategically at doors, windows, and other possible entry points to ensure that the system can detect all forms of intrusion.

2. Alarm System: The system must include a reliable and effective alarm system that can trigger an alarm immediately or silently to the monitoring services when an intrusion is detected. The alarm should be loud enough to alert the homeowner and surrounding neighbours.

3. Monitoring Services: The system must have an integrated monitoring service that can verify the security threat and take the appropriate measures. Furthermore, the monitoring service must be available around the clock to ensure prompt response in the case of an emergency.

4. Response Teams: The system must include response teams that can take the necessary action in case of a break-in or security threat. These teams should comprise security personnel, law enforcement or fire-fighting units, depending on the situation.

5. Remote Control Features: The system must allow the user to control the system from their smartphone and monitor the property remotely. This feature provides the user with greater control and flexibility over the system.

6. User-Friendly Interface: The system must be user-friendly, ensuring that the homeowner can arm and disarm the system with ease. The user interface must be intuitive and easy to use, with all features and functions clearly labelled and accessible.

7. Cost-Effective: The system must be cost-effective, ensuring that it is affordable for the average homeowner. It should be designed to minimize installation and maintenance costs, while providing maximum security functionalities.

8. Reliability: The system must be reliable and durable, providing consistent and long-lasting protection against burglaries and intrusion. It should be designed to withstand harsh weather and other environmental conditions that may impact its performance.

9. Customization: The system should be customized to meet individual homeowner or business requirements, depending on the property's size, location, and other specific security needs.

10.Compliance: The system must be compliant with all relevant industry standards and regulations, ensuring that it is safe, secure, and meets all relevant security protocols.

CONCLUSION

The IoT-based burglary detection system is a very effective and efficient way to secure homes or offices. The system provides real-time monitoring and detection of intruders, and sends alerts to the owner's mobile device. It is a low-cost solution that uses various sensors, such as PIR motion sensors and magnetic door sensors, along with a NodeMCU (ESP8266) board and Wi-Fi connectivity.

In conclusion, the IoT-based burglary detection system is a reliable and smart way to secure homes or offices. It can detect intruders before they can cause any harm, and provide peace of mind to the owners. With further advancements in technology, the system can be improved and made even more efficient, ensuring the safety of people and their belongings.

REFERENCES

- https://nodemcu.readthedocs.io/en/release/
- https://stackoverflow.com/questions/tagged/nodemcu
- https://www.arduino.cc/reference/en