

ANTI-THEFT FLOORING SYSTEM

A MINI-PROJECT REPORT

Submitted by

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LIST OF ABBREVIATION

IoT	Internet Of Things
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MCU	Micro-Controller Unit
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IR	Infrared
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Wi-Fi	Wireless Fidelity
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HTTP	Hypertext Transfer Protocol
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ABSTRACT

The rise of theft and unauthorized access in various settings has necessitated the development of advanced security measures. This abstract introduces an innovative Anti-Theft Flooring System (ATFS) designed to enhance security using Arduino Uno microcontrollers and piezoelectric sensors. The proposed system aims to detect and deter unauthorized access by sensing pressure changes on the floor surface, typically caused by human footsteps. Integrating Arduino Uno microcontrollers with piezoelectric sensors enables real-time data processing and immediate response actions. Upon detecting suspicious pressure patterns, the system triggers predefined security protocols, such as sounding alarms, activating CCTV cameras, or notifying security personnel. This abstract outlines the conceptual framework, design principles, and operational mechanisms of the ATFS. Additionally, it highlights the system's potential applications in various environments, including homes, offices, retail stores, and public spaces. The ATFS represents a significant advancement in proactive security solutions, offering reliable detection capabilities and prompt response actions to mitigate theft and unauthorized access incidents.

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

The Anti-Theft Flooring System (ATFS) is a security solution that uses Arduino Uno microcontrollers and piezoelectric sensors to detect pressure variations on surfaces. It distinguishes between normal foot traffic and unauthorized access attempts, enabling real-time detection and response. The modular nature of Arduino Uno allows for seamless integration with other security peripherals, enhancing its effectiveness in deterring theft and unauthorized entry.

1.2 SCOPE OF THE WORK

This project aims to create an anti-theft flooring system using piezoelectric sensors and an Arduino Uno for data processing, Wi-Fi module for communication, and a buzzer for alerting. The system will use an IoT platform for notifications. Key activities include requirements analysis, system design, component setup and integration, software development, IoT platform configuration, testing and validation, and deployment. The project will deliver hardware, software, and documentation, with a timeline of weeks for requirements analysis, assembly, testing, IoT platform configuration, system deployment, and documentation.

1.3 PROBLEM STATEMENT

This project aims to develop an anti-theft flooring system using piezoelectric sensors, an Arduino Uno, a Wi-Fi module, and a buzzer. The system detects unauthorized entry by sensing pressure changes on the floor surface, alerting the property owner via a local buzzer and remote notifications via an IoT platform. The goal is to create a discreet, reliable, and user-friendly solution that is affordable compared to traditional security systems. The expected outcomes include a functional prototype, successful detection of unauthorized entry, real-time alerts, and comprehensive documentation.

1.4 AIM AND OBJECTIVES OF THE PROJECT

The project aims to develop a discreet, reliable anti-theft flooring system using piezoelectric sensors, an Arduino Uno, a Wi-Fi module, and a buzzer. The system detects unauthorized entry by detecting pressure changes on the floor surface and alerts property owners via local and remote notifications via an IoT platform. The system is user-friendly, cost-effective, and integrates with popular IoT platforms for remote monitoring.

CHAPTER 2

LITERATURE SURVEY

[1] This project aims to design a system using an Arduino camera module to protect homes from thievery. It includes a web camera, sensors, a servo motor, resistor, ESP32, and a mobile device for interfacing. The system captures video footage for the owner.

[2] The IoT-based anti-theft flooring mat-system uses Arduino uno to monitor movement and alert users when a thief enters. The system uses sensors on walls to detect and control movements, improving efficiency, accuracy, and economic benefits.

[3] This system aims to prevent theft by using a NodeMCU with a microcontroller, PIR sensor, ultrasonic sensor, buzzer, Blynk application, and light bulb. It detects movement, sends a message, illuminates the environment, and alerts an alarm. Unlike existing systems, it can distinguish between human and non-human objects, making it essential for every building.

[4] Crime rates are increasing rapidly in big shops, jewelry shops, and houses, where only CCTV cameras provide security. This leads to significant losses for owners and delayed arrests. To address this, an IoT-based anti-theft system has been proposed. This system detects crimes and takes necessary actions immediately, ensuring assets are safe from theft. The system captures images and prevents motions in secured areas.

[5] Security systems detect intrusion, trespassing, and unauthorized entry into homes to protect assets and people. With the rise of modern technology, home security systems have become increasingly important, especially in urban areas. Automated systems, such as gas leakage, fire alarming, and theft monitoring, have become more sophisticated and cost-effective. Microcontroller-based home security system automation is emerging, allowing users to remotely access and change security passwords. These systems are accurate, cost-effective, and allow for remote monitoring and control of systems.

CHAPTER 3

SYSTEM SPECIFICATIONS

3.1 HARDWARE SPECIFICATIONS FOR APPLICATION

Processor	:	Pentium IV Or Higher
Memory Size	:	256 GB (Minimum)
HDD	:	40 GB (Minimum)

3.2 SOFTWARE SPECIFICATIONS

Operating System	:	WINDOWS 10 AND PLUS
Application	:	ARDUINO IDE

3.3 HARDWARE COMPONENTS FOR PROTOTYPE

Sensor	:	IR-Sensor
Board	:	Arduino Uno
Actuator	:	Micro Servo Motor 9g
Screen	:	16x2 LCD Display & I2C Module

CHAPTER 4

MODULES DESCRIPTION

Arduino Uno

This is microcontroller setup for the car parking system which acts as the CPU of the whole system. This takes inputs from the Sensors and triggers the actuators.

IR - Sensor

This sensor is used to trigger an event at the time of car's entry or exit and sends the information to the controller.

WI-FI Module

This module is used to notify about the availability of slots in the parking.

Servo Motor

This module is the actuator of the system which controls the gate based on the decisions taken by the controller of the system.

Buzzer

This is used as a communication medium between the LCD module and Controller just utilizing 4 pins from the controller whereas to connect LCD directly it needs more pi

CHAPTER 5

SYSTEM DESIGN

5.1 FLOW CHART

A flowchart is a type of diagram that represents an algorithm, workflow or process. The flowchart shows the steps as boxes of various kinds, and their order by connecting the boxes with arrows. This diagrammatic representation illustrates a solution model to a given problem.

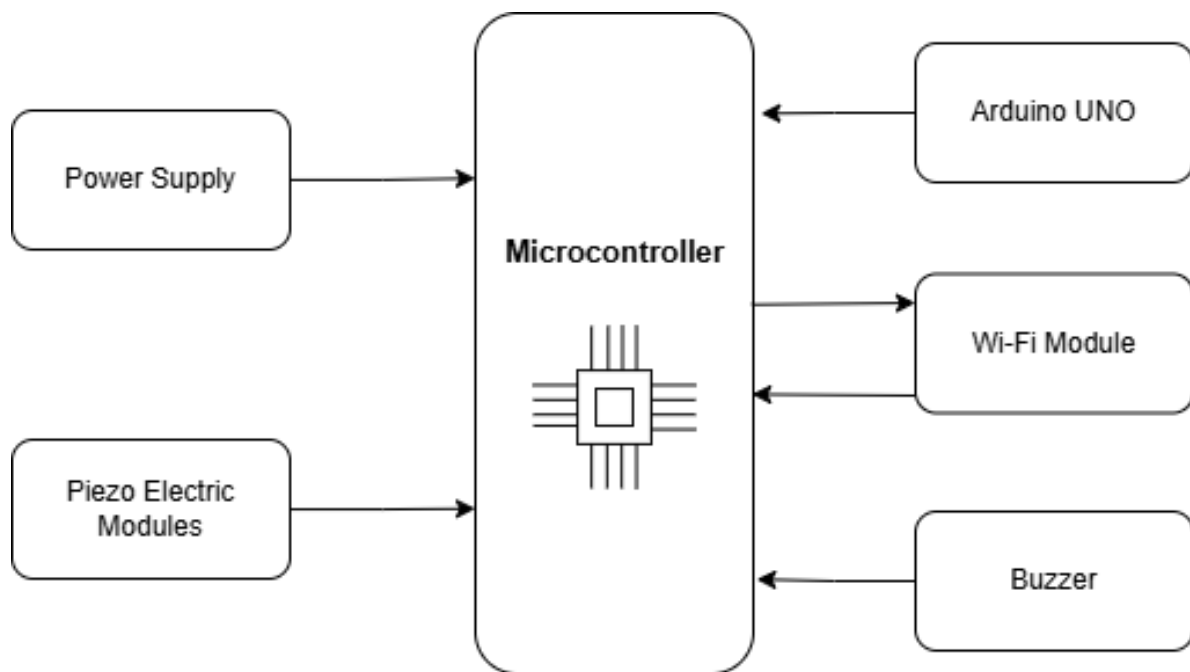


Figure 5.1 Block Diagram

5.2 WORKING PROCESS

The working process explains the connections made with the hardware components and the board. The Arduino uno is connected with the piezosensors. The Sensors, Buzzer and Arduino Uno is given connection with the rails and the other input/output pins are connected to digital as per the requirements.

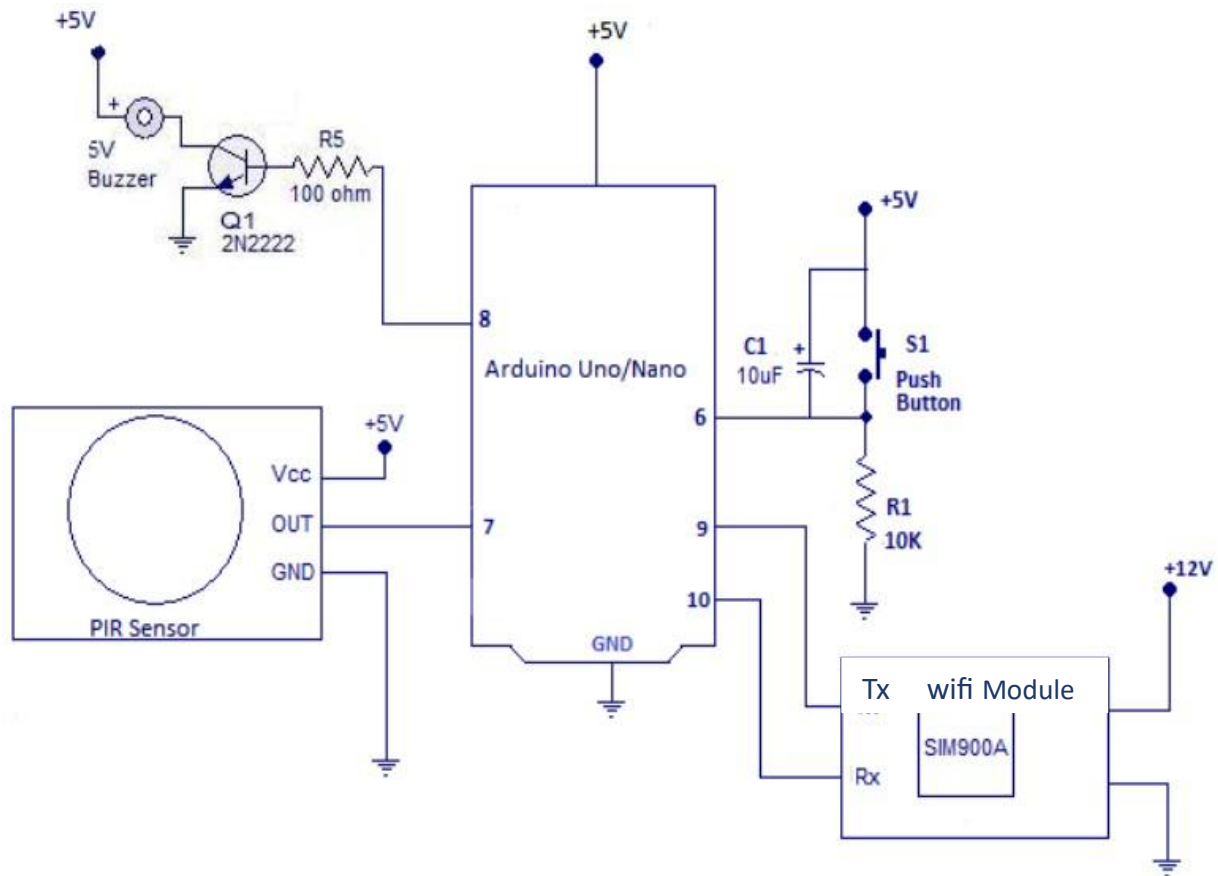


Figure 5.2 Circuit diagram

5.3 ARCHITECTURE DIAGRAM

The anti-theft flooring system uses piezoelectric sensors strategically placed under flooring materials to detect pressure changes. The Arduino Uno, a central controller, reads analog signals from these sensors and processes them to determine if pressure exceeds a predefined threshold, indicating a potential intrusion. An audible alarm is produced when an intrusion is detected. A Wi-Fi module (ESP8266/ESP32) connects to the Arduino and communicates using serial communication. The system connects to a Wi-Fi network, enabling data transmission to the internet. The IoT platform (Blynk) receives intrusion data and sends real-time notifications to the user's smartphone or device. The user receives instant notifications about potential intrusions, enabling quick response and action. This integrated architecture ensures a seamless flow of information from pressure detection to user notification.

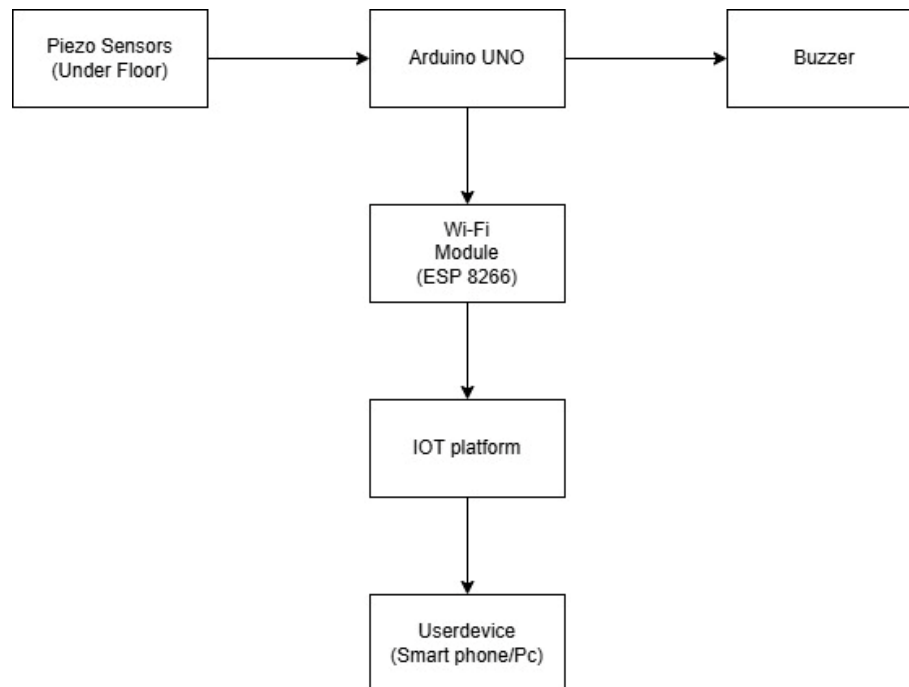


Figure 5.3 Architecture Diagram

CHAPTER 6

CODING

```
#include <ESP8266WiFi.h>
#include <ESP8266HTTPClient.h>
#include <WiFiClientSecure.h>

const char* ssid = "Motog62";
const char* password = "password123";

const char* serverName =
"https://maker.ifttt.com/trigger/alarm_triggered/with/key/your_IFTTT_key";

// Piezo sensor pins
const int piezoPin1 = A0;
const int piezoPin2 = A1;
const int threshold = 100; // Adjust this value based on your piezo sensor
sensitivity

// Buzzer pin
const int buzzerPin = 8;

void setup() {
  Serial.begin(115200);
  pinMode(piezoPin1, INPUT);
```

```
pinMode(piezoPin2, INPUT);
pinMode(buzzerPin, OUTPUT);
digitalWrite(buzzerPin, LOW);

// Connect to Wi-Fi
WiFi.begin(ssid, password);
Serial.print("Connecting to WiFi...");
while (WiFi.status() != WL_CONNECTED) {
    delay(1000);
    Serial.print(".");
}
Serial.println("Connected to WiFi");
}

void loop() {
    int sensorValue1 = analogRead(piezoPin1);
    int sensorValue2 = analogRead(piezoPin2);

    if (sensorValue1 > threshold || sensorValue2 > threshold) {
        triggerAlarm();
        sendEmailNotification();
    }

    delay(100); // Small delay to avoid bouncing
```



```
}
```

```
void triggerAlarm() {  
    digitalWrite(buzzerPin, HIGH); // Turn on buzzer  
    delay(5000); // Keep the buzzer on for 5 seconds  
    digitalWrite(buzzerPin, LOW); // Turn off buzzer  
}
```

```
void sendEmailNotification() {  
    if (WiFi.status() == WL_CONNECTED) {  
        WiFiClientSecure client;  
        HTTPClient http;  
  
        client.setInsecure(); // Skip certificate verification for simplicity  
  
        Serial.print("Connecting to ");  
        Serial.println(serverName);  
  
        if (http.begin(client, serverName)) {  
            int httpResponseCode = http.GET();  
            if (httpResponseCode > 0) {  
                String response = http.getString();  
                Serial.println(httpResponseCode);  
                Serial.println(response);  
            } else {
```

```
    Serial.print("Error on sending POST: ");  
    Serial.println(httpResponseCode);  
}  
http.end();  
} else {  
    Serial.println("Unable to connect");  
}  
} else {  
    Serial.println("WiFi not connected");  
}  
}
```

CHAPTER 7

SCREEN SHOTS

1. CONNECTION

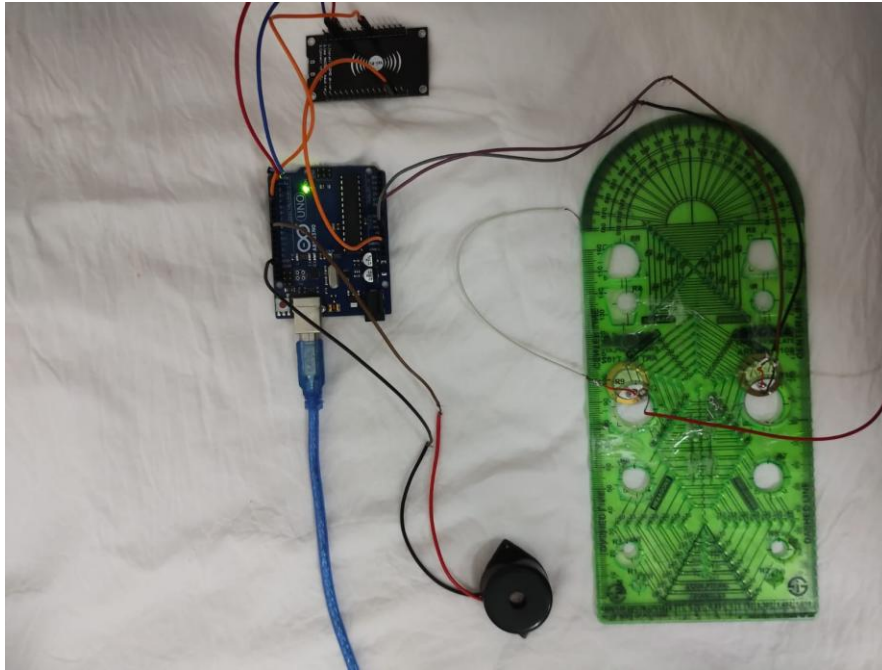


Fig:7.1 Connection Setup

1. Piezoelectric Sensors:

- Connect the positive terminals to analog input pins (e.g., A0, A1) on the Arduino Uno.
- Connect the negative terminals to the ground (GND) on the Arduino.

2. Buzzer:

- Connect the positive terminal to a digital output pin (e.g., D9) on the Arduino.
- Connect the negative terminal to the Arduino's GND.

3. Wi-Fi Module (ESP8266/ESP32):

- Connect VCC to the 3.3V (or 5V, based on the module) and GND to GND on the Arduino.
- Connect TX of the Wi-Fi module to RX on the Arduino (D0).
- Connect RX of the Wi-Fi module to TX on the Arduino (D1).

This setup ensures proper communication and functionality of all components.

CHAPTER 8

CONCLUSION AND FUTURE ENHANCEMENT

The anti-theft flooring system, which uses piezoelectric sensors, an Arduino Uno, a Wi-Fi module, and a buzzer, has proven to be an effective solution for detecting unauthorized entry. Its discreet installation under flooring materials reduces susceptibility to tampering and provides an additional layer of security. The Arduino Uno processes sensor data to trigger an audible alert through the buzzer and sends real-time notifications via the Blynk IoT platform. Despite occasional false positives and intermittent Wi-Fi connectivity issues, the system's overall performance was satisfactory.

Future enhancements include reducing false alarms by incorporating advanced filtering algorithms and machine learning techniques to distinguish between human footsteps and other pressure sources. Adding GSM modules and mesh networking could improve coverage and reliability, especially in larger areas. A modular design will allow for the easy addition of more piezoelectric sensors, making the system suitable for extensive properties or commercial spaces.

A battery backup system will ensure the system continues to operate during power outages, maintaining security. A dedicated mobile app will provide users with a more sophisticated interface for real-time monitoring, system status checks, and customizable alert settings. Integrating the system with existing security infrastructure, such as CCTV cameras and automated door locks, can create a comprehensive security solution. These future enhancements will improve the system's robustness, reliability, and user experience, making it an even more effective and versatile security solution.

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