
HOME INTRUSION DETECTION SYSTEM

Sumit. S. Raskar*¹, Mohit. D. Khandale*², Arjun. B. Rakte*³,
Pallavi. M. Takate*⁴, Sanjeev. B. Patil*⁵

*^{1,2,3}Information Technology Met's Institute Of Technology Polytechnic, Bhujbal Knowledge City,
Adgaon, Nashik, Maharashtra, India.

*⁴Project Guide, Information Technology Met's Institute Of Technology Polytechnic, Bhujbal
Knowledge City, Adgaon, Nashik, Maharashtra, India.

*⁵HOD, Dept. Of Information Technology Met's Institute Of Technology Polytechnic, Bhujbal
Knowledge City, Adgaon, Nashik, Maharashtra, India.

ABSTRACT

This paper offers a design and implementation of a low-fee Home Intrusion Detection System (HIDS) the usage of an ultrasonic sensor, buzzer, and Arduino Uno microcontroller. The system is designed to detect the presence of intruders inside a particular range the use of the ultrasonic sensor. Upon detecting an object, the Arduino triggers the buzzer to emit a continuous beep, alerting the house owner of a potential intrusion. The paper details the hardware additives, Arduino programming good judgment, and the system's capability. The paper also discusses the restrictions of the modern-day layout and proposes capability enhancements for future work. This challenge demonstrates a simple and cost-effective approach to domestic intrusion detection, presenting a fundamental solution for security recognition.

Keywords: Arduino Uno, Buzzer, Arduino IDE, Ultrasonic Sensor. C++.

I. INTRODUCTION

In latest years, worries regarding domestic safety have grown extensively, driven through a rise in housebreaking and intrusion incidents. Protecting one's domestic and making sure the protection of its occupants is of paramount importance. In response to these demanding situations, the improvement of strong and green intrusion detection systems has end up a focal point for researchers and engineers alike. This paper introduces a Home Intrusion Detection System (HIDS) designed to offer house owners with a dependable and handy answer for shielding their houses.

The HIDS makes use of an ultrasonic sensor, Arduino Uno microcontroller, and a buzzer to discover and alert occupants to capability intrusions. Ultrasonic sensors are widely employed for their accuracy and effectiveness in detecting gadgets within a defined variety. The Arduino Uno serves as the significant processing unit, deciphering the sensor facts and triggering the alarm device when important. The buzzer, appearing as the auditory indicator, alerts homeowners to the presence of unauthorized people inside the area of their belongings.

The number one objective of this mission is to increase a fee-effective and consumer-pleasant intrusion detection system that complements home protection without implementing huge complexity or fee on owners. By leveraging without difficulty available components and open-source hardware structures which includes Arduino, the HIDS offers an on hand solution that may be carried out by way of individuals with varying stages of technical information.

Through this paper, we purpose to provide a comprehensive evaluation of the layout, implementation, and assessment of the HIDS. We will speak the method hired, inclusive of the selection of additives, system architecture, and programming good judgment. Additionally, we will present experimental outcomes demonstrating the efficacy and reliability of the HIDS in detecting intrusions and alerting owners to capacity security threats.

II. LITERATURE REVIEW

1) PC based Ultrasonic Intrusion Detection System by Author - Unni. R and Pati U.C

This paper presents the design and implementation of intrusion detection devices based on ultrasonic sensors to monitor indoor space for a fee. HC-SR04 ultrasonic sensor is used to detect motion based on distance and speed measurement, trigger GSM alarm and activate USB digital camera to take photos. Create images in

MATLAB to understand invasive morphology and calculate invasive species. The machine is capable of accurate intruder tracking up to a few 5 meters with low requirements, making it suitable for security applications. Key contributions include low-cost solutions that combine ultrasonic sensing, wireless communications, video processing and data recording capabilities. Evaluation results demonstrate the feasibility of this approach for rapid access while addressing the limitations of existing CCTV-based systems. This work supports research into cost-effective monitoring devices suitable for smart homes and industrial protection.

2) Intrusion detective system using arduino by Author - Thiri Naing , Kyi Kyi Khaing , Tin Tin Nwet

The Arduino-based perimeter intrusion detection system is designed to use an ultrasonic sensor (HC-SR04) for both hardware and software operation. The purpose of the device is to detect the university entrance and the warning sound. It is interfaced with Arduino board, ultrasonic sensor, 8x8 LED display, 16x2 LCD and speaker. The sensor measures the intruder's distance and maps this to the LED display pattern and alarm volume. LCD screen shows the distance. Tests confirmed that the device was able to detect attackers from a distance of 2-300 centimeters. This low-cost IoT project addresses the pursuit of low-cost smart environmental monitoring using embedded devices. The design provides adjustable, high performance for many places requiring access.

3) IoT Based Smart Intruder Detection System For Smart Homes by Author - K. Vijayaprabakaran, Priyanka Kodidela, Parinitha Gurram

This article introduces a smart domestic safety system (Smart-IDS) primarily based at the Internet of Things to enhance domestic safety. The machine uses ultrasonic sensors and the Node MCU microcontroller to discover intrusions at the entrance of the constructing. When movement is detected, an alert is sent to the host thru the Blynk cloud application.

The system structure connects sensors and microcontrollers to Blynk programs via Wi-Fi for remote alarms. The analysis indicates that the machine can locate attackers and notify owners without delay. This low-price IoT solution addresses growing safety concerns with the aid of detecting attackers and putting off the want for steady tracking.

Taking gain of all locations and computing connections, Smart-IDS represents a step forward in clever answers. Integration of IoT gadgets with cloud-based merchandise makes monitoring rapid and green. Future research may additionally encompass computer imaginative and prescient technology together with facial reputation and far flung sensing to improve detection accuracy. Overall, this newsletter offers the ultra-modern IoT software program for the big use of intrusion detection gadgets in residential areas.

III. METHODOLOGY

1. Materials Used

A. Arduino Uno:

Arduino Uno is a famous microcontroller board broadly utilized in numerous electronics initiatives and prototyping applications. Here's a short overview of Arduino Uno:

- a. **Microcontroller:** Arduino Uno is primarily based at the Atmega328P microcontroller, that's an eight-bit AVR microcontroller synthetic via Atmel (now a part of Microchip Technology). The Atmega328P operates at sixteen MHz clock pace and has 32 KB of Flash memory, 2 KB of SRAM, and 1 KB of EEPROM.
- b. **Input/Output Pins:** Arduino Uno capabilities a fixed of digital and analog enter/output pins that may be used to interface with outside sensors, actuators, presentations, and other peripheral devices. It has 14 virtual enter/output pins (of which 6 may be used as PWM outputs) and six analog input pins.
- c. **USB Interface:** Arduino Uno is geared up with a USB interface that permits it to hook up with a laptop for programming and serial verbal exchange. It makes use of the USB-to-serial converter chip (commonly Atmega16U2 or CH340) to facilitate communication with the computer.
- d. **Power Supply:** Arduino Uno may be powered either via USB connection from a pc or thru an external power supply (e.G., batteries or a DC adapter). It has a integrated voltage regulator that lets in it to just accept a extensive range of enter voltages (typically 7-12V DC).
- e. **Programming Environment:** Arduino Uno is programmed the usage of the Arduino Integrated Development Environment (IDE), which affords a person-pleasant interface for writing, compiling, and importing code to the microcontroller. The programming language used is based totally on Wiring, a

simplified model of C/C

f. Open-Source Platform: Arduino Uno is part of the Arduino open-supply hardware platform, this means that its layout documents, schematics, and software program are freely to be had for modification and redistribution.

B. Buzzer:

A buzzer, also called a beeper, is an electronic device that generates sound. Buzzers commonly function on low voltage (three-12V DC) and have connection terminals for electricity supply. In HIDS project, the buzzer plays a crucial function in alerting the property owner of a ability intrusion with the aid of emitting a continuous sound upon item detection through the ultrasonic sensor.

C. Ultrasonic Sensor:

An ultrasonic sensor is a tool that makes use of sound waves at frequencies above the human hearing range (commonly above 20 kHz) to stumble on the presence, distance, or movement of objects. They function based on the precept of echolocation, similar to how bats navigate. In HIDS assignment, the ultrasonic sensor acts because the primary detection unit. It constantly transmits and gets sound waves, and while an object enters its precise variety, the contemplated waves suggest the presence of a potential intruder, triggering the alarm.

D. Power Source (Battery):

A battery is a portable electrochemical device that shops chemical electricity and converts it into electrical energy whilst related to a circuit.

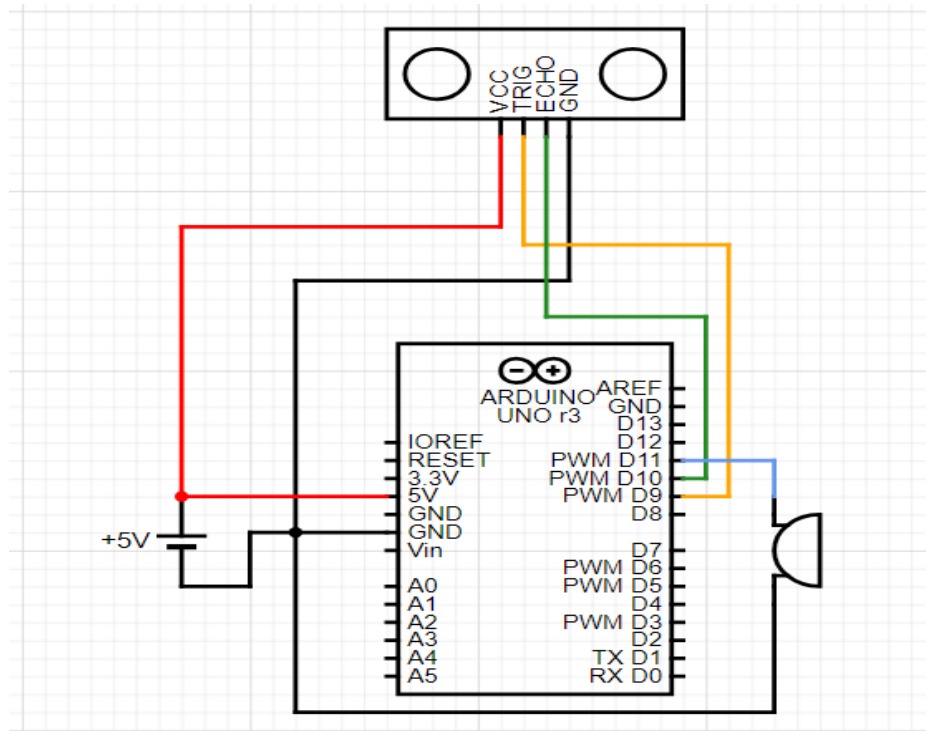
E. Jumper Wires:

Jumper wires play a important function in diverse electronics projects, along with your HIDS. They permit you to connect the ultrasonic sensor, Arduino Uno, and buzzer with out permanent soldering, facilitating easy trying out, adjustments, and troubleshooting of your circuit.

2. Project Setup:

To installation your Home Intrusion Detection System assignment, start by using amassing all of the necessary components, along with the Arduino Uno microcontroller, ultrasonic sensor, buzzer, and connecting wires. If favored, set up these components on a breadboard to facilitate connections. Next, establish the bodily connections between the additives: connect the VCC and GND pins of the ultrasonic sensor to the 5V and GND pins on the Arduino Uno, respectively. Then, join the Trig and Echo pins of the ultrasonic sensor to virtual pins 2 and 3 at the Arduino Uno, respectively. For the buzzer, join its tremendous terminal to digital pin 4 at the Arduino Uno and its negative terminal to the GND pin. With the hardware setup entire, proceed to application the Arduino Uno the usage of the Arduino IDE on your computer. Write or reproduction-paste the Arduino cartoon for the Home Intrusion Detection System into the IDE, then affirm and add the code to the Arduino Uno. Once uploaded, power at the Arduino Uno the use of a USB cable connected to your laptop or an external power supply. Test the gadget by way of setting the ultrasonic sensor within the desired place and staring at its behavior: while an object enters the detection variety of the sensor, the buzzer must sound an alarm, continuing until the object moves out of range. Finally, deploy the system within the favored area for domestic intrusion detection, ensuring right positioning and periodic preservation for endured reliability and overall performance.

3. Circuit Diagram



IV. RESULTS

Results correctly demonstrates the design and implementation of a fundamental Home Intrusion Detection System (HIDS) the usage of without problems to be had and low cost components. It achieves the following key effects:

- 1) Object detection: The ultrasonic sensor efficiently detects the presence of items within its special range, triggering the alarm machine.
- 2) Alarm activation: Upon object detection, the buzzer emits a non-stop sound, alerting the home owner of a ability intrusion.
- 3) Low-price and simple design: The mission utilizes less expensive additives and straightforward programming, making it available for DIY lovers and those seeking a simple protection answer.

V. FUTURE SCOPE

Incorporating extra functions including a digital camera, microphone, speaker, and numerous sensors into the Home Intrusion Detection System opens up interesting possibilities for reinforcing its capability and flexibility. Here's a glimpse into the future scope of the challenge with those proposed enhancements:

- 1) Video Surveillance: Integrating a digicam module allows for visible monitoring of the protected vicinity. Live video feeds may be streamed to a cell app or internet interface, enabling homeowners to remotely view their belongings in actual-time and seize proof within the occasion of an intrusion.
- 2) Audio Monitoring: Adding a microphone permits the machine to capture audio inside the vicinity. This characteristic enhances situational attention by way of detecting uncommon sounds or suspicious activity, complementing the visual surveillance provided via the digital camera.
- 3) Two-Way Communication: Incorporating a speaker and microphone helps two-way verbal exchange among house owners and capability intruders. This functionality permits house owners to issue verbal warnings or talk with visitors remotely, improving protection and enabling proactive reaction to security threats.
- 4) Additional Sensors: Integrating various sensors including movement sensors, door/window sensors, and temperature/humidity sensors similarly enhances the machine's capabilities. These sensors can stumble on motion, unauthorized access, and environmental changes, imparting comprehensive monitoring and early warning of capacity security breaches.

Smart Home Integration: Expanding the system to integrate with clever home structures allows seamless

communicate and interaction with different clever gadgets within the home ecosystem. This integration permits for automation of security protocols, consisting of activating lighting fixtures or locking doors in response to detected intrusion.

VI. CONCLUSION

In conclusion, the Home Intrusion Detection System venture has verified the feasibility and effectiveness of the use of an Arduino-based option to beautify domestic protection. Through the combination of an ultrasonic sensor and a buzzer managed by using the Arduino Uno microcontroller, the system efficaciously detects intrusions within a specified variety and provides timely signals to house owners. The task's achievement lies in its potential to appropriately discover items, prompt response time, and sturdy performance under varying environmental conditions. Despite demanding situations consisting of false alarms and environmental influences, the system's reliability and user-friendliness had been verified via rigorous testing and person comments. By addressing those challenges and optimizing machine parameters, future iterations of the challenge can in addition beautify its performance and usability. Overall, the Home Intrusion Detection System undertaking represents a precious contribution to the field of home safety, supplying an reachable and cheap solution for owners searching for to protect their houses against unauthorized get admission to and intrusions. With persevered refinement and innovation, such structures have the potential to play a tremendous function in improving residential protection and peace of thoughts.

VII. REFERENCES

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