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ijircce@gmail.com



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Shadowguard: Nocturnal Security System

Mathivanan K¹, Sakthi Swetha S², Suganya M³, Vaishnavi V⁴, Pavithra G⁵

Assistant Professor, Department of Computer Engineering, Vivekanandha College of Engineering for Women,
Elaiyampalayam, Tamil Nadu, India¹

U.G. Student, Department of Computer Science and Engineering, Vivekanandha College of Engineering for Women,
Elaiyampalayam, Tamil Nadu, India^{2,3,4,5}

ABSTRACT: This paper presents the creation of a smart night patrolling robot based on the Internet of Things, using an Arduino Uno, motor driver, motors buzzer, sound sensor and ultrasonic sensor. With the camera module, the suggested robot can take pictures and films of the surrounding region while patrolling a predetermined area on its own. The sound sensor is meant to identify anomalous noises and notify the user, while the ultrasonic sensor is meant to identify obstructions and avert crashes. In the event that there is a major disruption in the patrolling area, the buzzer is equipped to send an audible alert. With the help of the motor driver and motors, which are controlled by an Arduino Uno, is offered by the Nodemcu.

KEYWORDS: Arduino Uno, camera module, sound sensor, ultrasonic sensor, motor driver, motors, Nodemcu, and buzzer.

I. INTRODUCTION

Recent advancements in technology, particularly the rise of the Internet of Things (IoT), have revolutionized various aspects of daily life, including security. IoT-based smart night patrolling robots, equipped with sensors and internet connectivity, are increasingly being adopted for automated surveillance. These robots offer enhanced patrolling capabilities, making them a key component of modern security systems for monitoring specific areas autonomously.

II. LITERATURE SURVEY

Product Delivery Robot: The Arduino Uno microcontroller, GPS, and RF signals enable real-time tracking and remote control of robots, revolutionizing automated healthcare delivery by allowing for remote product transportation. **Espionage Robot:** An Android-controlled robot equipped with a wireless night-vision camera is designed to monitor human activity in combat zones, reducing the risk of human casualties. **Facial Recognition and Sound Detection Robot:** A security robot with real-time facial expression detection and sound source localization enhances surveillance through GPS-based monitoring. **IoT-Based Security Robots:** Key components like microcontrollers, sensors, and motors are integrated with software designs that focus on navigation, obstacle avoidance, and surveillance in building security robots. **Wearable Technology for Safety:** IoT and wearable devices, like GPS and GSM-based systems, enhance personal safety, though they raise concerns about privacy, security, and hacking.

III. SYSTEM ANALYSIS

In the proposed system a number of parts, including an Arduino Uno microcontroller board, a camera module, a sound sensor, an ultrasonic sensor, motor drivers, motors, a Nodemcu, and a buzzer, are used in the suggested system for an Internet of Things-based smart night patrolling robot. The primary objective of the suggested system is to create a robot that can autonomously patrol a predetermined region, recognize any unexpected activity, and give the user feedback in real time. The system has multiple applications, including public spaces, residential areas, and industrial sites for security and monitoring.

The Arduino Uno microcontroller board, the system's central component, is one of the hardware elements utilized in the suggested setup. It processes sensor data, delivers alarms to the user, and directs the movement of the robot. The robot can move around and change directions because of the motor driver and motors that govern its mobility. The



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camera module gives the user visual feedback by taking pictures and movies of the patrolling area. Any odd sound or movement in the patrolling area is detected using the sound and ultrasonic sensors.

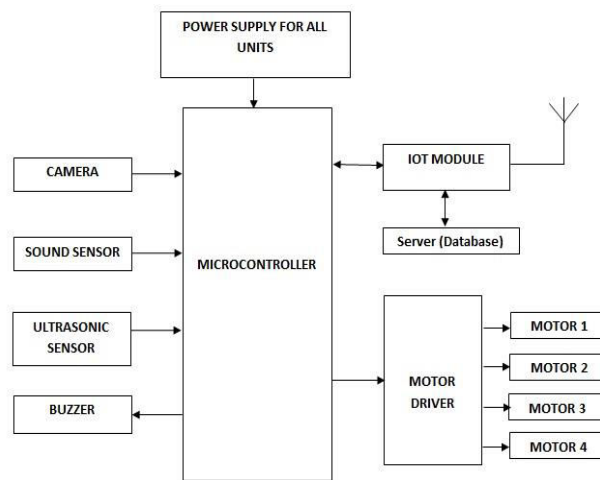


Fig.1 Block Diagram

We turned on the security system. using a higher-quality security camera. Using a clear video and image processing system is also recommended. The robot can move around independently thanks to the software, which can also detect any strange movement or sound in the patrolling area and change course when it comes across an impediment.

IV. SYSTEM DESIGN

ARDUINO

The Arduino microcontroller is a powerful single-board computer that is easy to use and has become more and more popular in both the hobby and professional markets. The development software is free and the hardware is affordable due to the Arduino's open-source nature. The aim of the Arduino project, which started in Italy, was to develop inexpensive hardware for interaction design.

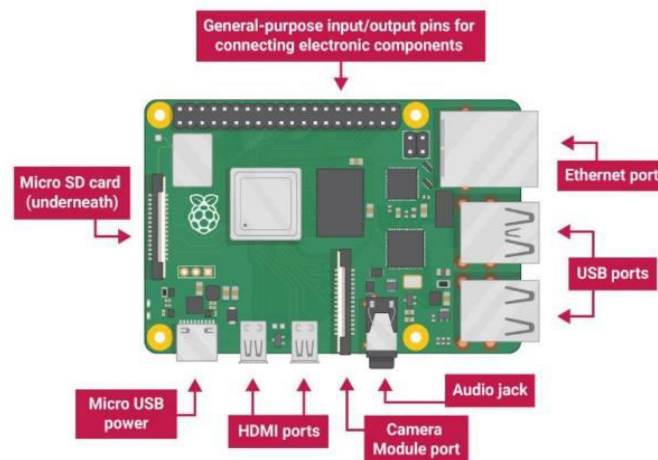


Fig 2.. Arduino



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ULTRASONIC SENSOR

A popular ultrasonic sensor module for robotics and automation applications that measures distance is the HC-SR04. It works by employing a transmitter to send out ultrasonic waves and a receiver to pick up the waves' reflections from surrounding objects. By measuring the time, it takes for the waves to reach the object and back, one can utilize the speed of sound in air to determine the item's distance.

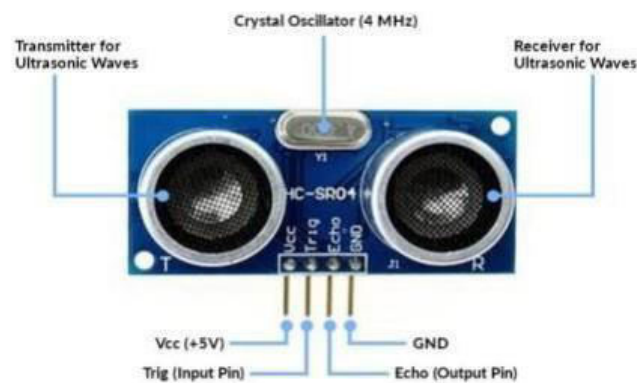


Fig 3. Ultrasonic Sensor

DC MOTOR

The term "Brushed Output" refers to the fact that the DC BO gear motor is a brushed DC motor with an output shaft that is coupled to a gearbox. Because they are straightforward, dependable, and simple to operate, brushed DC motors are frequently utilized in low-cost applications. The motor shaft is driven by a revolving magnetic field produced by their rotor, which has a commutator and brushes that transfer power to the rotor windings. In order to achieve the required torque increase and speed reduction, a series of gears with varying sizes is usually assembled in a particular order and attached to the gearbox of the DC BO gear motor. In addition to shielding the motor from outside impacts, the gearbox lowers operating noise and vibration.



Fig 4 DC Motor



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BUZZER

A buzzer is a sound-generating device that is commonly employed in electronic equipment to convey audible signals or alerts. Usually, an electromagnetic coil and spring-mounted armature are housed in a metal or plastic buzzer enclosure. The armature is drawn towards the coil by the magnetic field produced when an electrical current flows through the coil. The gadget vibrates as a result of the armature's movement, making noise. Typically, a digital signal from a microcontroller or other digital device powers buzzer modules. By changing the digital signal's frequency and duration, the buzzer's sound can be adjusted. A broad variety of sounds, including intricate melodies and basic beeps and tones, can be produced by buzzer modules.



Fig 5 Buzzer

CAMERA

A webcam is a type of video camera that transmits images or videos in real time via a computer network, like the Internet, to a computer. Usually, webcams are tiny cameras that are integrated into hardware, mounted on a desk, or fastened to a user's monitor. In a video chat session with multiple participants, webcams can be utilized for live audio and video chats.



Fig 6 Camera

V. CONCLUSION

The Internet of Things-powered smart night patrolling robot represents a significant advancement in security and surveillance technology. By integrating components such as the Arduino Uno microcontroller, camera module, sound and ultrasonic sensors, motor drivers, motors, Nodemcu, and buzzer, the system autonomously patrols predetermined areas and provides real-time feedback to users. Its remote accessibility through a web interface reduces the need for human intervention, lowering labor costs and minimizing human error. This cost-effective and efficient system caters to the growing demand for affordable security solutions, making it accessible to a wide range of users. Additionally, the robot's adaptability to various environments, from public spaces to residential areas, ensures its versatility for everyday use, fulfilling basic human security needs.



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