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Night Patrolling Robots

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Abstract: *This paper is an overview of project night patrolling robot. The designed control module comprised software and hardware. The system uses cameras and a motion detector mounted on a robotic vehicle for securing any premises. The robotic vehicle moves at a particular path and is equipped with a camera and object detector sensors. It uses a predefined line to follow its path while patrolling. The system uses IR based path following system for patrolling assigned areas. It monitors each area to detect any problem using HD cameras. It scans the area using its camera to detect any human faces detected. It captures and starts transmitting the images of the situation immediately to the IOT website. And it can control by its owner. Thus we put forward a fully autonomous security robot that operates tirelessly and patrols large areas on its own to secure the facility.*

Keywords: Night safety, patrolling area, robotics, motion detector, Wi-Fi module.

I. INTRODUCTION

Night patrolling robots are a state-of-the-art technology that has been developed to enhance security measures in a variety of environments. These robots are equipped with advanced sensors, cameras, and navigation systems that allow them to move autonomously, detect intruders, and alert security personnel in real time. The use of night patrolling robots in security measures has become increasingly important in recent years. These robots are capable of operating in low-light conditions and can navigate through obstacles, making them an ideal choice for patrolling large premises such as warehouses, factories, and industrial sites. In addition, these robots are designed to cover large areas, providing comprehensive coverage and making them an efficient solution for security monitoring.

II. LITERATURE REVIEW

Night patrolling robots have become an essential part of security systems for various facilities, including residential, commercial, and industrial areas. These robots are designed to provide continuous surveillance and monitoring during the night hours to ensure the safety and security of the premises. In recent years, the use of Wi-Fi modules has gained significant attention in the development of these robots.

A literature review of various research studies and publications reveals that Wi-Fi-based night patrolling robots offer several advantages over traditional patrolling methods. These robots can be remotely controlled and monitored through a Wi-Fi-enabled device, such as a smartphone or computer. They can also be programmed to detect and respond to suspicious activities or anomalies in the environment, such as movement or sound.

Furthermore, Wi-Fi-based night patrolling robots can be equipped with various sensors, such as cameras, temperature sensors, and gas detectors, to enhance their surveillance capabilities. They can also be integrated with machine learning algorithms to improve their decision-making abilities and provide more accurate and efficient monitoring.

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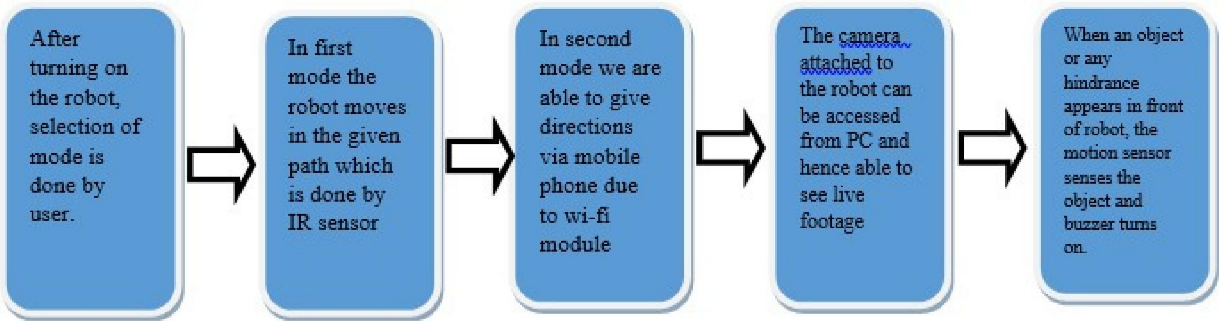
III. PROJECT METHODOLOGY

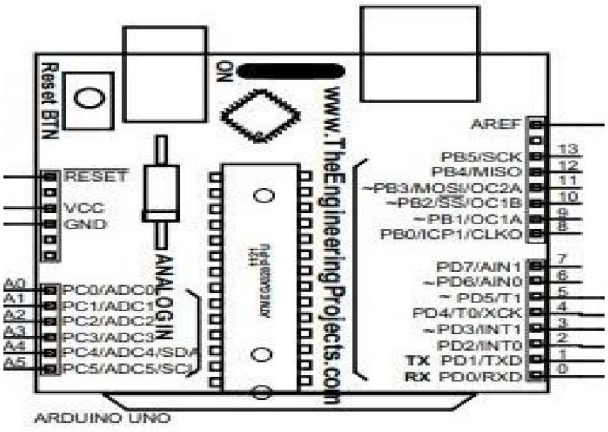


IV. HARDWARE COMPONENTS

1. Microcontroller AT mega 328
2. Motor driver IC
3. IP camera
4. IR sensor (transmitter & receiver)
5. Motion detector
6. Wi-Fi module
7. Battery
8. DC motor
9. Power supply

4.1 Microcontroller AT mega 328

The ATmega328P is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, theATmega48PA/88PA/168PA/328P achieves throughputs approaching 1 MIPS per MHz allowing the system designed to optimize power consumption versus processing speed.



4.2 Motor Driver IC

A motor driver IC is an integrated circuit chip that is usually used to control motors in autonomous robots. Motor driver ICs act as an interface between microprocessors in robots and the motors in the robot. The most commonly used motor driver ICs are from the L293 series such as L293D, L293NE, etc. .

These ICs are designed to control 2DC motors simultaneously .L293D consist of two H- bridge. H-bridge is the simplest circuit for controlling a low current-rated motor.

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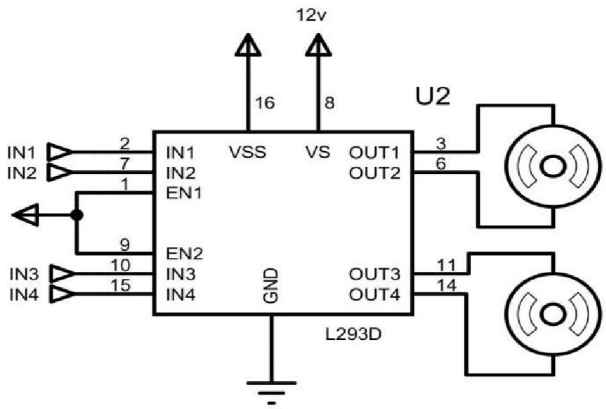
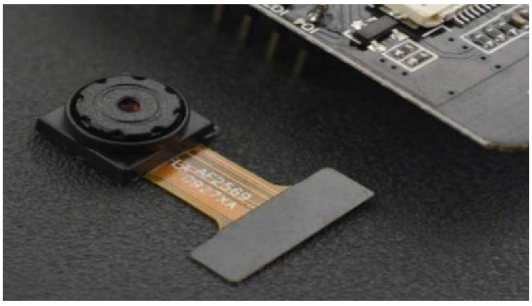


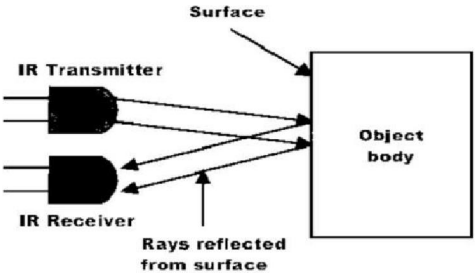
4.3 IP Camera

The ESP32-CAM is a very small camera module with the ESP32-S chip that costs approximately $10. Besides the OV2640 camera, and several GPIOs to connect peripherals, it also features a microSD card slot that can be useful to store images taken with the camera or to store files to serve to clients.



4.4 IR Sensor

The IR transmitter continuously emits the IR light and the IR receiver keeps on checking for the reflected light. If the light gets reflected back by hitting any object in front it, the IR receiver receives this light. This way the object is detected in the case of the IR sensor.



4.5 Motion Detector

A motion detector is an electrical device that utilizes a sensor to detect nearby motion. Such a device is often integrated as a component of a system that automatically performs a task or alerts a user of motion in an area. They form a vital component of security, automated lighting control, home control, energy efficiency, and other useful systems.

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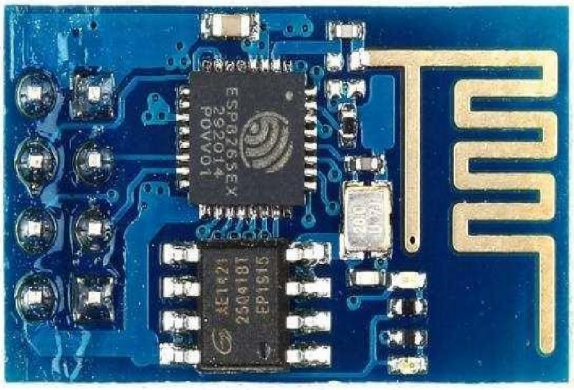
4.6 Wi-Fi module

With the popularity of Wifi IoT devices, there is an increasing demand for low-cost and easy-to-use WiFi modules. ESP8266 is a new player in this field: it's tiny (25mm x 15mm), with simple pin connections (standard 2x4 pin headers), using serial TX/RX to send and receive Ethernet buffers, and similarly, using serial commands to query and change configurations of the WiFi module. This is quite convenient as it only requires two wires (TX/RX) to communicate between a microcontroller and WiFi, but more importantly, it offloads WiFi-related tasks to the module, allowing the microcontroller code to be very light-weighted.

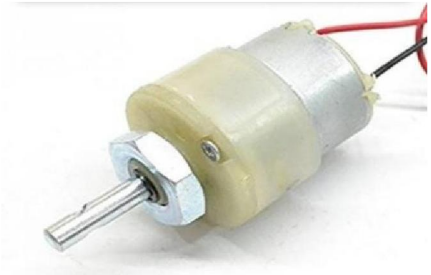


4.7 Battery

12V 1.2Ah Rechargeable Lead Acid Battery is normally used for robots in the competition. Wired or Wireless Robots run for a long time at high speed with this type of battery. Seal Lead Acid (SLA) Rechargeable battery is the most common general-purpose battery. Low cost, robustness, and less maintenance required are the advantages of SLA. But it is considered heavyweight for certain robotic applications. To charge SLA batteries, you can use any general DC power supply as long as it provides the correct voltage to your battery.

4.8 DC motor

A DC motor is any of a class of rotary electrical motors that converts direct current (DC) electrical energy into mechanical energy. The most common types rely on the forces produced by induced magnetic fields due to flowing current in the coil. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current in a part of the motor.



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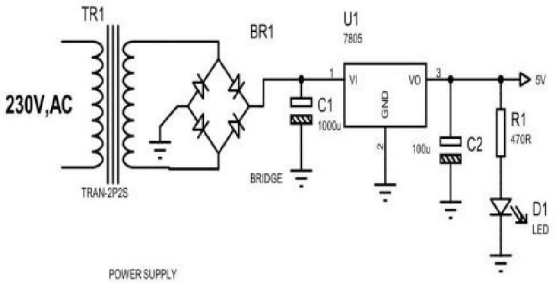
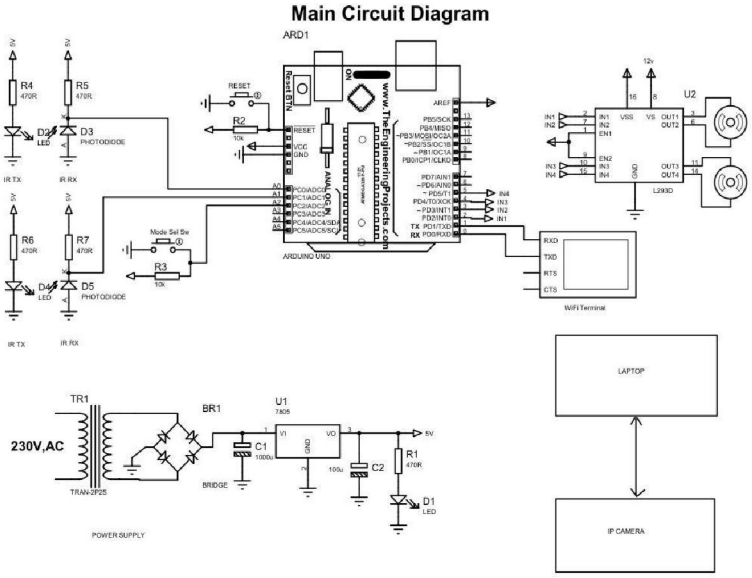
4.9 Power Supply

A power supply is an electrical device that supplies electric power to an electrical load. The main purpose of a power supply is to convert electric current from a source to the correct voltage, current, and frequency to power the load. As a result, power supplies are sometimes referred to as electric power converters. Some power supplies are separate standalone pieces of equipment, while others are built into the load appliances that they power.



V. CIRCUIT DIAGRAM

The system uses the IR-based path-following system for patrolling assigned areas and is controlled by the It controller. It can detect an object in front of it and act according to it. It monitors each area to detect any problem using HD cameras. It scans the area using its camera to detect any human faces detected. It captures and starts transmitting the images of the situation immediately to the IOT website. And it can control by its owner. Thus we put forward a fully autonomous security robot that operates tirelessly and patrols large areas on its own to secure the facility.



VI. ADVANTAGES

- **24/7 Surveillance:** A night patrolling robot can operate round the clock, providing constant surveillance and monitoring without any breaks.
- **Autonomous Operation:** With the Atmega 328 microcontroller, the robot can be programmed to perform various tasks autonomously, such as patrolling a specific area, detecting obstacles and intruders, and collecting data.
- **Customizable:** The robot can be customized to fit specific requirements by adding additional sensors and actuators, making it suitable for a wide range of applications.
- **Remote Control:** The WiFi module allows the robot to be remotely controlled from a central system, providing real-time monitoring and control over the robot's movement.

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- **Quick Response:** With the robot's real-time video streaming and remote control capabilities, it can provide a quick response to any potential security threat, minimizing the risk of any damage or loss.
- **Cost-Effective:** The Atmega 328 microcontroller and WiFi module are both inexpensive and widely available, making the night patrolling robot a cost-effective solution for security and surveillance.
- **Improved Safety:** The robot eliminates the need for human intervention, reducing the risk of injury or harm to security personnel.
- **Easy to Program:** The Atmega 328 microcontroller is easy to program, allowing for the robot's capabilities to be modified and updated easily.
- **Efficient Data Collection:** With the robot's ability to collect and transmit data in real- time, it can provide valuable insights and analysis to improve security and surveillance.
- **Versatile:** The night patrolling robot can be used in various environments, such as industrial areas, warehouses, and residential areas, making it a versatile and useful tool for security and surveillance.

VII. SCOPE

The scope for a night patrolling robot using Atmega 328 and WiFi module is vast and promising, as it has the potential to revolutionize the field of security and surveillance. Some of the key areas where the robot can be deployed include:

- **Industrial Security:** The night patrolling robot can be used in industrial areas to monitor and secure sensitive equipment and machinery, ensuring their safe and efficient operation.
- **Warehouse Security:** The robot can be deployed in warehouses to patrol and monitor the premises, detecting any unauthorized entry and reducing the risk of theft or damage to goods.
- **Residential Security:** The night patrolling robot can be used to secure residential areas, providing surveillance and monitoring of the surroundings and ensuring the safety of the residents.
- **Border Security:** The robot can be used in border areas to patrol and monitor the border, detecting any suspicious activity and improving the overall security of the area.
- **Disaster Management:** The robot can be deployed in disaster-prone areas to monitor and assess the situation, providing real-time data and insights to aid in disaster management.
- **Surveillance in Public Places:** The robot can be used in public places, such as parks and malls, to provide surveillance and monitoring, ensuring the safety of the public.

The scope for the night patrolling robot using Atmega 328 and WiFi module is not limited to the areas mentioned above. With the robot's customizable capabilities, it can be modified and adapted to suit specific requirements and environments. The cost-effectiveness of the robot makes it a viable option for security and surveillance in various sectors, making it a promising solution for improving safety and security across different industries and environments. As technology advances, the scope for the robot will only continue to expand, making it an exciting area for further development and exploration.

VIII. CONCLUSION

In conclusion, the implementation of a night patrolling robot using Atmega 328 and a WiFi module is a promising solution for enhancing security and surveillance. The integration of Atmega 328 provides the robot with intelligent capabilities, allowing it to autonomously move, detect obstacles and perform various tasks.

With the added WiFi module, the robot can be remotely controlled, and data can be transmitted to a central system in real-time. This feature allows for monitoring of the robot's movement, and quick response to any potential security threat.

The robot can be used in various environments, including but not limited to industrial areas, warehouses, and residential areas. It can also be customized to fit specific requirements by adding additional sensors and actuators. The robot can detect intruders, collect data, and provide real-time video streaming of the surrounding environment.

The Atmega 328 microcontroller is easy to program, and its small size makes it a suitable choice for embedding in a mobile robot. Additionally, the WiFi module is inexpensive and widely available, making it a cost-effective solution for the robot's communication needs.

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One of the significant advantages of using a night patrolling robot is that it does not require any human intervention, eliminating the need for security personnel to be present physically. The robot can operate 24/7, providing constant surveillance without the need for breaks or rest.

In summary, the implementation of a night patrolling robot using Atmega 328 and a WiFi module has the potential to revolutionize the field of security and surveillance. With the robot's autonomous capabilities and remote control features, it can provide constant surveillance and quick response to any potential security threat. The robot is customizable and can be used in various environments, making it a versatile and cost-effective solution.

However, it is important to note that the robot's effectiveness relies on proper maintenance and regular updates to its software and hardware components. With proper care, the night patrolling robot can provide reliable and efficient security and surveillance for years to come.

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