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Hill Climbing and Surveillance Animal Monitoring Spy Vehicle

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Abstract: ***A spy robot is a modern surveillance system used to monitor areas remotely without human presence, improving safety and security. This project develops a spy robot using ESP32 for robot movement control and ESP32-CAM for real-time video streaming. The ESP32 microcontroller controls the DC motors through a motor driver, allowing the robot to move forward, backward, left, and right. The robot is controlled wirelessly using Bluetooth communication from a mobile device, making it easy for the user to operate. The ESP32-CAM module captures live video and transmits it to a web page using Wi-Fi, enabling real-time monitoring of the surrounding environment.***

This allows the user to observe remote or dangerous areas safely and efficiently. The system is designed to provide continuous surveillance without the need for physical presence. The integration of wireless control and live video streaming improves the functionality and effectiveness of the robot. The project is low cost, portable, and easy to implement using IoT technology. This system can be used in security surveillance, military applications, industrial monitoring, and rescue operations. Overall, the project demonstrates an efficient and reliable solution for remote monitoring and surveillance using ESP32 and ESP32-CAM.

I. INTRODUCTION

A. Background Information of the Study

In recent years, surveillance and security have become very important in various fields such as military, industrial areas, public places, and home security systems. Continuous monitoring of sensitive and restricted areas is necessary to prevent unauthorized access, theft, and dangerous situations. However, human surveillance in certain environments may be difficult, risky, or sometimes impossible due to safety concerns. To overcome these challenges, robotic surveillance systems, commonly known as spy robots, have been developed to perform remote monitoring effectively. These robots can move into restricted or hazardous areas and provide real- time information to the user without human presence. With the advancement of Internet of Things (IoT) and wireless communication technologies, spy robots have become more efficient, compact, and affordable. The integration of microcontrollers with wireless modules allows robots to be controlled remotely and transmit data in real time. The ESP32 microcontroller is widely used in such applications because it has built-in Wi-Fi and Bluetooth capabilities, high processing speed, and low power consumption. This makes it suitable for controlling robotic movement and handling communication functions. In addition, the ESP32-CAM module is used for capturing images and streaming live video, enabling the user to visually monitor the robot's surroundings through a web interface. In this project, a spy robot is developed using ESP32 for motion control and ESP32-CAM for real-time video streaming. The robot is controlled wirelessly through Bluetooth using a mobile device, which sends commands to the ESP32 to control the direction of the DC motors. At the same time, the ESP32-CAM captures live video and transmits it to a web page using Wi- Fi, allowing the user to observe the environment remotely. This system provides an efficient solution for surveillance in areas where human access is limited or unsafe. The proposed system is low cost, easy to implement, and suitable for various applications such as security monitoring, military surveillance, industrial inspection, and rescue operations. This project demonstrates how modern IoT and embedded systems can be used to develop smart robotic surveillance systems for real-world applications.

II. METHODOLOGY

The spy robot system is developed using ESP32 as the main controller for robot movement and ESP32-CAM for live video streaming. DC motors are connected to the ESP32 through a motor driver to control the robot's direction. The ESP32 receives control commands from a mobile device via Bluetooth and moves the robot accordingly. The ESP32-CAM captures live video and transmits it to a web page using Wi-Fi for real-time monitoring. The entire system is powered by a battery and works wirelessly. The robot is tested in different environments to ensure proper movement control and continuous video streaming for surveillance applications.

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III. LITERATURE SURVEY

Author: R. Kumar, S. Prakash, and A. Singh
Abstract: This paper presents the design and implementation of an IoT-based surveillance robot using the ESP32-CAM module for real- time video streaming. The robot is controlled wirelessly through a mobile application using Wi-Fi communication. The ESP32-CAM captures live video and sends it to a web server, allowing users to monitor remote areas. The system improves security by providing continuous monitoring without human presence. The proposed robot is low cost, efficient, and suitable for home and industrial surveillance applications.

Title: Wireless Surveillance Robot with Live Video Transmission
Author: M. Sharma and P. Gupta Abstract:
This research describes a wireless surveillance robot capable of transmitting real-time video using a camera module and wireless communication. The robot can be remotely controlled and provides live video feedback to the user. The system is designed for security and monitoring applications in dangerous and restricted environments. The results show that the robot provides reliable communication and efficient surveillance performance.

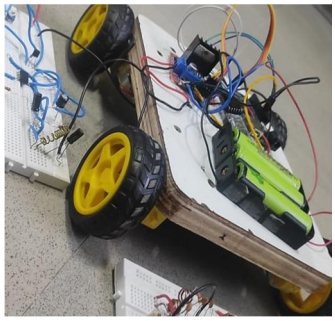
Title: Bluetooth Controlled Spy Robot with Camera
Author: S. Reddy and K. Lakshmi Abstract:
This paper presents a spy robot controlled using Bluetooth technology and equipped with a camera for live monitoring. The robot receives commands from a mobile device and moves accordingly. The camera captures images and video for surveillance purposes. The system is useful in military, security, and rescue applications. The design is simple, low cost, and easy to implement.

Title: Design and Implementation of Surveillance Robot Using IoT
Author: A. Verma, R. Singh, and N. Patel Abstract:
This paper proposes an IoT-based surveillance robot that uses wireless communication to monitor remote locations. The robot is equipped with a camera module for real-time video streaming and controlled through the internet. The system improves security and reduces human effort in monitoring dangerous areas. The results demonstrate reliable performance and effective remote surveillance.

Title: ESP32-CAM Based Wireless Video Monitoring System
Author: D. Johnson and M. Ravi Abstract:
This research focuses on developing a wireless video monitoring system using the ESP32-CAM module. The system captures live video and transmits it through Wi-Fi to a web page for remote monitoring. The ESP32-CAM provides a low-cost and efficient solution for surveillance applications. The system is suitable for security, home monitoring, and industrial inspection.

IV. RESULTS AND DISCUSSIONS

The ESP32-based spy robot with ESP32-CAM was successfully developed and tested for wireless control and real-time surveillance. The robot responded correctly to Bluetooth commands from the mobile device and moved in all directions such as forward, backward, left, and right. The ESP32-CAM module captured live video and transmitted it to a web page through Wi-Fi, providing clear and continuous real-time monitoring. The system showed stable performance with reliable wireless communication and smooth motor operation. This project proved to be an effective, low-cost, and efficient solution for remote surveillance and monitoring applications.



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V. WORKING

The spy robot works based on wireless communication and real-time video streaming using ESP32 and ESP32-CAM modules. The ESP32 microcontroller acts as the main controller for the robot's movement, while the ESP32-CAM module is used for capturing and transmitting live video. DC motors are connected to the ESP32 through a motor driver, which controls the direction and movement of the robot. When the user sends commands such as forward, backward, left, or right fmobile device through Bluetooth, the ESP32 receives the signals and controls the motors accordingly. At the same time, the ESP32-CAM connects to a Wi-Fi network and starts capturing live video using its camera module. The captured video is transmitted to a web page, allowing the user to monitor the robot's surroundings in real time. This helps the user to safely observe remote or dangerous areas without physical presence. The system works continuously as long as power is supplied through a battery. The integration of wireless control and live video streaming makes the robot efficient for surveillance and monitoring applications.

A. Working of L293D

There are 4 input pins for l293d, pin 2,7 on the left and pin 15 ,10 on the right as shown on the pin diagram. Left input pins will regulate the rotation of motor connected across left side and right input for motor on the right hand side. The motors are rotated on the basis of the inputs provided across the input pins as LOGIC 0 or LOGIC 1.
In simple you need to provide Logic 0 or 1 across the input pins for rotating the motor.

B. L293D Logic Table.

Lets consider a Motor connected on left side output pins (pin 3,6). For rotating the motor in clockwise direction the input pins has to be provided with Logic 1 and Logic 0.
Pin 2 = Logic 1 and Pin 7 = Logic 0 | Clockwise Direction

- Pin 2 = Logic 0 and Pin 7 = Logic 1 | Anticlockwise Direction
- Pin 2 = Logic 0 and Pin 7 = Logic 0 | Idle [No rotation] [Hi-Impedance state]
- Pin 2 = Logic 1 and Pin 7 = Logic 1 | Idle [No rotation]

In a very similar way the motor can also operate across input pin 15,10 for motor on the right hand side.
The ESP32 and ESP32-CAM based spy robot was successfully designed and implemented for wireless surveillance and monitoring applications. The robot can be controlled easily using Bluetooth from a mobile device, allowing movement in different directions. The ESP32-CAM captures and streams real-time video to a web page through Wi-Fi, enabling the user to monitor remote areas safely. The system is low cost, portable, and reliable, making it suitable for security and surveillance purposes. This project demonstrates the effective use of IoT and embedded systems in developing smart robotic monitoring solutions.

VI. CONCLUSION

The ESP32 and ESP32-CAM based spy robot was successfully designed and implemented for wireless surveillance and monitoring applications. The robot can be controlled easily using Bluetooth from a mobile device, allowing movement in different directions. The ESP32- CAM captures and streams real-time video to a web page through Wi-Fi, enabling the user to monitor remote areas safely. The system is low cost, portable, and reliable, making it suitable for security and surveillance purposes. This project demonstrates the effective use of IoT and embedded systems in developing smart robotic monitoring solutions.
The ESP32-based spy robot with ESP32-CAM was successfully developed and tested for wireless control and real-time surveillance. The robot responded correctly to Bluetooth commands from the mobile device and moved in all directions such as forward, backward, left, and right. The ESP32-CAM module captured live video and transmitted it to a web page through Wi-Fi, providing clear and continuous real-time monitoring. The system showed stable performance with reliable wireless communication and smooth motor operation. This project proved to be an effective, low-cost, and efficient solution for remote surveillance and monitoring applications.

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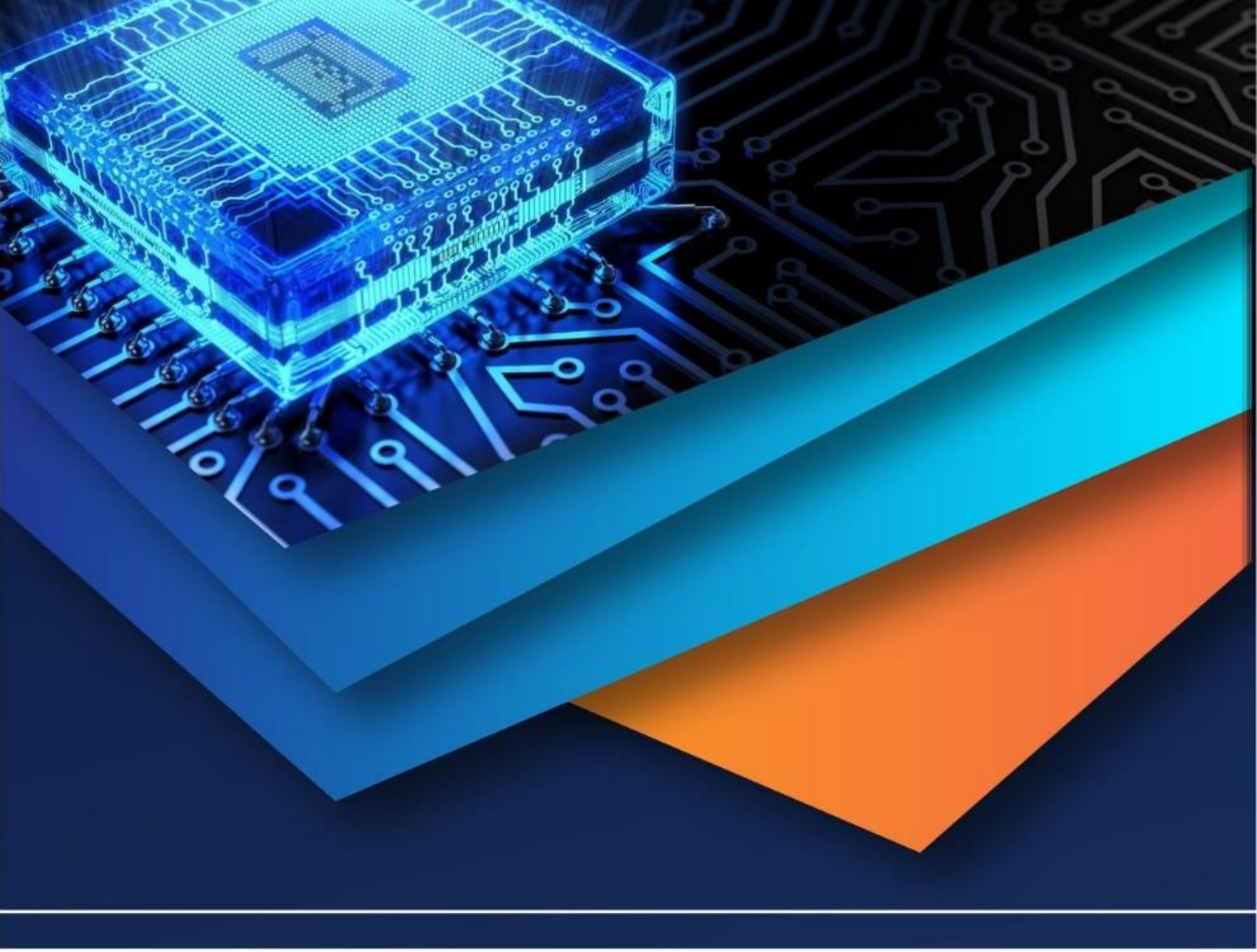

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