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Original Article

Rescue Robot Control Car Using ESP32-Cam

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Abstract: *Many workplace environments pose significant risks to human workers, such as the handling of hazardous waste, radioactive materials, explosive devices, or hostage situations. To safely perform these tasks, a machine capable of working in such environments is necessary. This study aimed to develop a prototype robotic pick-and-place vehicle capable of performing tasks similar to those of human workers in hazardous conditions. The vehicle is controlled through a Bluetooth module that receives commands from the operator. The vehicle is moved using a DC motor, which was the method used in this study.*

Keywords: *High-Performance Robot, Car, ESP32-Cam, Compute, Control Devices.*

I. INTRODUCTION

Advancements in high-speed technology and computer capacity have opened up possibilities for new methods of control theory and improved robot controls. To meet the demand for high-performance robots, new control devices, drivers, and algorithms have been developed. However, traditional robot control systems are wired, requiring time- consuming reprogramming if any changes are made to the project. To address this issue and make robots more user- friendly and customizable, this project proposes using an android mobile device to control the robot. Smartphones have become ubiquitous in daily life, with applications available for various purposes such as home automation, vehicle security, and health maintenance. This project leverages the multimedia and user-friendly features of smartphones to create a more accessible and efficient method of robot control. The use of a smartphone as a control device is the primary theme and motivation behind this project, as it provides a modern and easily accessible solution to robot control.

II. EXISTING METHODOLOGY

A mobile robot is a machine that can move based on instructions and is mounted on a movable platform. Mobile robots are increasingly used in various fields and have given rise to more complex robots. This technology has opened up new applications in many industries. Mobile devices, in combination with robots, have led to new ideas and solutions in several fields. The portability and longer battery life of mobile devices make them suitable for many industrial applications. The mobile robots can be categorized into different types, such as track robots that use tracks to move, but these are expensive to build and less flexible compared to wheeled robots. Wheeled robots can only move on smooth flat surfaces, whereas legged robots are based on human form and are challenging to design.

III. PROPOSED METHODOLOGY

A. Any Robot's Structure, or Body, on Rewrite without Plagiarism

The ESP32-CAM module is a surveillance robot that features an ESP32-S processor, an OV2640 camera, and a microSD card slot. The camera can take pictures and store them in the MicroSD card slot. The HTTP communication protocol is used to stream videos from the OV2640 camera through a web browser. The web page includes buttons to control the car's movements, including Left, Right, Forward, and Reverse.

Once the code is uploaded, disconnect GPIO 0 from GND, open the Serial Monitor, and use a baud rate of 115200. Press the on-board RST button on the ESP32-CAM to display the device's IP address on the Serial Monitor. After removing the FTDI programmer, connect the ESP32-CAM to the Pan/Tilt platform, turn on the power, and press the on-board RST

button on the ESP32-CAM.

To forward the video stream to an android application for vehicle control, access your router settings and locate the Forwarding or Port Forwarding settings. Enter "80-81" for the Port Range and select your ESP32-CAM device for the Device or IP address. The android application will then receive the live video feed and enable the user to control the vehicle's movements.

Android Application

Figure 1: Android Application

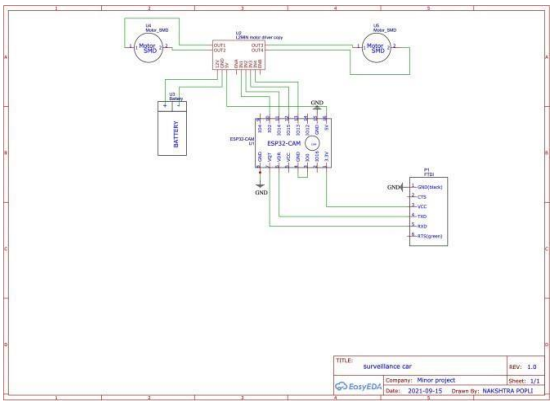

Figure 2: Circuit Diagram

A. Expected Outcomes

The use of surveillance robots provides us with live footage of a scene, but they are limited in their ability to engage with or provide details about different aspects. Nonetheless, these robots have numerous applications for analyzing dangerous or inaccessible situations where humans cannot easily go. For instance, in mining accidents, urban disasters, and other emergency situations, remotely controlled surveillance robots can assess the damage, identify viable access points and evacuation exits, and help save lives.

Traditionally, human surveillance has been carried out by skilled personnel in sensitive areas, such as war zones or enemy territory, but this poses a high risk of losing personnel if they are caught by the enemy. With advancements in technology, remote surveillance robots can be used to monitor such areas instead of humans. In some cases, there is a need to temporarily monitor certain areas, such as fields during harvest season or pastures when animals are grazing, and stationary CCTV systems are not feasible. Additionally, these areas may not have access to a power supply, making stationary systems even more impractical. In the agricultural sector, using mobile video surveillance with the help of

Surveillance Robot Cars is much more convenient and cost-effective than installing stationary systems that require expensive infrastructure, poles, or cables.

IV. APPLICATION WITH SCOPE

The use of technology is becoming increasingly important in today's world, and robots are becoming a necessity for the future. Virtual safety is crucial in monitoring compliance with traffic rules, such as wearing helmets and seat belts. In the current pandemic situation, robots can also be utilized to enforce mask-wearing and social distancing measures.

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