IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.102 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 12, December 2024

DOI: 10.17148/IJARCCE.2024.131248

TRAFFIC SIGN BOARD DETECTION

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Abstract: Systems for detecting and recognizing traffic signs are now crucial parts of intelligent transportation systems, especially for driver-assistance and autonomous cars. In this study, an embedded platform-based traffic sign detecting system that is both economical and effective is designed and implemented. The suggested system makes use of essential parts like an Arduino Uno, ESP32-CAM, and infrared sensors in addition to supplementary hardware including a 4WD car chassis kit, 18650 batteries, and an L293D motor driver shield. Real-time traffic sign recognition is made possible by the combination of technology and software, which can improve traffic control and road safety. The system's capacity to accurately identify and recognize traffic signs is demonstrated by the testing findings, which makes it appropriate for low-cost autonomous car applications.

Keywords: Traffic Sign Detection, Embedded Systems, ESP32-CAM, Arduino Uno, Autonomous Vehicles, Intelligent Transportation, IR Sensors, L293D Shield

INTRODUCTION

Reliable traffic sign detection and recognition (TSDR) systems are required due to the growing use of advanced driver-assistance systems (ADAS) and autonomous cars. Drivers can obtain vital information from traffic signs, including warnings, speed limits, and road conditions. These indicators need to be detected in real time by a reliable TSDR system under a variety of environmental circumstances.Using an Arduino Uno for system control, an ESP32-CAM module for image capture, and infrared sensors for vehicle localization, this study aims to develop an affordable embedded system for traffic sign detection. The system runs on 18650 batteries and is installed on the chassis of a 4WD vehicle. The goal is to show how these elements may cooperate to create a working system for recognizing traffic signs.

METHODOLOGY

Hardware Components:

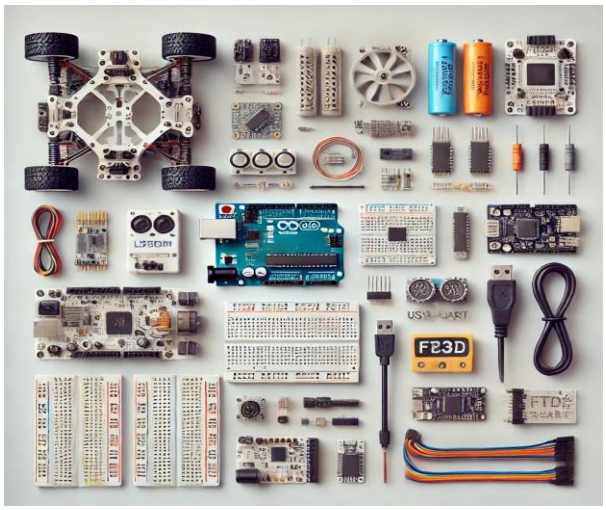

Fig.1 Components used in traffic sign board detection

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4WDCar Chassis Kit: The 4WDCar Chassis Kit serves as the foundation for installing parts such as the Arduino Uno, ESP32-CAM, and infrared sensors. comprises four mobility-enhancing DC motors that are managed by the L293D shield.

Arduino Uno: serves as the main controller, combining inputs from the motor driver shield and infrared sensors.

ESP32-CAM: takes pictures of the surroundings in real time and interprets them to identify traffic signs.

IR Sensors: Recognize obstacles and steer the car in the right direction.

L293D Motor Driver Shield: uses instructions from the Arduino Uno to control the 4WD motors.

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FTDI USB-UART Converter: makes it easier to communicate and program the ESP32-CAM module.

Breadboard and Jumper Wires: Make it possible for the components to join..

18650 Batteries: Power the entire system, ensuring portability and uninterrupted operation.

Software Framework:

The software of the system is separated into two primary functions:

Traffic Sign Recognition: Using a neural network that has already been trained, the ESP32-CAM takes pictures and analyzes them. Feature extraction and categorization are done using OpenCV tools and lightweight deep learning techniques.

car Control: Based on indicators it detects, the Arduino Uno interprets inputs from the infrared sensors and transmits control signals to the L293D motor driver shield to move the car.

CONCLUSION

This work effectively illustrated how to use inexpensive embedded components in the design and execution of a traffic sign detection system. Real-time traffic sign recognition and vehicle control are made possible by the combination of the Arduino Uno and ESP32-CAM. Future research will concentrate on enhancing recognition precision in different lighting scenarios and adding further features like GPS-based navigation.

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DOI: 10.17148/IJARCCE.2024.13xx

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