SELF-DRIVING CAR USING CONVOLUTIONAL NEURAL NETWORK ESP32 DEVKIT

[1]Mrs. S Visalini Asst.Professor,ISE Dept ,The Oxford College of Engineering

[2]Aman Singh, [3]Anuj Khandelwal, [4]Christo Roy, [5]Mohammed Tanzil Touqeer

BE. Students, Department of Information Science and Engineering, The Oxford College of Engineering, Karnataka,India

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Abstract- *Self-driving cars are cars that do not need human assistance to drive from one place to another. With the development of artificial intelligence, it worked as a catalyst in the field of technology. Using this technology, we can now develop self-driving cars. One such creation is the birth of self-driving cars. Adding assistive information technology to vehicles, such as the use of cameras and stability control systems, improves passenger safety. This project proposes a car model that can drive from one place to another . It uses the camera to take pictures of real things later, sends them to a convolutional neural network through the ESP32 DEVKI, and the Arduino decides any direction to drive the car and reach its destination..*

Keywords: *Airtificial intellegency,Machine learning ESP DEVKIT,L2981,Ultra Sonic Sensors ,image processing, convolutional neural network, arduino IDE.*

1. INTRODUCTION

About 1.25 million people die from road accidents every year. This equates to 3,287 deaths every day. In addition, we have to put up with a ridiculous amount of traffic that causes unnecessary frustration for most people. This led to the discovery of the self-driving car.

The goal of self-driving cars is to drive the car like a human driver. One thing is that there is a driver behind the seat. Driving is the biggest necessity of our daily life. Almost all people travel and move from one place to another by vehicle. Vehicles are used in all walks of life. A car that can accelerate itself looking for obstacles.

This project uses the concept of image processing, the front camera, where the camera captures images of the real world. He uses ultrasonic sensors, convolutional neural network, arduino microcontrollers to detect obstacles. Lane detection and pothole detection are also done in this article..

2. METHODOLOGY

- *A camera module is mounted on top of the car, where the Camera sends images of the real world to a convolutional neural network, which then predicts one of the following directions, ie. right, left, forward, stop, followed by transfer. signal from the arduino to the remote control car controller and as a result the car moves in the desired direction.*

- *The predicted direction is sent to the Arduino and an Arduino signal is triggered, which in turn helps the car to move in a certain direction with the help of the controller.*
- *The Camera and the laptop are connected to the same network, the Camera sends a captured image that serves as the input image for the convolutional neural network i.e ESP32 DEVKIT v1.*

- *The image is in grayscale before being connected to the neural network.*
- *A neural network predicts control based on input images..*

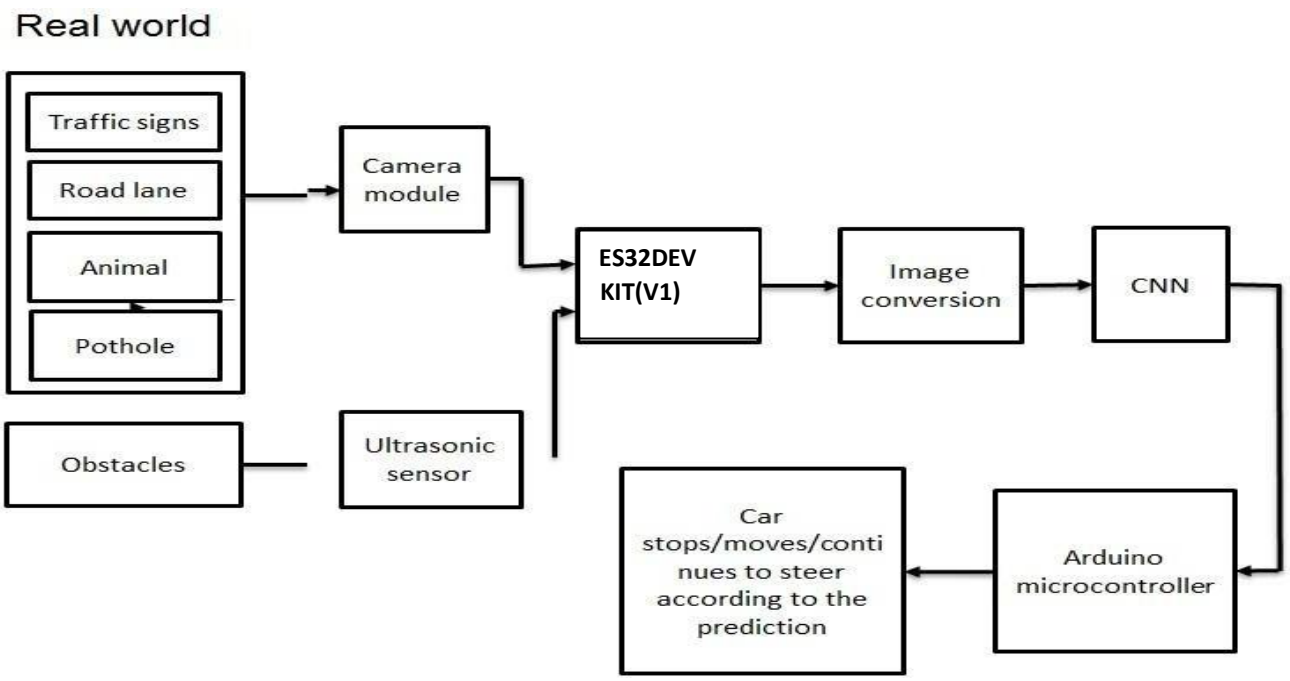

Fig 1: Block diagram of self-driving car.

3. IMPLEMENTATION

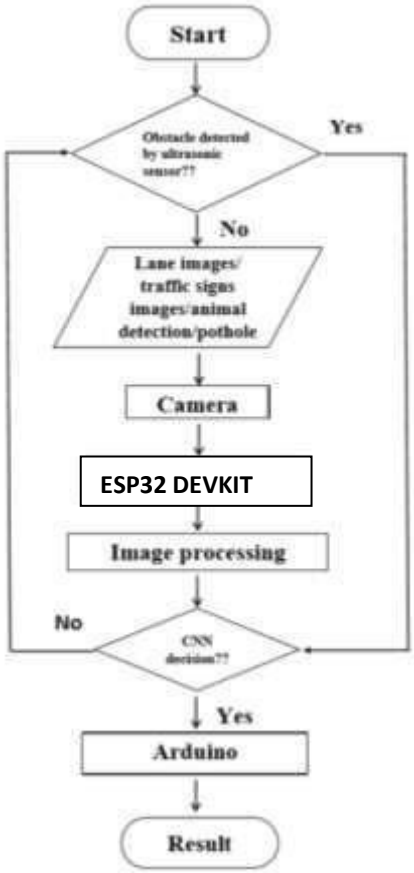

Fig 2: pothole detection

POTHOLE DETECTION

The pothole model is derived from the assumption that any strong dark edge of the removed road surface is considered a pothole edge if it obeys certain size constraints. It can be seen that one of the characteristic features of the pits is a large dark shadow area. Holes that do not have dark edges and only have different color variations, such as sand or dirt, are not considered at this stage. Size constraints are obtained using a selection of stored images to adjust the parameters. The algorithm considers any contour shape that meets these conditions..

LANE DETECTION

Real-time road detection with network cameras, road markings that use image processing to detect the edge, and yet transformations have been developed to help the driver leave the road, reduce concentration and avoid accidents. . while driving Here we propose a method to detect lane markings in real time using a web camera to record the road as a video stream file. the edge.

expression is a method used to identify points as edge segments. The Hough transform method is used to detect the lane in the image to ensure high-precision lane detection and safe driving system. The results show the performance of the proposed lane detection and tracking algorithm on a video clip used for testing under different track conditions..

TRAFFIC SIGN DETECTION

Traffic signs have two main characteristics: shape (square, circle, triangle, etc.) and color (red, yellow, blue, green). Shape detection in an urban environment is very difficult and unreliable due to the intricacies of the acquired image. Environmental conditions also play an important role in the discovery process. On the other hand, road signs deliberately use a raw/strong color that stands out in any environment, allowing it to be noticed. Therefore, color information can be considered one of the best features of traffic sign analysis.

ANIMAL DETECTION

Recovery of images/videos from the camera is complete. It is then converted into photo frames. Save the images of each animal to a database that will be used as training for our program. Compare the shots taken by the camera with the database. The function then reads the image and performs preprocessing on that image. After that, run Blob detection on the frame and the blobs will match the images in the training database. And check whether the image is suitable or not. Wanted or not for animal identification. For each recognizable animal, a set is made and a program is written. Finally, the result is announced or a warning is given.

4. RESULTS

1) Proposed self driving car model

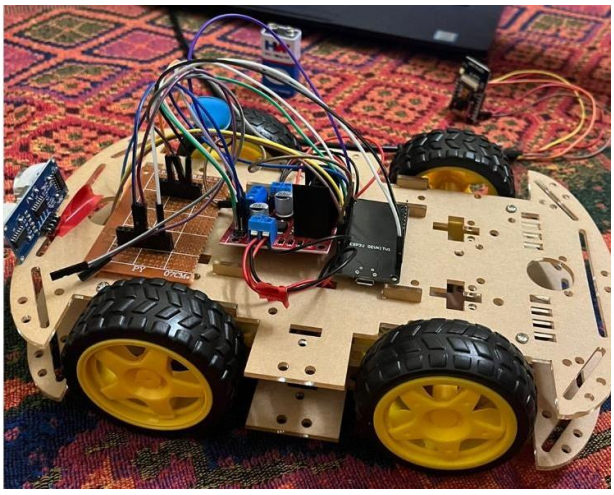

Fig 3: proposed model

2) Animal detection

Fig 4: animal detection

3) Convolutional neural network implementation

Fig 5: convolutional network implementation

4) Direction detection (Right and left)

Fig 6: direction detection

5) Obstacle detection using ultrasonic sensor

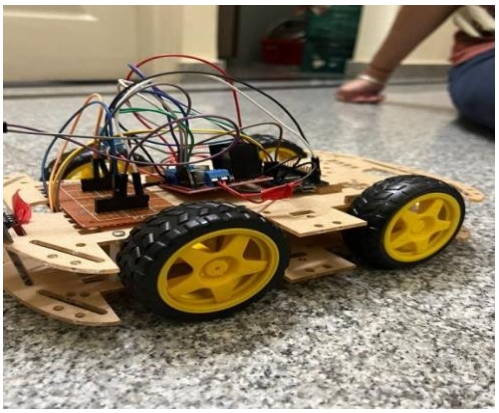

Fig 7: obstacle detection

6)Pothole detection

Fig 8 : pothole detection

5 . CONCLUSION

Different hardware components as well as software and neural network configurations are clearly described. Using image processing and machine learning, a successful model was developed that worked as expected. Despite its inherent advantages, autonomous vehicle technology must overcome many societal barriers. Like the problem with the first cars, the influence of metal models can prevent the development of technology. However, the new legislation creates opportunities for these cars to prove their viability. As more countries legalize driverless cars, the social barrier is giving way, enabling the biggest revolution in personal transportation since the introduction of cars..

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