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IoT Based Autonomous Car

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A B S T R A C T

The project aims to represent a mini version of self-driving car using IOT with raspberry pi and with high resolution pi camera will supply the necessary data, the raspberry pi will analyze the data (samples), and it will get trained in pi with neural network and machine learning algorithm, which would result in the car being able to detect road lanes, traffic lights, and turn in accordance with them. In addition to these characteristics, the automobile will overtake if it encounters an obstruction with the appropriate LED indications. Initiative for automated driving. The research focuses on creating a model of an autonomous vehicle rather than on cars and traffic problems. The project start with implementation of hardware building after that image processing for the signal detection by using machine learning(CNN) and use numerical method for object detection to know that distances between the object and we will test all the function with the models .The precision can be increased by utilizing several cameras and sensors. Future traffic congestion can be avoided by designing a system where each car is connected to surrounding vehicles. The resultant outcome of this project is reduce the road accidents and helps to save the lives of the people's.

Keywords: Object and Signal Detection, Autonomous car, Neural network, Sensors

1. Introduction

The project focuses on building a model of autonomous vehicle. The concept of self-driving isn't new or recent Leonardo tha vinci has theorised this concept of self-propelling cartin late 1500 century If we see history of traffic related issues. Nearly 1.3 million people die in road crashes each year and talking about India the number of people who got killed in a road accident in 2017 alone were 1, 37,000. According to the Road accident cases in the country have increased from 3,54,796 in 2020 to 4,03,116 in 2021, the report added. One of the most talked-about technologies nowadays is self-driving automobiles. Technology has made self-driving cars a reality, and in the upcoming decade, they are anticipated to reach the highest level of automation. More and more researchers pay attention to the field of self-driving cars, especially the research on the safety and reliability of vehicle driving.

Obviously road environment perception, path planning and decision-making are particularly important for the safety and reliability pf self-driving cars. The sensor solution used by road sensing technology have become modular and low cost , which is the direction of future development .In this research, we used a low cast modular computing platform and camera sensor to realize that the electric vehicle senses the road ahead and gives appropriate driving decision under low-vehicle driving conditions. This proves that this method is used in assisted driving research and self-driving research. It is very helpful and effectively improves the reliability and safety of self-driving. Driverless cars utilize this connectivity when updating their algorithms based on user data. In order to operate these autonomous vehicles, a tremendous amount of data must be gathered and processed. In this instance, the driverless automobile communicates road information via IoT. (which has already been mapped out). This details the real route, the flow of traffic, and how to get around any impediments. All environmental sensor data will be shared on the cloud, and the car will operate by analyzing this data. The IoT connectivity analyses the data from these radar lasers, maps a course, and transmits commands to the controls of the vehicle (steering, acceleration, and braking). Also, each car has predictive modelling and obstacle avoidance systems that make sure it follows traffic laws and steers clear of particular obstructions.

The potential benefits of autonomous cars include reduced mobility and infrastructure costs, increased safety, increased mobility, increased customer satisfaction and reduced crime. Specifically, a significant reduction in traffic collisions; the resulting injuries; and related costs, including less need for insurance. Autonomous cars are predicted to increase traffic flow; provide enhanced mobility for children, the elderly and disabled; review travellers from driving and navigation chores; lower level fuel consumption; significantly less parking spaces are required; business concepts for transportation as a service are made easier, particularly through the sharing economy. This demonstrates the cutting-edge technology's enormous disruptive potential.

2. Literature Review

2.1 Real Time Multiple Vehicle Detection And Tracking From A Moving Vehicle .

Modules for detecting other vehicles on the road are present. To improve and improve the performance of the vehicle, a module for recognizing overtaking vehicles and a trinocular stereo module (three view vision) for identifying distant impediments were included. A forward-looking video camera in a car that is travelling down a highway has been outfitted with a real-time vision system that can evaluate color films. To identify and track lane markings,

road edges, and other moving objects, the system combines motion, edge, and color information. The general goal of our research is to develop an intelligent, a camera-assisted vehicle that can accurately and quickly assess its surroundings. Traffic volume, driver behavior, lighting, and road conditions are difficult to predict. Our system therefore analyzes the whole highway scene. It segments the road surface from the image lane markings, road boundaries, and other road signs using color classification, and then multiple vehicles. Our vision system does not need any initialization by a human operator, but recognizes the cars it tracks automatically. The video data is processed in real time without any specialized . The vision algorithms use information about brightness, hue, and saturation to analyze the highway scene. A recursive least squares filter is used to find and track highway lanes and limits. The roadway landscape is divided into "tracking windows," or sections of interest, from which car templates are generated online and their symmetry assessed in real time. The system determines whether a vehicle is recognized and tracked based on the tracking and motion history of these windows, the detected features, and the correlation and symmetry findings

2.2 Self Driving Cars: A Peep Into The Future.

In this paper, a novel embedded controller design method for a self-driving, electrified, accident proof and GSM destination guided vehicle. A GPS unit precisely monitors the location of Navigation is provided by the vehicle, the source, the destination, and the coordinate mapping. Keeping a safe distance from the car, which is a function of velocity, and having the vehicle in front of you automatically controls the speed of the vehicle. A stepper motor-driven rotating distance measurement sensor continuously measures the distance between the front and side of the vehicle, and tracks are changed and speed limits are applied as necessary. An autonomous automobile is a vehicle that can sense its surroundings and navigate without the assistance of a driver (also known as a driverless car, auto, self-driving car, or robotic car).In numerous expanding application areas, autonomous vehicle navigation is becoming more and more important. Radar, laser light, GPS, odometers, and computer vision are just a few of the methods used by autonomous vehicles to sense their environment. Some self-driving cars update their maps based on sensory data, which enables the cars to maintain their position even when the environment changes or when they travel through unfamiliar territory. One of the most crucial qualities for any mobile robot is the capacity to navigate in its surroundings. Maintaining a dynamic speed with the front car or an obstacle is efficiently done here with distance measuring sensors. Stepper motor controlled rotating sensor is used at the time of changing lane. Climate change and pollution are becoming a serious threat to human existence. Oil-burning vehicles are a key contributor to this. Here, environmentally friendly solar PV electricity has been used to generate the energy needed to propel the car.

2.3 A Vision-Based Method For Improving The Safety of Self-Driving.

Automatic vehicles use sensors, including cameras and radar, to detect the condition of their surroundings. The vehicle itself interacts with these collected data to control driving inputs such as steering, acceleration and braking. Auto driving missions already exist in vehicles such as vehicles that can park themselves, and researchers are working to develop a vehicle that can perform every driving task without human control. There is more opportunity for refining the perception of the road environment and the operation under complicated traffic circumstances as sensors' accuracy and controller power keep increasing. Connected Automated Vehicles. we used the binocular camera and GPU computing platform to realize the perception of the front and back environment. Using the Enet (efficient neural network) algorithm based CNN in conjunction with the OpenCV library, small obstacles on the road can be exploited, because they have common attributes though they have inherent differences in shape, size and appearance, road environment, perception, path planning and decision-making are particularly important for the safety and reliability of self-driving cars. The sensor solutions used by road sensing technology have become modular and low cost, which is the direction of future development. In this research, we used a low-cost modular computing platform and camera sensor to realize that the electric vehicle senses the road ahead and gives appropriate driving decisions under low-vehicle driving conditions. This proves that this method is used in assisted driving research and self-driving research. It is very helpful and effectively improves the reliability and safety of self-driving. The paper gives detailed view about how they developed a simulator which is able to detect traffic signs and lanes and road segmentation.

2.4 An Inter Networked Self-driving Car System Of Systems.

Self-driving cars are posed to create a major change in the way people are transported. They may reduce car ownership with low-cost shared-vehicle services moving from one transport job to the next. They may even allow certain pickup and delivery tasks to be performed without a driver. Current commercially available vehicles offer some automation, such as self-parking and even limited driving in some circumstances. Commercial testing of more fully autonomous vehicles is currently underway. These vehicles, however, must – and are designed to – interact with human- driven vehicles. There could be skills that may not be specified in a candidate's profile or a JD, but can be easily determined by business knowledge (for example, 'java' being an object-oriented programming (OOP) language, its experience also indicates experience of OOP), and c) A skill could be an out of dictionary skill, that is, a not-so-common skill-term missing in the dictionary or from a new unseen domain for which the system may not have skills. Self-driving vehicles have been previously considered from a variety of perspectives, all of which are critical to building a successful self-driving car infrastructure.

The system must be economically sound: the cost (both financial and, for some, the loss of driving enjoyment) must be outweighed by the benefits of system implementation. From manufacturers' perspectives, the impact on the sale of existing vehicles (which may decline, if vehicles are shared between multiple users) must be considered , in addition to competitive factors. For users, the benefit picture is clearer. Despite the significant technical challenges they pose, interest in the development of autonomous vehicles remains strong. This is likely buoyed by the benefits that can be provided to all prospective vehicle users as well as the benefits that they are poised to provide for numerous special groups such as youth, the handicapped and the elderly.

2.5 Driver Assistance System For Lane Detection And Vehicle Recognition With Night Vision.

The suggested system can recognize vehicles and locate lanes. Three features—lane markers, brightness, slenderness, and proximity—are used in lane recognition to identify the locations of lane markers in an image However, vehicle recognition is accomplished utilizing a clear feature that is retrieved through three or four steps: the taillight standing-out procedure, adaptive thresholding, centroid detection, and the taillight pairing technique. Additionally, a method for automatically calculating the camera's tilt and pan is provided. It does this by using the location of the vanishing point, which is found in the image using the techniques of Canny edge detection, Hough transform, major straight line extraction, and vanishing point. estimation .The efficiency of the suggested strategy at night is shown by experimental results for thousands of photos. About 99% of lanes are detected, and 91% of vehicles are identified. Furthermore, our system can process the image in almost real time. Provide a night-vision based driver assistance system on highway environment to enhance the driver's safety.

Furthermore, we also give an automatic mechanism to compute the parameters of camera without measuring instruments. Finally, the experimental results demonstrate the effectiveness and efficiency of our proposed system. For lane detection, the Peak- Finding Algorithm is proposed to extract the feature points effectively based on the lane markers are detected by grouping the feature points. Next, the line segments are combined into a lane boundary by confidence function. Finally, the lane boundaries of the main lane are selected in the image successfully.

3. Proposed Methodology

In the proposed system there will be multiple cameras and sensors that will detect the objects, traffic signs ,path holes and gives the location of the car. We use pi cameras and ultrasonic sensor and radar sensor and use to detect the distance between the next cars and using the numerical method and using the CNN algorithm used for the image detection. Based on the image detecting the device will act according to the training our system .Once we image is captured it is processed and it will send the signals to the Arduino then will send the signals to the motor driver and it will perform the stop and moving of the car. parse all the applicants resume and store the summary by extracting key field in the database. The system used to detect the distance and it will be stopped at particular distances.

3.1 Image Processing

Basically, image processing involves some steps

1.Importing the photo using the pi camera and using capture software.

2.Examining and modifying the picture captured by the camera.

3. Altered image that was the outcome of the output from an image analysis.

3.2 Convolution Neural Network

Convolution neural network (CNN) designed specifically for use in image and video recognition applications. CNN is primarily utilised for image analysis applications such segmentation, object detection, and picture recognition.

1.Input Layer

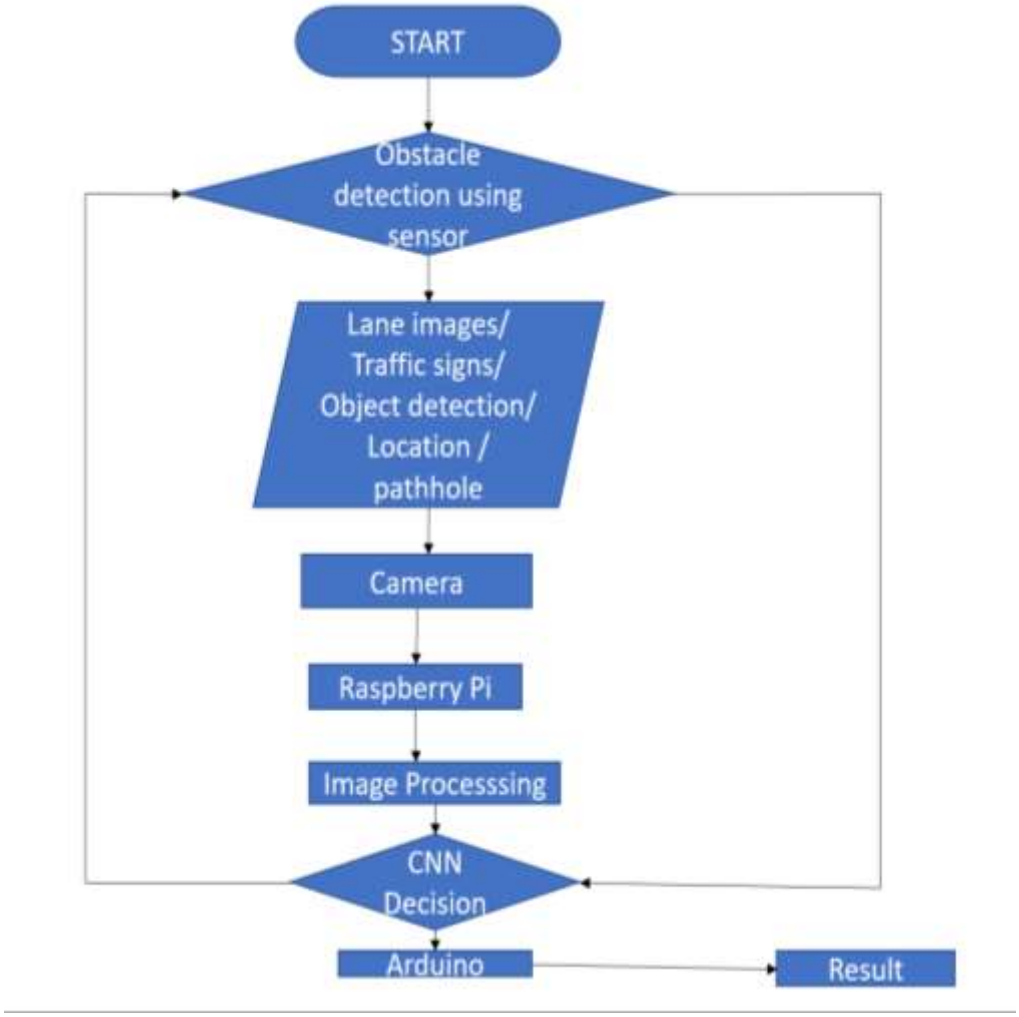
2.Convolution Layer

3.Pool Layer

4.Full Connected Layer

5.Output Layer

Image is sent to the input layer and then sent to convolutional layer and it will filter the image patches after that it is feed to the pooling layer for reducing the volume of image which makes the computation fast reduces the memory and also prevent the over fitting.



3.3 Flow chart of the Methodology

The multiple sensor are used such as ultrasonic sensor ,radar sensor are used to detect the distance of the obstacles and gives the distance and stops according to the instructions. Using the pi cameras we used to detect the Traffic signs, Road lanes, obstacle detection and path holes and that is used to slow down or stop the system. That are sent to the raspberry pi software and then it is feed to the convolution neural network for the image processing and then it is sent to the Arduino microcontroller and at the prediction will done. If any object detection will be done then it will automatically stops and moves if any object and traffic signs and not detected**.**

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