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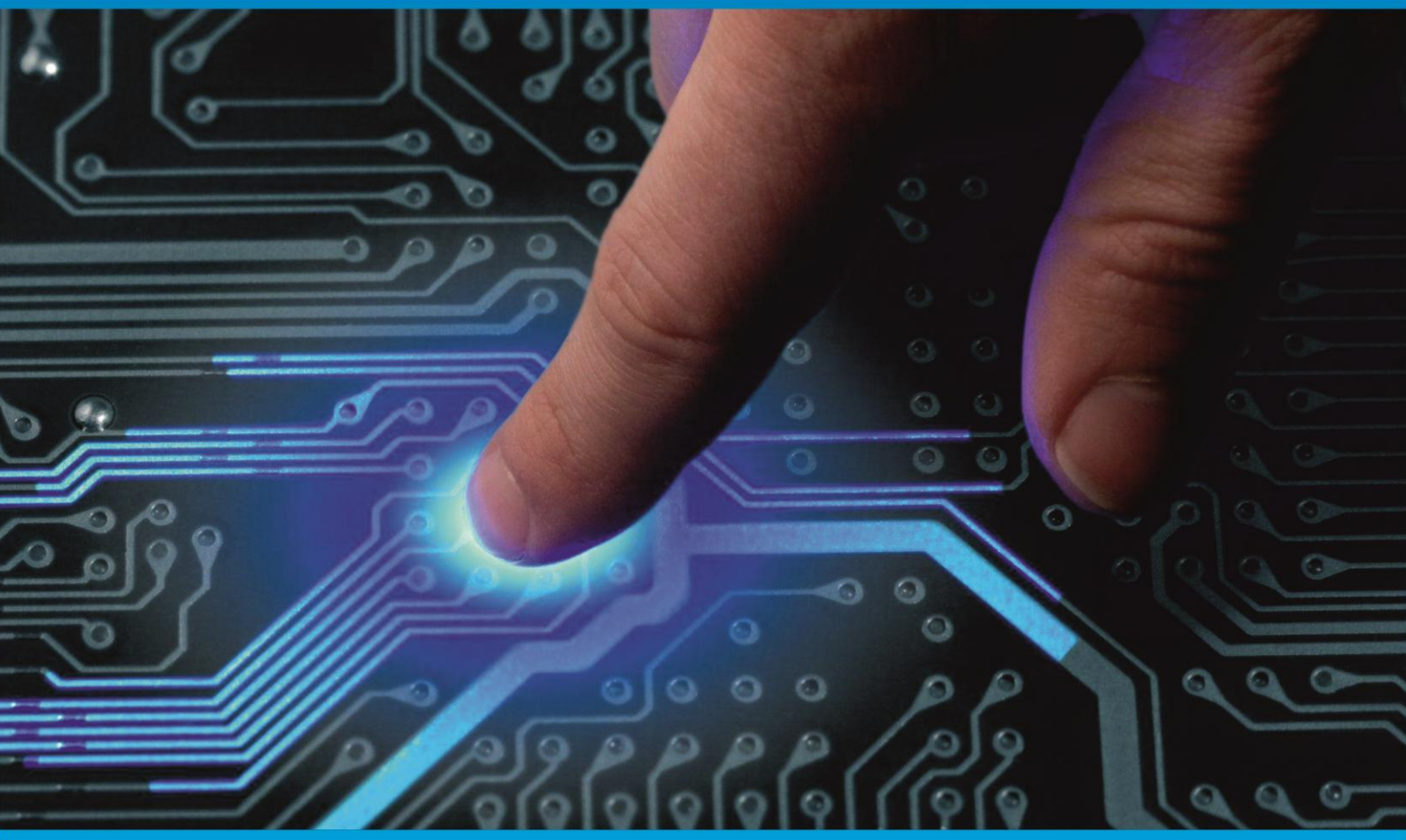

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Autonomous Car for Smart Transportation Using Deep Learning

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ABSTRACT: Car accidents are unfortunately common in our world and the majority of this road crashes due to distracted driving, drunk driving and night driving etc. In order to avoid this problem we introduce autonomous car. Autonomous cars have the potential in the future to reduce deaths and injuries from car crashes, particularly those that result from driver distraction and it also help to reduce the traffic congestion.

An autonomous car is a vehicle capable of sensing its environment and operating without human involvement .A human passenger is not required to take control of the vehicle at any time, nor is a human passenger required to be present in the vehicle at all. An autonomous car can go anywhere a traditional car goes and do everything that an experienced human driver does. The proposed concept in our project is to make an autonomous model car using Image processing and Deep Learning. We perform this process with the help of camera module. We achieve the features such as lane detection and pedestrian detection .Vehicle movement will be according to the white line detection and also detect the person with the help of Deep Neural Network (DNN) in Deep Learning.

KEYWORDS: Deep Learning, OpenCV, YOLO, Arduino UNO, Ultrasonic sensor

I. INTRODUCTION

Automation in vehicles is a major focus in today's research. The objective of the project is to achieve autonomousity in a generic toy car so as to eliminate the existing disadvantages that comes with a human driver. This is done so as to illustrate that same can be done on a regular car/automobile. This is achieved by using image processing which is trained by using neural networks and machine learning to create a model through which autonomous cars are achieved. An autonomous car is a vehicle capable of sensing its environment and operating without human involvement. A human passenger is not required to take control of the vehicle at any time, nor is a human passenger required to be present in the vehicle at all. An autonomous car can go anywhere a traditional car goes and do everything that an experienced human driver does. Autonomous cars rely on sensors, actuators, complex algorithms, machine learning systems, and powerful processors to execute software. Autonomous cars create and maintain a map of their surroundings based on sensors situated in different parts of the vehicle. Sensors monitor the position of nearby vehicles. Video cameras detect traffic lights, read road signs, track other vehicles, and look for pedestrians. Ultrasonic sensors helps to measure distances, detect road edges, curbs and other vehicles when parking and identify lane markings. Sophisticated software then processes all this sensory input, plots a path, and sends instructions to the car's actuators, which control acceleration, braking, and steering. Hard-coded rules, obstacle avoidance algorithms, predictive modeling, and object recognition help the software follow traffic rules and navigate obstacles. This project is developed using python programming language.

II. RELATED WORKS

There have been different studies conducted on self-driving car "Development of Autonomous Downscaled Model Car Using Neural Networks and Machine Learning". It's a 2019 IEEE paper presented by the UvaisKarni, S.ShreyasRamachandran, K.Sivaraman, A.K.Veeraraghavan.In this contemporary world, the number of accidents occurring has increased drastically which leads to an increase in the number of fatal deaths. This is mostly caused by the distractions that driver encounters. For example, texting and driving, less attention span of driver etc. Due to the above reasons, autonomous cars would be a better option which takes the errors of a driver away from the equation. The proposed concept in the paper is to make an autonomous downscaled model car using a generic RC car as base. We aim to achieve the above by using image processing which is trained by using neural networks to create a model through which autonomous cars are achieved. The hardware components used in this project are Raspberry PI 3 B

microcomputer, camera module, HCSR04 ultrasonic sensor. We achieve the following features in our model, (a)Lane detection, (b)Traffic signal identification, (c)Road signs identification, (d)Obstacle detection avoidance, (e)Pedestrian Detection.

III. PROPOSED SYSTEM

In this paper, we introduce a fully computerized car capable of doing almost everything a car lover would want to. Almost all automobiles will interact with computer on dashboard. The key idea is to construct a neural network model can be generated on Laptop instead of Raspberry Pi so as to reduce time and increase processing power for generating said model. The reliability, efficiency and cost effectiveness of an autonomous vehicle depend mainly on how judiciously it's navigation sensors, perception unit and computer control is incorporated .in our project is to make an autonomous model car using image processing and deep learning. We perform this process with the help of camera module. We achieve the features such as lane detection and pedestrian detection .Vehicle movement will accord the white line detection and also detect the person with the help of Deep Neural Network (DNN) in Deep Learning. The project is done using Python programming language using anaconda. Python is an interpreted programming language.
Autonomous Car acts as an analog to the real world car with basic motion capabilities. It is battery operated. The Machine Learning Model guides the car in the environment based on the data set on which it is trained. The model uses neural networks as the underlying learning framework. Python programming languages used to framing the code to generate autonomous car.

Product Functions
- Autonomous motion
- Person detection
- Line of detection
- Obstacle detection

State chart Diagram

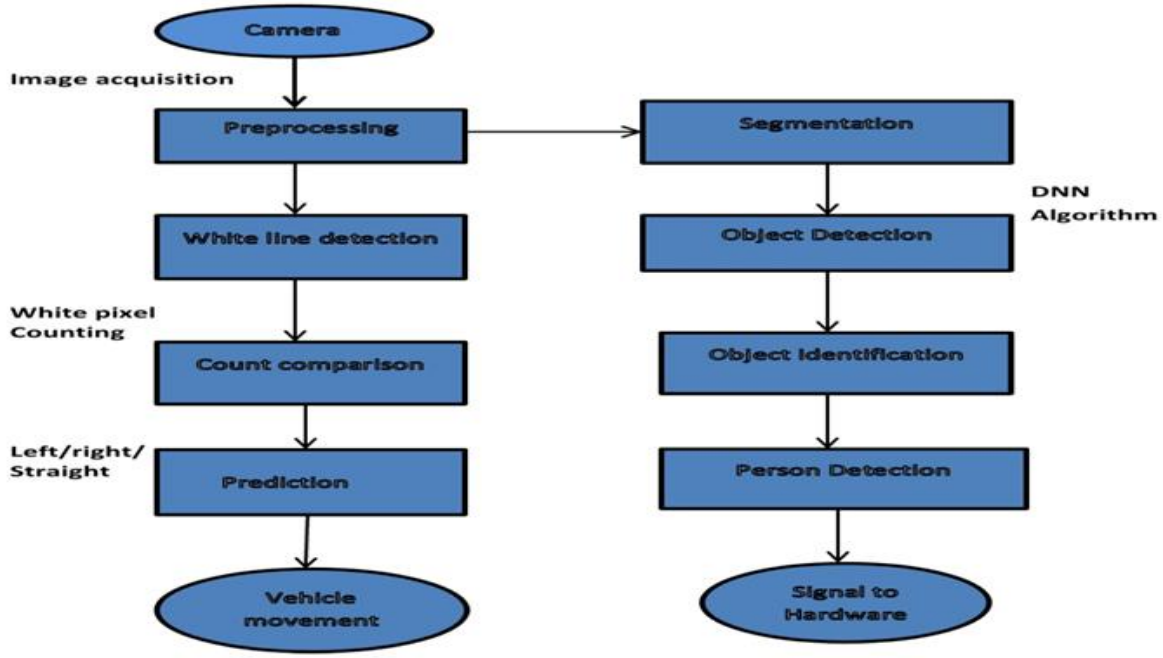

FIGURE 1: STATE CHART DIAGRAM

IV. METHOD

The modularity criteria are:
- Camera to capture image of road

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• Machine Learning Model: makes decisions as to how the car should move
• Hardware model to represent car
• Ultrasonic Sensor (HC - SR04): collects distance data
• Arduino Uno used for controlling the car speed and turning radius

Train the CNN model for vehicle detection using YOLO technique. YOLO trains on full images and directly optimizes detection performance. It is extremely fast and it learns generalizable representations of objects. Please refer to Fig. 1, which illustrates the proposed method. The next subsection defines the brief description about the Tools/Scripts for Implementation:

- **Python Anaconda 3**: Anaconda is a free and open-source distribution of the Python and R programming languages for scientific computing (data science, machine learning applications, large-scale data processing, predictive analytics, etc.), that aims to simplify package management and deployment. Package versions are managed by the package management system

- **OpenCV**: OpenCV-Python is an appropriate tool for fast prototyping of computer vision problems.

- **ArduinoUno**:Arduino Uno is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins ,6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get start

COMPONENT DIAGRAMS

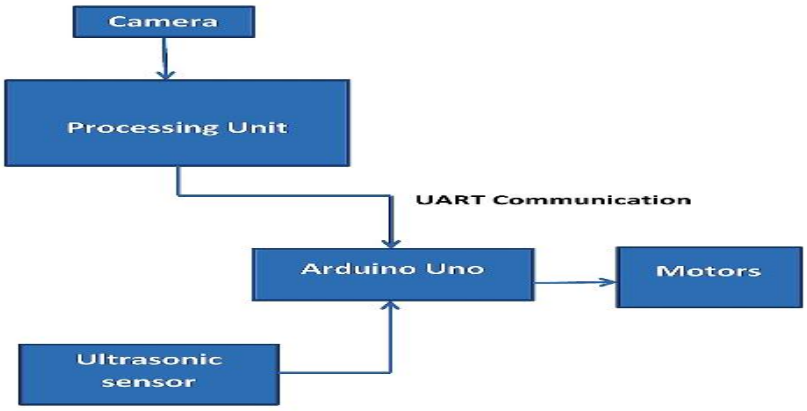

FIGURE 2: HARDWARE

V. IMPLEMENTATION

MODULE HIERARCHY

The proposed system has following modules: • Lane detection Lane detection is performed using image processing. Images of roads are given as input in to the system, and then it is processed and counts the space between the lanes. The movement of the car is on the basis of the count, it can be left, right or straight.
• Person detection CNN model is trained to detect person on the road using YOLO technique. Images of roads are given as input in to the model and then detect the person on road, if any exist there. Then control will pass to the hardware in order to stop the car.
• Ultrasonic sensor is used to detect the obstacle in front of the car to avoid the accidents.
• Arduino Uno is connected to the processing unit through port COM3.It takes the count between lanes as input and then control the car based on it. It's also give control to stop the car during person detection and obstacle detection.

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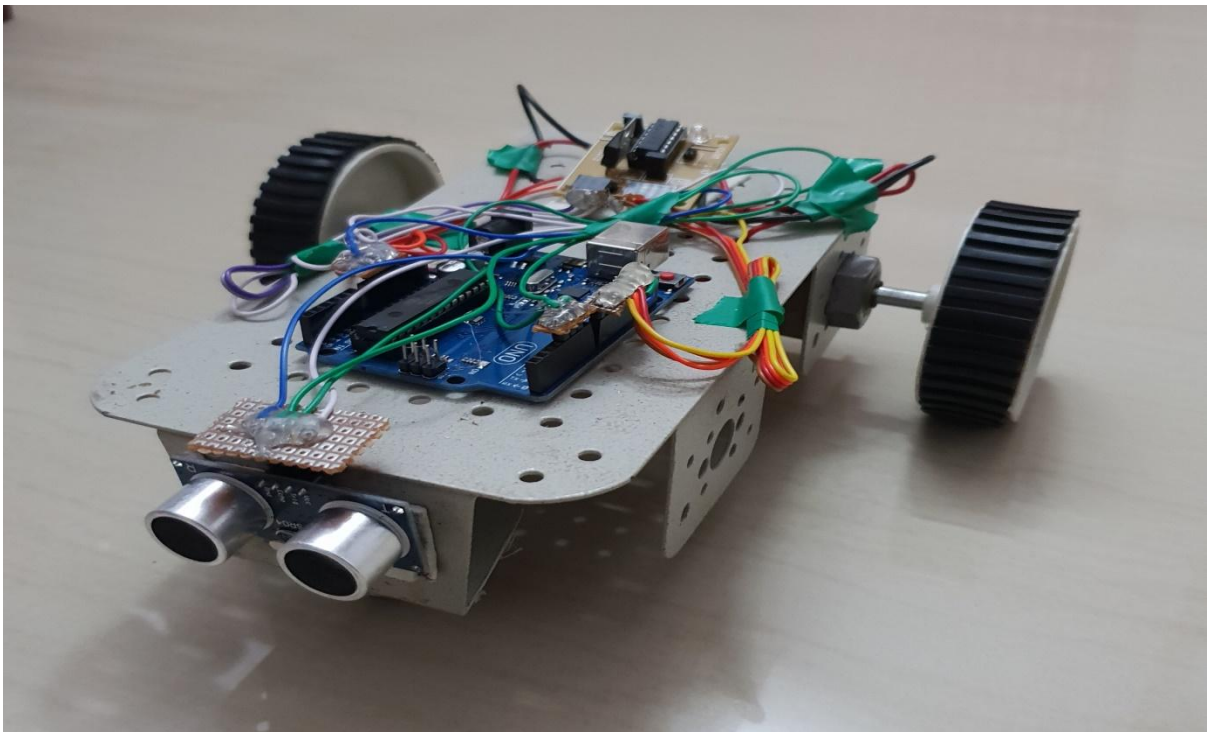

FIGURE 3: HARWARE PICTURE

VI. CONCLUSION

If the people's thought hasn't changed about the self-driving cars being safe, these cars are already safe and are becoming safer. Only if they believe and give a try to technology, they get to enjoy the luxury of computerized driving. Driverless cars appear to be an important next step in transportation technology. They are a new all-media capsule- text to your heart's desire and its safe. Developments in autonomous cars are continuing and the software in the car is continuing to be updated. Though it all started from a driverless thought to radio frequency, cameras, sensors, more semi-autonomous features will come up, thus reducing the congestion, increasing the safety with faster reactions and fewer errors.

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