



AUTONOMOUS VEHICLE USING MACHINE LEARNING

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Abstract- Autonomous cars are becoming future smart cars and to be driver less, efficient and crash avoiding ideal car of future. For reaching this goal automakers have started working in this area to realized the potential and solve the challenges currently in this area to reach the expected outcome. So it is the first challenge would be to customize and imbibe existing technology in conventional vehicle to translate them to a near expected autonomous car. This paper explains how the Machine Learning aims to control the vehicle without involvement of any human intervention. Multiple images are been captured by the camera module which is the only input to the prototype. The captured images are useful for Lane detection, obstacle avoidance, traffic signal detection etc.

Keywords - Machine Learning, Autonomous Vehicle, Obstacle Avoidance.

Introduction

An Autonomous Vehicle refers to a computer-controlled car that can guide itself, familiarize itself with surroundings, make decisions, and fully operate without any human interaction. Variety of sensors are combined and are used to identify the pathway, obstacles, pedestrians etc. from the surrounding. Benefit of having a driverless car is having reduced costs due to less wastage of fuel, increased safety, increased mobility, increased customer satisfaction etc. Machine learning algorithms make it possible for Autonomous Vehicles to exist. They allow a car to collect data on its surroundings from cameras and other sensors, interpret it, and decide what actions to take. Machine learning even allows cars to learn how to perform these

tasks as good as (or even better than) humans. Autonomous cars are technological development in the field of automobiles. Many companies throughout the world are making a serious and continuous effort to make driving a safe and risk free process.

Literature survey

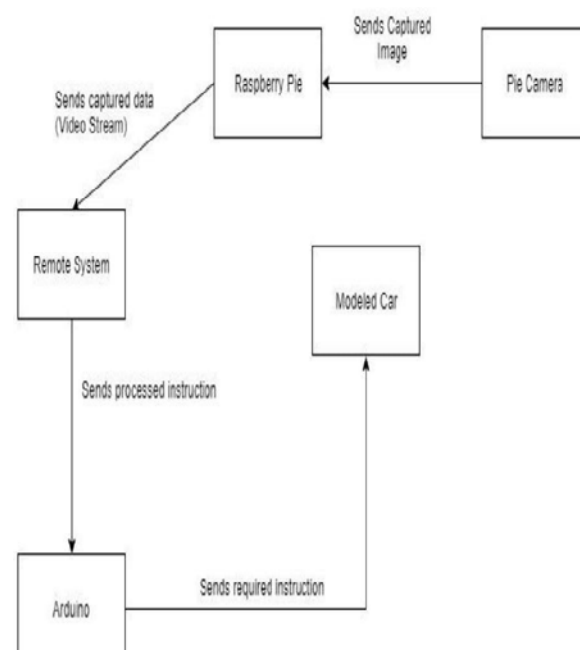
Here we have provided a brief insight of the reference papers we have referred for the project. [1] The paper “Working model of Self-driving car using Convolutional Neural Network, Raspberry Pi and Arduino” the proposed model takes an image with the help of Pi cam attached with Raspberry Pi on the car. The Raspberry Pi and the laptop is connected to the same network, the Raspberry Pi sends the captured image to the Convolutional Neural Network. The image is gray-scale before passing it to the Neural Network. Upon prediction the model gives one of the four output i.e. left, right, forward or stop. When the result is predicted corresponding Arduino signal is triggered which in turn helps the car to move in a particular direction with the help of its controller. [2] In this paper it illustrates on such a unique technique embedded controller design of a self-driving, electrified, accident proof and GSM destination guided vehicle. A GPS module accurately tracks the location of the car, source and destination, and mapping the coordinates provides navigation speeds of the vehicle is automatically controlled by keeping a safe distance, which is a function of velocity, having the vehicle in front view. Distance of the front and side vehicle are continuously monitored by a stepper motor controlled rotating distance measuring sensor and the speed limit as well as track changing are done accordingly. It also prevents collision due to an

obstacle 8-megapixel pi-camera with image processing unit has been used to sense traffic signal and traffic density on road.[3] This paper aims to involve equipping GPS and GSM system on a 4 wheeled robot. The GPS system steers the robot and is capable of reaching from one point to another without any human intervention. While in the former one with the help of GSM system they promise to report theft in case is there is any. An SMS alert is sent to the vehicle owner reporting about the issue and as a result of it, the owner of the car can switch the ignition off and in the latter one the project states that vehicle can only be turned on if the authorized person sends a predefined location to the car.[4] In this the author introduces the paper they have designed two applications of an autonomous vehicle, which can help the driver to relax for the limited duration of time. It also presents a concept which focuses on modified concept of Google car, the Google car has to reach the static destination automatically; in this prototype, they made the dynamic destination. Here self-driving car will follow a vehicle which is moving on a certain route. This prototype will follow that vehicle.[5] In this paper It aims to improve driving, by creating an assistance system. To enhance driver's safety at night time the algorithm includes lane detection along with vehicle recognition system. It can detect Lane which helps To localize the markers. Operation like canny edge Extraction is done to extract edge map to which Matching technique is applied followed by the selection of potentials edge points. Finally linking is done to localize the lane lines.[6] This paper gains insight into an efficient way of establishing communications between two or more cars in a particular system to keep the traffic less congested. As the Autonomous Vehicle continues to overcome the roles and responsibilities of humans, taxi, trucks, or even co-pilots may be laid off as their services will no longer be needed. This may significantly impact the employment rate and economic growth of a certain country.

Main Design of the paper

The implementation of the car will start from source on detection of traffic light the camera will capture signal's image and process it. If the traffic signal is red, it will stop for some time and wait for signal to become green if, green it

will be in motion. If green it will continue its path. If there is an obstacle it will detect obstacle and it will stop and change its path. If not, then it will continue its normal path and reach the destination, the camera, and the raspberry pi, installation of open CV which is required for image detection, processing and recognition Implementation of the remote mode. The hardware consists of the acrylic fiber base. Two permanent type DC motors are connected at the back and a ball castor wheel is connected in the front side for movement of the prototype. On the base- a power supply, a raspberry pi board, motor driver circuit, a camera for capturing images are the various components that have been mounted. As the vehicle starts all the sensors and hardware components gets activated camera is capturing images raspberry pi starts working and car will start moving. While processor starts processing the images it will search for 3 things red traffic signal, obstacle, stop sign. If any one of this detected then raspberry pi sends appropriate signal to Arduino to work further. If red signal is detected raspberry pi gives command to Arduino Uno to stop the car until red is turned into green. If stop sign is detected. Then car will stop for specified predetermined time limit if an obstacle is detected then vehicle will stop and overtake it by giving proper turning indications.



Block Diagram of Proposed System

Hardware Description

A. Raspberry Pi

The raspberry pi is the main processor here. Popularly Known as low cost single board computer. We are using raspberry pi 3B+ version for image processing. With the help Of Open CV software, a machine learning algorithm is implemented and the images are trained in various lighting conditions using neural network technology. Further the decisions taken by the raspberry pi are sent as commands to Arduino.



Figure 1: Raspberry Pi

B. Pi Camera

The pi-camera we are using is V2 version which comes With specifications like 5mp camera and supports upto 1080p30 resolutions along with IMX219 sensor and F2.9 Aperture. This pi cam captures the images of surroundings and send them to the raspberry pi for further processing.

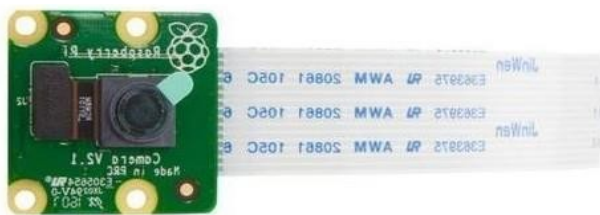


Figure 2 : Pi Camera

C.L298N Motor Driver

It is a basic motor driver module used to drive dc motors as Well as stepper motors too. Hbridge is used along with L298 IC to drive motors.h bridge is a circuit that can drive current In polarity and will be controlled by pulse width modulation (PWM).

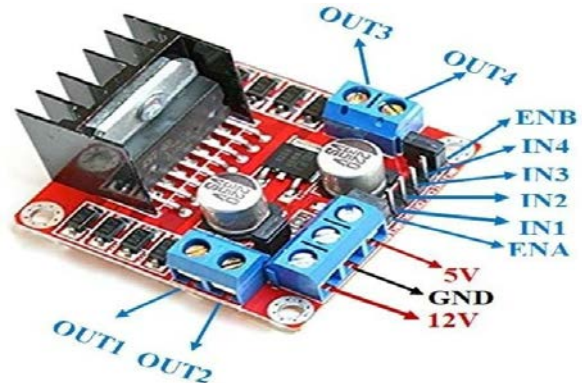
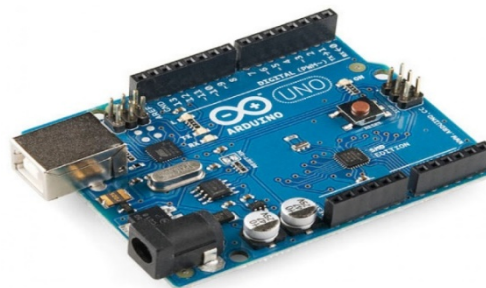


Fig 3 :L298N Motor Driver

D. ARDUINO UNO

The Arduino Uno here is the slave processor being used. Arduino Uno is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator(CSTCE16M0V53-R0), a USB connection, a power jack, an ICSP header and a reset button.



Software Description

1.ARDUINO IDE :-

The Arduino IDE is an open-source software, which is used to write and upload code to the Arduino boards. The IDE application is suitable for different operating systems such as Windows, Mac OS X, and Linux. It supports the programming languages C and C++. Here, IDE stands for Integrated Development Environment.

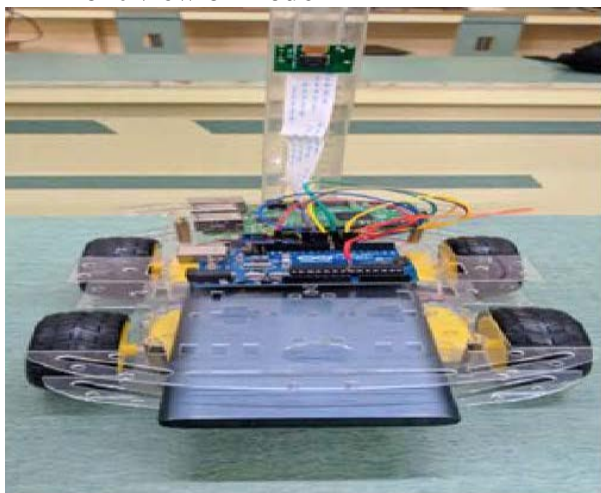
2.OPEN CV4 :-

OpenCV4 (Open source computer vision) is a library of programming functions mainly aimed at real-time computer vision. The library is cross-platform and free for use under the open source BCD license. It has been used in our project to train the processor to distinguish between positive and negative images. These algorithms can be used to detect and recognize faces, identify objects, classify human actions in videos, track camera movements, track moving objects, extract 3D models of objects, produce 3D point clouds from stereo cameras, stitch

images together to produce a high resolution image of an entire scene, find similar images from an image database, remove red eyes from images taken using flash, follow eye movements, recognize scenery and establish markers to overlay it with augmented reality, etc. Open CV4 software is mainly used in our project for image processing.

Implemented Results

Front view of model



Side view of model



Advantages

- Autonomous vehicles don't get tired
- Autonomous vehicles make fewer mistakes
- Systems do not have emotions
- No risk of drunk driving
- They are able to constantly focus
- It follows traffic rules
- They have higher attention spans

Disadvantages

- Higher unemployment rate since fewer cab drivers are needed

- People may unlearn how to drive manually
- Higher congestion levels
- High R&D costs
- High initial purchase price
- Maintenance may be difficult and costly

Future Scope

1. There is a huge scope of self-driving cars in the future, the various automobile companies are improving their autonomous cars rapidly making them more accurate and secured.
2. By using multiple cameras and sensors, the accuracy can be improved.
3. Designing a system where every car is interconnected to nearby cars will avoid traffic congestion in the future.

Conclusion

The different hardware components and their assembly are clearly described in our project model. Autonomous car revolution which aims at the development of autonomous vehicles for easy transportation without a driver. For the individual business, this autonomous technology is bringing many broad implications. Cars that drive themselves will improve road safety, fuel efficiency, and accessibility; driverless car technology helps to minimize loss of control by improving vehicle's stability as they are designed to minimize accidents by addressing one of the main causes of collisions:- driving error, distraction and drowsiness. Hence, due to greater autonomous nature and efficiency, an autonomous car of this nature can be practical and is highly beneficial for better regulation in goods and people mover's section.

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