RV College of Engineering®, Bengaluru-59
(Autonomous Institution Affiliated to VTU)
Department of Electronics and Communication Engineering

16EC73P Minor Project
Synopsis

Traffic Signal Detection, Collision Avoidance and Lane Detection in an Automated Vehicle

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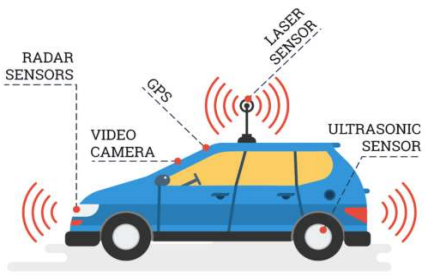
Introduction

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 a variety of sensors situated in different parts of the vehicle. Radar sensors monitor the position of nearby vehicles. Video cameras detect traffic lights, read road signs, track other vehicles, and look for pedestrians. Lidar (light detection and ranging) sensors bounce pulses of light off the car's surroundings to measure distances, detect road edges, and identify lane markings. Ultrasonic sensors in the wheels detect curbs and other vehicles when parking.

Literature Survey

1. **Self-Driving Cars - Mike daily, Swarup Medasani, Mohan Trivedi** - Obtained in site of various research and development going on in the field of Autonomous Vehicle in different region of the World by different Companies and Rules and regulations of different country for the Autonomous vehicle.

2. **Vision Based Lane Detection and Recognition for Self Driving Cars using Deep Learning:** In this paper, we reviewed the vision-based lane detection and tracking for simple applications like driver.The approaches diverse from traditional computer vision techniques to machine learning including deep methods. Deep neural network shows great potential in learning the environment varying features releasing the human engineering efforts in the future.

3. **Traffic Light Detection and Recognition for Self Driving Cars-Ruturaj Kulkarni ,Shruti Dhavalikar,Sonal Bangar 2018 -** In this paper, the execution of proposed system is distributed into following manner: collecting images of Indian traffic lights, pre-processing images to generate the dataset, training the CNN for detection and recognition of traffic lights and finally validation of model through experimental results.

4. **Intelligent Collision Avoidance Safety warning system for Car driving -** The major observations from this paper is that predict the collision happening using ultrasonic sensor and warn the driver using piezoelectric buzzer, the frequency of the beep of buzzer will increase as the vehicle is close to collision

5. **Vision Based Road Lane Detection System for Vehicle Guidance-Othman Omran ,Sheroz Khan , Md.Rafiqul Islam -** A real time vision-based lane detection method was proposed, Image segmentation and remove the **shadow of the** road were processed. Canny operator was used to detect edges that represent road lanes or road boundaries.

6. **Robust Traffic Light and Arrrow Detection Using Digital Map with Spatial Prior Information for Automated Driving -** Detailed explanation of Image proscessing for traffic signal detection along with different Algorithm and Techniques to Achieve the same

Motivation

Approximately 94-95 percent of road accidents are caused by human errors. These errors are usually taken place because of smart phone use, fatigue or distraction because of any other reason.

An autonomous vehicle will prevent the vast majority of the problems.

Problem Statement

Design and Simulate a Autonomous Car in the Software Environment

Objectives of the Project

1. **Traffic Light Detection** is the ability of the vehicle to sense the traffic signal and follow traffic rules, thus preventing Accidents.
2. **Collision Control** is to Continuously Sense the Immediate Environment to check for any kind of Obstacle in the vehicle Path.
3. **Lane Detection** to detect the Lanes and adjust the Vehicle Accordingly.

Methodology

In this Project we are using open-source Robot Simulator Software "Webots".

Webot is a free and open-source 3D robot Simulator used in Industry, Education and Research.

Flow Chart

1. **Modelling:**Identify various sensors and actuators requirements for the project. For example, to design traffic light detection we need camera module and warning lights. For collision detection we need distance sensors and for lane detection again we need camera.

2. **Program the controller:** Next step is to program the selected controller which can be done using any one of the supported programming languages.

3. **Set Parameters:** Identify and set the threshold for various functions of robot. For example, for collision detection we have to set some threshold such that it should warn the user in case of collision happening.

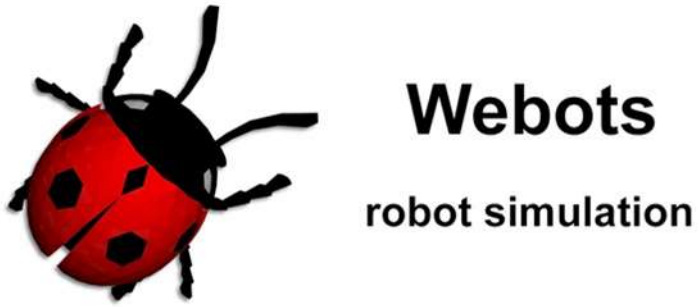
4. **Debug:** Verify the functionality of the vehicle and fine tune the threshold.

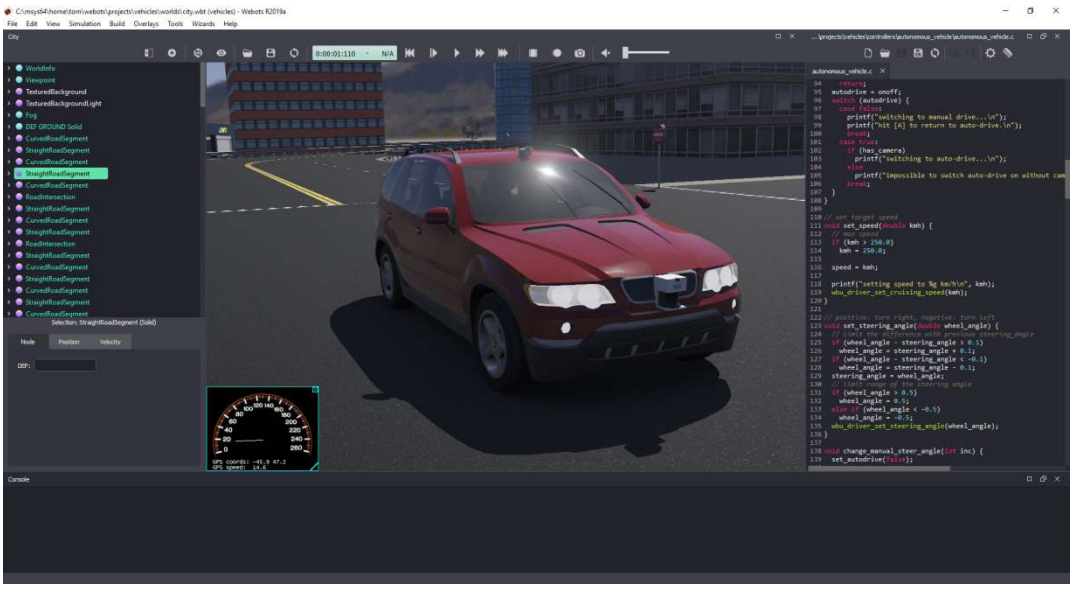
5. **Simulation:** Simulate the robot in a virtual environment.

Software tools used

Webots is a free and open-source 3D robot simulator used in industry, education and research. The Webots project started in 1996, initially developed by Dr. Olivier Michel at the Swiss Federal Institute of Technology in Lausanne, Switzerland and then from 1998 by Cyberbotics Ltd. as a proprietary licensed software.

Webots is a professional mobile robot simulation software package. It offers a rapid prototyping environment, Robot Tools that allows the user to create 3D virtual worlds with physics properties such as mass, joints, friction coefficients, etc.
These robots can have different locomotion number of sensor and actuator devices, such as distance sensors, drive wheels, cameras, motors, touch sensors, emitters, receivers, etc. Finally, the user can program each robot individually to exhibit the desired behavior.





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