LANE DETECTION, FOLLOWING AND CHANGING USING ROS

Abstract:

The advancement in the autonomous vehicle technology created a demand for systems to respond to complex traffic situations. Lane detection, following and lane changing are essential components of an autonomous vehicle to navigate more safely and efficiently through a variety of traffic scenarios.

In this project ROS is used to implement these functions and a Gazebo simulator for testing the algorithm, which is a cost-effective method. Canny edge detection and Hough transformation is used to detect the lanes from video system obtained from cameras on the bot. The Canny edge detection algorithm is used to extract the edge of the image, which are then used as input to the Hough transform algorithm to identify the straight lines that represent the lanes. The Hough transform algorithm uses a probabilistic approach to identify the most likely lines that represent the lanes, while filtering out noise and other spurious lines. The detected lane lines are then used to guide the bot along the centre of the lane. OpenCV is used to perform computer vision tasks such as obstacle identification. By using OpenCV's built-in object detection algorithms or training custom machine learning models, the robot can be programmed to recognize and avoid obstacles in its path. These algorithms have been tested and the results shows effective tracking of lanes in real time.

This system is designed for applications such as Assisting Human drivers, Agricultural bots, Automated Guided Vehicles (AGVs), Surveillance, Home automations, etc. This system can help in preventing accidents caused by driver's fault or distractions.

The system uses sensors such as cameras mounted on the vehicle to detect lane markings and identify obstacles and LIDARs, Ultrasonic sensors, Infrared sensors to plan a safe lane change manoeuvre and requires stepper motors, motor drives and microcontrollers such as Arduino or Raspberry Pi. It implements PID controller for adjusting the position and help keep the robot centred on the path by using feedback loop system.

The result of the project will show that the system can effectively detect and follow lanes, avoid obstacles and safely change lanes when necessary.

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