Commentary

iMedPub Journals
www.imedpub.com

International Journal of Advanced Research in Electrical Electronics and Instrumentation Engineering

2022
Vol.5 No.12:57

Implementing a Robot Operating System in the Creation of an Autonomous Vehicle

Wang Li*

Department of Electrical Engineering and Computer Science, University of Technology, Brisbane, Australia

Corresponding author: Wang Li, Department of Electrical Engineering and Computer Science, University of Technology, Brisbane, Australia,

E-mail: Li_W@edu.au

Received date: November 16, 2022, Manuscript No. IJAREEIE-22-15691; **Editor assigned date:** November 18, 2022, PreQC No. IJAREEIE-22-15691 (PQ); **Reviewed date:** November 29, 2022, QC No. IJAREEIE-22-15691; **Revised date:** December 09, 2022, Manuscript No. IJAREEIE-22-15691 (R); **Published date:** December 16, 2022, DOI: 10.36648/ijareeie.5.12.57.

Citation: Li W (2022) Implementing a Robot Operating System in the Creation of an Autonomous Vehicle. Int J Adv Res Vol.5 No.12: 57.

Description

Scientists have paid a lot of attention to self-driving technology and autonomous vehicles in recent research. In the first radio controlled vehicles were being designed, the concept of autonomous vehicles could be anticipated. In this modern era of automation and technology, autonomous vehicles will be the fad of the future. This paper discusses various aspects of autonomous driving, focusing on the software stack and hardware components. The Robot Operating System (ROS), Machine Learning (ML), Deep Learning (DL), and OpenCV frameworks, in addition to the calibration of sensors and cameras, are the primary components of the software architecture. Intelligent object avoidance, computer vision based controller, and Simultaneous Localization and Mapping (SLAM) based path tracking were also discussed in the paper. In addition, point cloud, ground, radius, and raycast filters were used to differentiate between the ground, real time objects, and the obstacle's own parts or shadows. The paper focuses on the car's overall hardware modules that control it.

Self-driving Model

Self-driving vehicle technology has seen a number of developments, and other companies, as well as a number of researchers, have reached a number of milestones in this field. The most appropriate and effective self-driving model has been developed through the testing of various algorithms and methods. New frameworks are now being used by developers as a result of advancements in software techniques. For better processing and receiving real time data, the best hardware configuration has been utilized. Vehicle movement has been accomplished by means of powerful maxon motors. Two nano kubernetes work together in the processing unit to run the ROS package and record real time data from intel real sense and light detection and ranging cameras. The powerful ouster LIDAR has 16 layers and provides excellent point cloud data observation on rviz. In every parameter, the virtual simulation produced excellent results. On a grassy lane, lane and object detections were spot on, and LIDAR displayed 16 layers of real time point cloud data recorded in rosbags. The overall results can be improved and navigation accuracy can be increased with improved lane detection in road scenarios. The point cloud filter can be improved further to improve obstacle borderline detection, which will improve robot recovery behavior and enable faster and better path planning. Convolutional Neural Network (CNN) techniques for object, lane, and pothole detection are applied to real time camera images for improved vehicle navigation. In addition to a response after obstacle detection, we have written ROS nodes for estimating wheel odometry and dynamic speed control. Path planning is made easier by the inclusion of logic for the vehicle's recovery responses. We have created a significant number of middleware packages that are required to support the framework as a whole.

The Global Navigation Satellite System (GNSS), light detection and ranging, cameras, radar, and sonar are typical types of sensors utilized in autonomous driving: GNSS receivers, particularly those with real time kinematic capabilities, update global positions with at least meter level accuracy to help autonomous vehicles locate themselves. Recent years have seen the rise of autonomous racing as a testing ground for autonomous vehicle technology to see how far it can go. The F1tenth racing series, Formula Student Driverless (FSD), roborace, and the Indy Autonomous Challenge (IAC) are the most well-known. While each series has a slightly different scope and focus, they all aim to improve the sensors, actuators, and compute platforms that are used, as well as the algorithms, middleware, and operating systems that are required. The race track is a secure testing ground for high speed testing and frequently presents complex scenarios to autonomous vehicles. In the real world competition, universities from around the world competed in two different formats: To begin, the objective in Indianapolis was to achieve both the fastest lap on the Indianapolis Motor Speedway (IMS) and the ability to dynamically evade obstacles with each round featuring alternating attempts by two competitors to pass each other at increasing speeds.

Dynamic Limits

A race track typically has one lane that is driveable, with curbs defining the inner and outer boundaries and non-driveable areas like grass and gravel. In addition, tires or stone walls surround the race track to keep the car inside in the event of an accident. In the field of perception, researchers demonstrate large scale mapping with fewer features using the racetrack's unique environment and high speed localization. Autonomous driving has become increasingly important to the industry since these events. At the same time, researchers started using race cars and high performance sports cars for their research. This is because the autonomous software faces a variety of difficulties when driving on the race track: control of the vehicle at the dynamic limits of handling, localization and object detection at high speeds, trajectory and behavior planning in an adversarial environment. The majority of this field's research focuses on hardware and soft efforts. The improvement of algorithmic and knowledge transfer between autonomous domains must come first. While autonomous racing with one or two vehicles is a reasonable testing ground, we believe that these challenges must be made more difficult to match the issues encountered in urban and highway scenarios. Racing more than two vehicles simultaneously to demonstrate the interaction awareness and scalability of the algorithms is an essential component of this. We have identified a pressing need for enhanced open and freely available resources for virtual development because this strategy raises the possibility of vehicle damage. There is a strange connection between improving software performance and increasing model fidelity. A software stack that has trouble adapting to the behavior of other vehicles on the track or other deviations from the internal assumptions is the result of the low complexity of the algorithms. However, this almost certainly results in a decrease in update rate and an increase in computational costs. Even though the used model improves accuracy, this may result in worse overall performance because the opportunity to respond appropriately in dynamic situations.

This article is available from: https://www.imedpub.com/advanced-research-electrical-electronics-instrumentation-engineering/