Chapter 20
Autonomous Intelligent Robotic Navigation System Architecture With Mobility Service for IoT

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ABSTRACT

This article presents the platform for autonomous vehicle architecture, navigation optimization and mobility services. The basic approach is to develop an intelligent agent to create a safety journey and redefine the world of transportation. The goal is to eliminate human driving errors and save human life from accidents. AI robots are a concept of future transportation with full automation and self-learning. Velodyne laser sensors are used for obstacle detection and autonomous navigation of ground vehicles and to create 3D images of the surround so that navigation and controls are optimized. In this article, existing system accessibility will be optimized by multiple features. The agent accessibility is improved, and users can access the vehicles through different ways like mobile apps, speech recognition and gestures. This article concentrates on the mobility services of autonomous vehicles.

INTRODUCTION

Due to human driving errors and violations of the traffic rules, road accidents occur often. This depends on the three factors, man, machine and medium. These three factors change according to the situation and leads to the road accidents. World Health Organization (WHO, 2016) records say that increase in death rate due to road accident has risen to 1.2 million/year and around 50 million people suffer from non-fatal car accident. Most road accidents happen by human driving errors such as mobile phone, entertainment gadgets, drink and driving, distractions and exceeding speed limits. Autonomous vehicles are proven technology that significantly reduces the number of deaths in road accident. Autonomous

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vehicles will make clear decision in determining the path, use optimized steering control, assures safety and fuel efficiency. Autonomous Intelligent Robotics and System Architecture will present an architecture including the software and hardware required to build autonomous robots. The major aim is to develop an Autonomous Intelligent Robotic (Vine et al., 2015) system which is capable of self-learning (Vine et al., 2015) and supports all kinds of mediums and autonomous networks for communication between the robotic systems.

The goal is to create a future transportation system with fully functional autonomous vehicles with artificial intelligent agents to provide accident free zones. This is mainly focused on the aspect of the autonomous robot's capability to learn and react to IoT systems. This article presents a platform for intelligent robotic systems. It helps in better planning for transportation in the near future. Unfortunately, the existing system has some accessibility issues. But in AI based autonomous, intelligent and robotics systems (Fernandes et al., 2014), the accessibility is refined and optimized for making the system user-friendly. The optimization is achieved by autonomously sensing the environment and navigating without human interference. In order to provide optimization in path finding and navigation, it is proposed to use Velodyne lasers and Velodyne LIDAR sensors. By using these, the autonomous vehicle is able to detect obstacles and generate three-dimensional maps for navigation. Three-dimensional mapping helps the navigation system detect traffic signals, pedestrians and the environment. Also, autonomous vehicles can make quick decisions, finding the exact path for navigation. The LIDAR Laser sensor consists of three different components, GPRS, radar for distance measure, and a camera for capturing the surroundings. All these components create 3D surrounding MAP (HDL-64E). Thus, the agents can make better decisions in finding the safest path, avoiding the obstacles and other vehicles. The system aids the physically challenged people, adults and children, and assures an accident free globe.

RELATED WORK

To reduce difficulty in handling automatic cars, Stanley (Ward-Bailey, 2016), and CA-RINA (Fernandes et al., 2014) have proposed autonomous vehicles (Bradley 2016). Easy navigation is provided to the vehicles in a more sophisticated manner. Autonomous vehicles have successfully completed the DARPA Grand Challenge (Wikipedia, 2016b) dessert challenge. But the problem in using the autonomous vehicles is that at times it is complicated for the users to give the longitude and latitude coordination for decision-making. The optimal way of easily access the autonomous vehicle is through mobile applications. The vehicle can be accessed through calls, messages and speech. The autonomous intelligent robotic machine responds to the user need by hand gesture signals, understanding them and communicating them to the autonomous robotic system (Wynn et al., 2014).

All autonomous vehicles (Vine et al., 2015) are designed in such way to make navigation clear and fulfill the needs of the adults, physically challenged people and children. But there is still some inconvenience for some other people for accessing the system. So, the aim is to develop a system that eliminates the barrier in the existing system and make the autonomous vehicle more and more convenient to every people. In most sedans and SUVs (Ward-Bailey, 2016), there are pre-installed adaptive queries that controls the mechanism and reduces the accident. But they have some limitation and it may require some knowledge about autonomous vehicles. The user has different modes of accessibility and in all such modes such as automatic or manual driving, the vehicle communication is still supported with cloud for ease sharing of the information such as traffic and accident spots for the emergency response.