DESIGN AND IMPLEMENTATION OF NAVIGATION CONTROL SYSTEM FOR UNMANNED GROUND VEHICLES

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Abstract

This paper presents the design and implementation of a navigation control system for
Unmanned Ground Vehicles (UGV). Three actuators for steering system, speed control and braking systems are designed and implemented to convert an electric car to be unmanned vehicle. A mathematical model for Ackerman steering is modeled and simulated using MATLAB/SIMULINK. The concept of structure of the system and
the modularity and redundancy of the implemented control algorithms are emphasized during system development. The proposed navigation system includes longitudinal control and lateral control. Longitudinal control is responsible for controlling the speed of the vehicle through the accelerator actuator. Lateral control is
responsible for controlling the direction by using steering motor. The proposed navigation control system is implemented based on GPS with an integrated digital compass. The distance error of the vehicle position is calculated according to vehicle
heading. Of coarse the simulation path from simulation results, is coincident on the required path. Form experimental testing results there are good correlations for actual and required navigation between two points, three points and four points. There is a little difference between actual vehicle path and required path. This is due to using commercial (low-cost) sensors and actuators. The significance of this work is
in the understanding of the transition from theory to practice and to integrate the necessary technology for local manufacturing of these types of vehicles.

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