Path Planning and Control of Mobile Robot in Road Environments using Sensor Fusion and Active Force Control

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Abstract

A path planning and control approach of a non-holonomic three-wheeled mobile robot (WMR) for on-line navigation in road following and roundabout environments is presented in this paper. We proposed a complete navigation algorithm that enables the WMR to autonomously navigate on the road with various scenarios. With such an algorithm, the robot is able to localize itself within the road environment and find a collision free-path starting from a pre-defined start position to a goal point using a novel approach called laser simulator (LS). The path planning and roundabout detection are determined based on LS and sensor fusion of a laser range finder (LRF), camera and odometry measurements. The sensor fusion algorithm is used to remove noises and uncertainties from sensors' data and provide optimum measurements for path planning. A robot motion control scheme is used for the purpose of controlling the kinematic parameters of WMR using a resolved acceleration control (RAC) coupled with an active force control (AFC) for rejecting the disturbances. Experimental results show the capability of the proposed algorithms to robustly drive the robot on the road following and roundabout environments.

***Index Terms*: Active Force Control, Laser Range Finder, Laser Simulator, Localization, Odometry, Road Roundabout, Sensor Fusion, Wheeled Mobile Robot, Wi-Fi Camera.**