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Editorial

Introduction to the Special Issue on Intelligent and Cooperative Vehicles

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Intelligent vehicles constitute one of the hot research topics on the Intelligent Transportation Systems (ITS) field. The development of Advanced Driver Assistance Systems (ADAS) based on multi-fusion information coming from on-board cameras, lidar or radar sensors is leading to more sophisticated passive and active safety systems. Additionally, the growing interest in using wireless communications to connect the vehicle either with other vehicles or the infrastructure is moving the intelligent vehicle research field toward smart interaction, moving to the Cooperative ITS (C-ITS) research field.

This Special Issue aims to cover the most recent advances in autonomous and automated vehicles, including their interaction with other vehicles. A brief introduction to each of the papers selected for this special issue is included below.

In the paper Cooperative Path-Planning for Multi-Vehicle Systems [1], the authors address the problem of coordinating the planning trajectory for multiple intelligent vehicle interaction for collisions avoidance using a reinforcement learning approach as a decision process. A value function is optimized whilst trying to keep path smoothness. This optimal value is later used to provide the path trajectory for the vehicle. Simulation results demonstrate the effective of the approach for scenarios with or without a single stationary obstacle.

The authors in [2] present a trajectory planning algorithm for performing automated overtaking maneuvers without speed lanes on a two-way road. Specifically, it deals with single-lane overtaking maneuvers, including a mechanism for cancelling it in case it is necessary. The designed set of behaviors was studied via a series of simulations. These simulations asses the feasibility of such overtaking and also formulate an initiation trajectory vehicle that has either successfully completed the overtaking action or was able to cancel this action. Two main results can be highlighted: no collisions were registered and vehicles behave as human-driven ones, validating the algorithm performance.

The paper entitled Motion Detection from Mobile Robots with Fuzzy Threshold Selection in Consecutive 2D Laser Scans [3] presents a simple method for detecting mobile objects using a fuzzy threshold selection to consecutive two-dimensional (2D) laser scans previously matched with robot odometry. Experimental results were conducted using a mobile robot Auriga-α equipeed with a Sick LMS 200 with a field-of-view of 180 degrees and an angular resolution of half degree. A Mamdani fuzzy system was developed using as inputs the speed and curvature of the mobile robot. Three simulated experiment were carried out to validate the proposed approach. Then, real experiments using an 8-shaped and O-shaped were done. These experiments showed the reduction in the number of clusters to be processed in order to detect pedestrians.

A method that provides an estimate of road bank by decoupling the vehicle roll due to the dynamics and the roll due to the road bank is presented in [4]. Using suspension deflection measurements, a measurement of the relative roll between the vehicle body frame and the axle frame or between the sprung mass and the unsprung mass are provided. Two different kinematic navigation models based on extended Kalman filter (EKF) architectures using the relative roll measurement were developed. Both algorithms were tested on the Prowler ATV experimental platform. Experiments demonstrate that both approaches provide proper estimations of the current vehicle roll and instantaneous road bank.

Mimicking professional drivers' behavior, the authors in [5] presents a reactive motion planner using an evolutionary algorithm which resembles the learning stage of professional drivers, including overtaking maneuvering. Validation results include motion of the vehicles at a traffic crossing to avoid any potential jam or collision. The algorithm was also tested against a number of scenarios that ranged from straight roads to roads with steep or smooth turns on either side, showing a good performance. Subsequent research work will be focused on the algorithm extension to cover diversions, mergers or completely blocked roads.

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