

2012 Robotics Seminar (6) / Japan Council of IFToMM

Date/Time: Monday, September 3rd, 2012, 13:00-14:30

Place: University of Tokyo, Hongo Campus, Engineering2, Room232 (3F)

Host: Prof. Yoshihiko Nakamura (nakamura@yml.t.u-tokyo.ac.jp)

Optimal Trajectory Planning of Road and Off-Road Vehicles

Professor Zvi Shiller

Mechanical Engineering and Mechatronics

Ariel University Center, Israel

Autonomous vehicles are destined to replace human drivers in the not too far future as Google is already operating a driverless car on public roads, and major car companies are developing commercial automated vehicles. A major technology component of automated vehicles is a trajectory planner that drives the vehicle to a desired destination while accounting for the vehicle's dynamic behavior, obstacles, and road conditions.

In this talk, the problem of trajectory planning for the typically nonlinear vehicle model will be discussed for road and for off-road applications. A physics-based motion planner will be presented that accounts for vehicle dynamics and road/terrain topography. It is based on first determining the vehicle's performance envelope, in the form of velocity and acceleration limits, which guide the selection of a time optimal trajectory. The optimal trajectories serve as the upper bound for the vehicle's motion, under which tracking accuracy and vehicle stability can be ensured. The physics-based planner will be presented, together with recent experimental results that demonstrate the high tracking accuracy achieved when following the optimal trajectories.

About Speaker: Professor Shiller is the founder of the Department of Mechanical Engineering and Mechatronics at Ariel University Center and the director of the Paslin Laboratory for Robotics and Autonomous Vehicles. He earned the BA engineering degree from Tel Aviv University, and the MS and Sc.D. degrees from MIT, all in Mechanical Engineering. Before joining the Ariel University Center in 2001, he served fourteen years on the faculty of the Department of Mechanical and Aerospace Engineering at UCLA where he lead the teaching and research activities in Robotics and directed the Laboratory for Robotics and Automation. Professor Shiller's research activities have focused on robot motion planning, dynamics and control, including time-optimal-motion control and obstacle avoidance. His recent work applies these methods to the navigation and trajectory planning of off-road vehicles, planetary rovers, and intelligent road vehicles. Prof. Shiller is the founding chair of the Israeli Robotics Association.