

**Abstract:**

Optimal control theory provides methodologies and numerical solution algorithms that prove valuable for handling several emerging problems in the era of vehicle automation, in particular for the computation of automated vehicle trajectories for a variety of tasks. After some brief historical highlights and introductory remarks on continuous-time and discrete-time optimal control, the presentation addresses a simple kinematic model for vehicle motion control and its usage for deriving optimal vehicle trajectories for several problems, including eco-driving, automated vehicle merging, deterministic and stochastic GLOSA (green light optimal speed advisory) systems and autonomous motorway driving.