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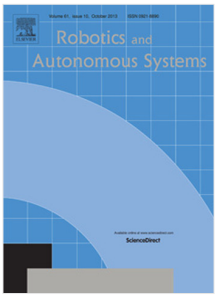

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Learning of Skid-Steered Kinematic and Dynamic Models for Motion Planning

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Abstract

Modeling of the motion of a skid-steered robot is challenging since slippage and skidding is inherent to this type of platform and it requires high torques to perform curvilinear motion. If the ground-robot interaction and torque requirements are not captured properly, motion planners will sometimes generate trajectories that are not achievable by the robot. Important motion planning applications that rely heavily in these models, include energy efficient and momentum based planning. However, these models change as the terrain surface varies. To cope with this issue, this paper presents a methodology to perform online learning of such models. It combines detailed slip and terramechanic-based dynamic models of wheel-terrain interaction with online learning via Extended Kalman filtering (to update the kinematic model) and an efficient neural network formulation (to update the dynamic model). The proposed approach experimentally demonstrates the importance of the joint utilization of the learned vehicle models in the context of energy efficient motion planning. In particular, the slip-enhanced kinematic models are used to efficiently provide estimates of robot pose and the dynamic models are

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