Path Planning with Orientation-Aware Space Exploration Guided Heuristic Search for Autonomous Parking and Maneuvering

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Abstract:
Due to the nonholonomic constraints of the vehicle kinematics, parking and maneuvering a car in a narrow clustered space are among the most challenging driving tasks. This paper introduces an extended version of Space Exploration Guided Heuristic Search (SEHS) method, called Orientation-Aware Space Exploration Guided Heuristic Search (OSEHS), to solve the path planning problems for parking and maneuvering. This method considers the orientation of a vehicle in the space exploration phase to achieve knowledge about driving directions. Such information is exploited later in the heuristic search phase to improve the planning efficiency in maneuvering scenarios. This approach is not bound to the specific domain knowledge about a parking or maneuvering task, but obtains the space dimension and orientation information through a generic exploration procedure. Therefore, it is convenient to integrate the maneuvering ability into a general SEHS motion planning framework. Experiments show that the OSEHS approach produces better results than common random-sampling methods and general heuristic search methods.

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