Abstract

Wheeled Mobile Robot (WMR) navigation is subjected to noise that brings several factors of uncertainties in the robot’s motion positioning as well as pose tracking. The uncertainty in motion makes the robot’s pose-tracking to be a difficult task. Motion models have been designed to track the robot poses within trajectories based on the robot’s inertial velocity-based information or the odometry readings obtained from its wheel encoders. This paper introduces a holonomic motion model based on geometric relationships between a robot’s laser-scanner and the landmarks in the environment. The laser-scanner is attached to an Omnidirectional Mobile Robot (OMR) capable of holonomic drive and thus the observation-based motion-tracking approach can capture the trajectory obtained of holonomic motions as well. In this method, despite the pioneering methods, the pose information in the laser-base-frame is used instead of the robot’s inertial information. In this way, a different perspective of sensing is provided that can enhance the robot’s pose tracking task. The method can be used along with a common robot’s motion model to further reduce the uncertainties in motion. The experiment is conducted based on a KUKA Youbot equipped with a Hokuyo URG-04lx laser range scanner in its front
that suggests that the method can successfully track the robot’s trajectory with a good level of consistency in restricted areas where the landmark distribution has covered the whole trajectory.

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Index Terms

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