ABSTRACT

MAGNETOMETER-LESS STATE-ESTIMATION OF A UNICYCLE MODEL MOBILE ROBOT USING A CASCADED KALMAN FILTER FRAMEWORK

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Localization is one of the most important aspects in the development of autonomous mobile robots. For effective navigation of these robots, an efficient localization algorithm is needed. Typical localization, or state-estimation algorithms, require an IMU along with an external reference that provides highly-precise pose information, such as a GNSS for outdoor applications. In indoor applications, GNSS data is not accessible so many mobile robot implementations turn to magnetometers to provide the additional pose information. However, with the push to miniaturize these robotic systems, magnetometers are not always reliable due to their close proximity to motors and other electronics, causing magnetic distortion and in turn, incorrect pose information. To address this issue, this thesis proposes a magnetometer-less state-estimation algorithm based on a cascaded Extended Kalman Filter (EKF) framework for localization of an autonomous mobile robot. The presentation will include background information on estimation and the Kalman Filter, explanation of the mathematical models for the algorithm, as well as simulation results, proving the feasibility for physical implementation on a mobile robot.