**ABSTRACT**

**MAGNETOMETER-LESS STATE-ESTIMATION**

**USING A CASCADED KALMAN FILTER**

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Localization, or state-estimation algorithms, are 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 requires an IMU (Inertial Measurement Unit) along with an external reference that provides highly precise pose information, such as GPS (Global Positioning System) for outdoor applications. In indoor applications, the GPS data is not accessible so many mobile robot implementations turn to magnetometers to provide additional pose information. However, with the push to miniaturize these robotic systems in fields such as security, research, and land surveying for more discrete surveillance, smaller scale experiments, and better accessibility, respectively, magnetometers are not always reliable due to their 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 unicycle model mobile robot. The algorithm includes an initial Course Error Correction EKF estimating the position and heading of a mobile robot using error compensated IMU measurements that are found in the following Error State Estimation EKF, which uses the course error data from the first filter mentioned as well as velocity from the IMU as measurement. 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.