

# MASTER OF SCIENCE IN ENGINEERING SCIENCE

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## SONAR-BASED LOCALIZATION OF MOBILE ROBOTS USING THE HOUGH TRANSFORM

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For an autonomous mobile robot to navigate in an unknown environment, it is essential to know the location of the robot on a real-time basis. Finding position and orientation of a mobile robot in a world coordinate system is a problem in localization. Dead-reckoning is commonly used for localization, but position and orientation errors from dead-reckoning tend to accumulate over time. The objective of this thesis is to develop a feature-based localization method that allows a mobile robot to re-calibrate its position and orientation by automatically selecting wall-like features in the environment.

In this thesis, the selection of features is accomplished by applying the Hough transform to sonar data. The Hough transform makes it possible to select the optimal feature (the longest wall, in this case) without finding all possible line segments from the sonar data. A least-square line fitting method is then employed to construct a model of the line segment that represents the feature selected by the Hough transform. The algorithm developed was tested using synthetic and real sonar data. Experimental results demonstrated the effectiveness of the proposed localization methods.