Executive Summary

Autonomous systems are being developed to do more activities in many different environments. As a Mechanical Engineering Senior Design project, this idea was used as an inspiration for the development of a robot that could use Monte Carlo Localization (MCL) to find itself within a given environment with known boundaries and landmarks. This project used the Lego Mindstorm and Java programming in order to develop a robot that could localize itself and navigate to a given end destination. A course was developed and built of plywood with set boundary dimensions and additional, movable walls for variability. The robot was also built to alleviate interference and error from the sonar sensor and compass sensor being used to aid in the movement of the robot throughout the course. A marble swivel wheel was used to allow smooth, tight turns of the robot.

The programming of the robot required several aspects in order to allow it to run effectively. The brick and computer were programmed to communicate through Bluetooth to effectively run and display aspects of the program. The course was designed to be interactive for easy addition of walls within the course. The program used A\* navigation to determine the best path the robot would need to take to arrive at the destination once it had localized itself. The MCL was programmed specifically for the sensors used on this robot, and follows a set of five steps until it converges and determines its location on the course. Several difficulties arose while programming the robot and solutions were determined to correct these issues. Some issues still remain and would be considered for future development of the robot.