

Requirements Document

Project: Liberty

Task: *Localization*

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1. 0 TABLE OF CONTENT

1. 0 TABLE OF CONTENT	2
2.0 CAPABILITIES	3
2.1 PURPOSE	3
2.2 SCOPE	3
2.3 CONSTRAINTS	3
2.4 USER FUNCTIONS	3
2.5 OPERATING ENVIRONMENT	3
2.6 PERFORMANCE	4
3.0 COMPATIBILITY	4
3.1 COMPONENT RE-USE	4
3.2 COMPATIBILITY WITH THIRD PART PRODUCTS	4
4.0 GLOSSARY OF TERMS	4

2.0 CAPABILITIES

2.1 PURPOSE

To update the odometry readings. The first full localization shall reset X,Y, and Theta readings within the starting square before anything else is done. Along the path the robot is taking detection of grid lines can be used to update and fix minor changes to the odometer. After the zip-line traversal is complete the robot will need to perform a full re-localization from within its square.

2.2 SCOPE

The full localization procedure should update reset odometer positioning as accurately as is feasible. Initial localization will take place within the first block and as such will have $30.48 \times 30.48 \text{ cm}^2$ of space to perform initial localization, and must be completed within 30 seconds. The entire area the robot will inhabit is composed of a 12x12 grid of squares of size described above. As such the robot will end up performing soft localization, in which minor changes are made to the robots odometer, at least once every 43.11 cm (assuming relatively linear motion).

2.3 CONSTRAINTS

The robot will have at its disposal up to 3 ultrasonic and light sensor, however due to dependencies of other sub-systems the robot may only have up to 2 light sensors and 3 ultrasonic sensors for localization.

2.4 USER FUNCTIONS

Before and during system operation the user will not be able to interact with the localization procedure.

2.5 OPERATING ENVIRONMENT

Ultrasonic localization will be conducted against vertical wooden placks at the edge of the map. Light localization will be conducted against the board itself, in which the light sensor should receive, after filtering, uniform readings, with minimums readings indicating black grid lines. The board will be placed in a large open room, lighting will be provided from windows. As such, varying light conditions during runs could trigger false positives of line detection or could cause lack of detection. Due to the unreliability of the ambient lighting conditions over long periods of time light sensor comparison values can not be hardcoded from testing, but rather must dynamically adjust to the ambient light readings.

2.6 *PERFORMANCE*

Time performance: *found in SCOPE*

Total operation distance: *found in SCOPE*

3.0 COMPATIBILITY

3.1 *COMPONENT RE-USE*

The initial full localization can be performed in a manner identical to that of Lab 4. As such, code from lab 4 can be refactored and used as a base for localization. Cases emerge in the project however that are not covered by Lab 4, such as localization updates and full localization away from the edges of the board.

3.2 *COMPATIBILITY WITH THIRD PART PRODUCTS*

4.0 GLOSSARY OF TERMS

Note that this document should be reviewed with the “Clients” and should be developed in conjunction with them.