Software Design Document

Project: LIBERTY
Task: SOFTWARE DESIGN

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2.0 SUBSYSTEM DIVISION

Localization: localize the robot using light and ultrasonic sensors
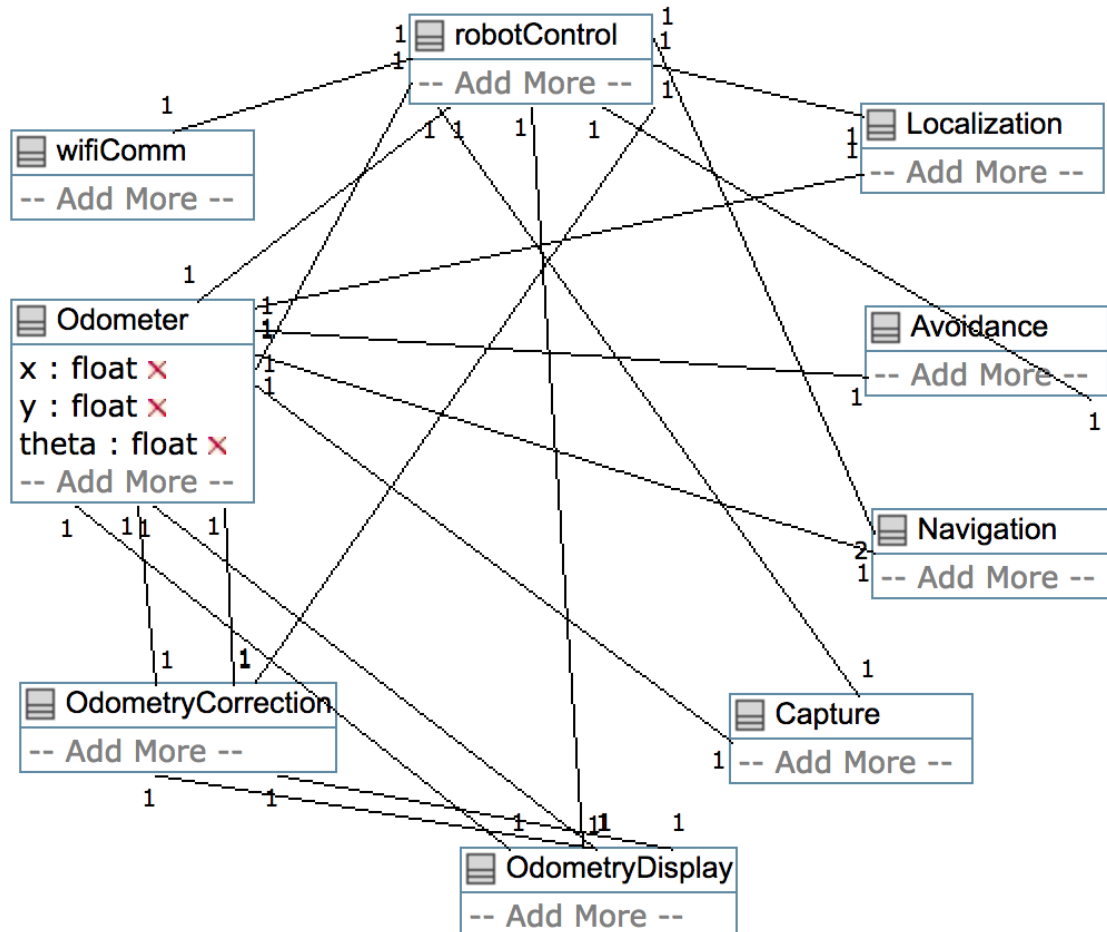**Navigation**: navigate the robot between two points also included path generation
WiFi Communication: take the input coordinates from the server
Capture: capture the flag by beeping 3 times
Zipline: traverse the zipline

3.0 CLASS DIAGRAM AND INTERACTIONS

Robot Control: the main class to call other classes when needed. The main method is written in this class

Localization: first perform the ultrasonic localization and then the light localization to ensure the accuracy of x, y and θ when starting

Navigation: drive between two points and generate a path based on the points given. Two instances should be running in the control class. One is for the driving motor, the other is for the zip-line traversal motor which only rotates.

<u>Odometry Correction</u>: correct the x, y and θ using light sensor when encountering a black line

<u>Avoidance:</u> Avoid any obstacles including useless flags

<u>Capture</u>: determine if the flag is the wanted one and beep 3 times to capture it

4.0 DEPENDENCY AMONG CLASSES

Class Name	Dependency
Robot Control	All other classes
Localization	Robot Control & Odometer
Navigation	Robot Control & Odometer
Odometry Correction	Robot Control & Odometer
Avoidance	Robot Control & Odometer
Capture	Robot Control
Wifi Communication	Robot Control
Odometry Display	Odometry Correction, Odometer, Robot Control
Odometer	Robot Control, used by Localization, Navigation, Odometry Correction, Odometry Display and Avoidance

5.0 OVERALL SOFTWARE WORKFLOW

Coordinates and path input from Wifi

Localization by ultrasonic and light sensors

Zipline or Bridge

zipline → Navigate to the zipline tower → Mount onto the zipline and drive for zipline length → Relocalize → Navigate to the orange zone

bridge → Navigate to the bridge side → Navigate through the bridge → Navigate to the orange zone → Check if the flag is the desired flag

check if the flag is the desired flag

Yes → Capture the flag

No → Go to the next flag

Navigate to the bridge side → Navigate through the bridge

Check if the flag is the desired flag — No → Go to the next flag

Yes → Capture the flag → Navigate to the zipline tower → Mount onto the zipline and drive for its lenght → Relocalize

Navigate back to the starting position