Lab 4

Mobile Robot Navigation

Objective

In this experiment, students will use MobileSim and Aria to achieve the following goals:
1. Get familiar with the mobile robot simulator.
2. Control one mobile robot to follow one user-manipulated mobile robot and also another mobile robot wandering around (the closest one at each moment).

Reference Materials

1. README files under MobileSim and Aria directories.
2. C++ API documentation under Aria directory located in /usr/local/.
3. Examples under Aria directory located in /usr/local/.

Lab Procedure

This lab consists of one main part with possible extra credit for the second optional part:

Part 1: Robot Following

1. From the command window run MobileSim.
2. Expand “More Options” and select the number of robots you want to use.
3. Select “No Map”. You will see a pop-up window simulating the indoor environment.
4. Go to the subdirectory “examples” under /usr/local/Aria. You will find sample codes and their corresponding binaries.
5. Run the "demo" on one of the simulated robots using the corresponding TCP port.
6. Follow the instructions to control the mobile robot with the keyboard. In the MobileSim window, you are able to scroll the middle button of the mouse to zoom in/out the robot. To drag the robot, click the right button of the mouse.
7. Run “wander” on a second robot using a different TCP port. The robot uses a laser scanner to detect obstacles. If no obstacles is found, the robot moves forward with a constant velocity.
8. For more details of the demo programs, please refer to README file under “examples”.

9. In this lab, your goal is to create a robot chasing program. At anytime the robot controlled by your algorithm should follow the closest robot while avoiding any collisions.

Hints:

- Typical laser device returns infinite values if there is no object in the scanning path of the laser. However, the laser reads certain angles in degree whenever it detects an object. Those angles are essential to adjust the orientation of the chasing robot. To determine the velocity, you are suggested to use sonar to measure the distance between the two robots.
- Examples “simpleMotionCommands”, “demo” and “wander” share similar functionality with the robot following. You are encouraged to build your own program on top of these demo programs.

Part 2: For Extra Credits

Extra credits are given if the program is able to follow the other robots successfully in a mapped environment (when there are some static obstacles like walls, etc. in the environment).

1. Open the “MobileSim” with a predefined map, i.e. columbia.map.

2. Start with the followings two demo programs: “actionExample” and “actionGroupExample”.
