

## Robotics Assignment 1

### Qi Mo

The basic strategy is random drive until the robot gets a wall signal, then it starts to follow the wall by turning and driving based on the varying wall signal. When following the wall, if it sees the docking signal, it will go towards the docker. After mounting itself onto the docker, considering it may not make it the first time, it will wiggle a bit on the docker to settle down, until the charger is sensed.

Because the test environment (my office) that I used was not ideal (due to those black strip on the bottom of the walls), I plugged in two other strategies, in the hope of at least one will work. First is basically traversing the room with bump sensor, so once the robot bumps on a wall, it could do wall following by keep bumping and turning (although it might not be able to follow the wall as closely as using the wall signal). The second is using the two buoys and force field, so when the robot is free driving and supposedly looking for a wall, if it happens to pick up one of those docking signals it will break from the initial wall searching and go towards the docker, steering based on the sequence of different docker signals on its way. None of these sensors was found to be robust enough, so hopefully a combination of them would work.

From what I've seen, once the robot finds the docker signal and goes toward it, the following process (mainly following the path towards the docker and wiggling itself into place) is quite smooth. When the robot comes from the side of the docker (e.g. when it is following the wall), it first picks up the force field and will try to turn around a bit to go to the docker from a more head-on direction. There could be several takes before the robot actually adjusts to a good direction, and it might very well fail and will back off for a moment and start over again. The power cable of the docker was found to be a common pitfall in this situation.

Important functions in my code:

***FreeDrive()***: driving around, searching for wall signal, and then do wall following

***Dock()***: main docking function, deal with traveling towards the docker and mounting onto it

***almost\_Test()***: called whenever the robot picks up one of the signals from the docker, it will abandon whatever it is doing (searching for wall, for example) and try to navigate towards the docker. This function samples consecutive signals and move and turn based on the sequence, for example if it finds itself encounters red buoy only follow by green buoy only signal it will turn clockwise towards the docker. That's why the function is basically two nested switch statements.

***Routine\_Check()***: currently this function only checks for bump sensor, so that the robot could go around obstacles. It also monitors the docker signal and wall signal, to modify the robot's operation mode (seeking dock-SEEKDOCK, or docking-DOCKING, or driving towards docker signal-ALMOST).

The wall signal is assumed to be between 100 and 125 when the robot reaches the wall, based on empirical data collected in my bedroom. If the environment is significantly different, changing these thresholds would help tremendously. They are defined in the wall following section in *FreeDrive()*. The serial port I used is COM9, change it in the makefile if need to.