

Auto Navigation and Obstacle Avoidance Vehicle Implementation Report

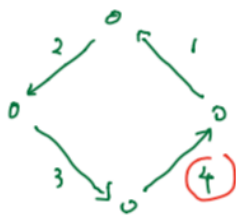
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Generally, two parts are implemented.

First, navigation according to the wifi signal strength.

1. The mcu takes the average signal strength every two times and memorizes the current average signal strength and previous signal strength.
2. If the current average RSSI is smaller than (the previous RSSI - offset) , it means the car is not making much progress, and the car needs to make a turn. Otherwise the car will just keep moving forward.
3. If the car is not making progress for 4 times (approaching > 3), it means it may get stuck in a cycle. The car then will take another turn on the opposite direction. Note in our set up, the right turn is 10 to 15 degree less than left turn so that the car won't repeat the same cycle.

Turning to one direction



→ approaching > 3
not making
progress →

Turning to another direction.



P.S. In our case the left turn angle
is a bit larger than right turn angle.

4. While the stopping condition is met, which indicates that the beacon is around the car, the car will stop and wait for the RSSI to be weak. In this way if beacon leaves the car will return to move state. But the stopping condition is about 20 percent larger than returning condition. So the car will not easily return to move state even if there is noise in RSSI channel.

Second, the obstacle avoidance part:

There are 3 sensors detecting the obstacle: left, right and middle. We realized that if the 3 sensors detect at the same time the measurement will be inaccurate. So each trigger signal only corresponds to one echo signal.

Reading 3 sensors one by one is too time-consuming, so the left and right sensors will only be used when the middle sensor detects obstacles in the way.

1. Middle sensor keeps detecting obstacle, when the distance to the obstacle is smaller than 20cm, call left and right sensor.
2. If any distance measured is smaller than 10 cm, going backward
3. If left edge is farther and there is no space for the right turn, turn left; If right edge is farther and there is no space for the left turn, turn left. **Otherwise the car will stick to the navigation turn according to the first part.**
4. The car keeps turning until the car leaves the obstacle
5. If an obstacle appears suddenly (for instance a human foot), the middle distance may drop to under 10 cm, then go backward.