ICS-520: Artificial Intelligence and Machine Learning for Robotics Project Report (201)

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Your Source Code
Did you start with your own code? Or have you used the instructor posted solution for HW#3? I started with my own code (close to HW3)
Mission Planning
Describe your strategy of how you plan your mission? My strategy was to make my robot sense all the obstacles around it within its location then move by one step (The robot will be sure about this step because it sensed before moving) This is my main strategy for solving the navigation part. I have put a lot of comments in my codes for the other parts just in case
Localization
1. Which technique did you use to localize? A1-Regression 2. If ML, which technique and what are the features and targets you use? A2-The features are the beacons, and the targets are x and y 3. Did you do any preprocessing (change the input values by encoding, scaling, etc.)? A3-No 4. Do you do any post-processing (rounding, mapping, etc.) after you get the predicted value? A4-Yes, rounding x and y to an integer 5. What is the accuracy of your model? A5-For x it is about 0.999 and for y it is about 0.996
Obstacle Detection

1. Which technique did you use to detect objects?

A1-Clustring (KMeans)

2. If ML, which technique and what are the features and targets you use?

A2-The features are the density and reflection. There are no targets

3. Did you do any preprocessing (change the input values by encoding, scaling, etc.)?

A3-No

4. Do you do any post-processing (rounding, mapping, etc.) after you get the predicted value?

A4-The predicted value is either 0 or 1 (cluster number) but I can't know which number represent which cluster until I test. After seeing the data by plotting, it is very clear that there are two clusters and if the density and reflection are both above 100 then it is an obstacle for that particular cluster number (Note I am using 100 based on the specific data I have seen but if I did not see it or there is more data coming 100 will not be the best threshold)

5. What is the accuracy of your model?

A5- I can't know because I don't have labeled targets (in clustering we search for patterns)

Object Recognition

1. Which technique did you use for object recognition?

A1-Multiclassification (RandomForestClassifier)

2. If ML, which technique and what are the features and targets you use?

A2-My features are border and color. the target is the object type (Book, Ball, Watch or Phone) The targets are discrete and represented by a number (It is much easier to deal with a number rather than a string)

3. Did you do any preprocessing (change the input values by encoding, scaling, etc.)?

A3- The preprocessing was already made (Watch=1, Book=2,Ball=3 and Phone =4)

4. Do you do any post-processing (rounding, mapping, etc.) after you get the predicted value?

A4-Just converting the labels to their string

5. What is the accuracy of your model?

A5-1.000

Navigation

Which technique did you use for path finding?

Hybrid deliberative/reactive paradigm

Describe any issues or problems with your project, if any.

State any limitations, errors, or incomplete parts of your project.
If applicable, add any notes I need to know in order to run your code (any special input, or setup).

I have tested the whole code and it works fine.

The main thing to keep in mind is that **it is very important to change the whole paths to an absolute path** (The relative path usually does not work with me)

I have made a library which is called robot. This library has a method which is defined as def senseThenUpdateVM(x,y,readUltrasoundSensor,updatedVM):. This method will update the virtual map so that all the obstacles around the x y point (the location of the robot) will be detected. The algorithm I am sure about (I have used the same concept in HW3) and it works fine. However, I have noticed that sometimes (about 1 in every 10 times) some obstacles will not be detected although I have used the same exact code (like for example if there is an obstacle below point (0,0) the robot will detect it but sometime if there is an obstacle at the same place for this same point it will not be detected. I think most likely that has to do with the fact that I am using a function as a parameter in my function and this function I don't know who internally it is working (maybe something related to EnvironmentSimulator.py library). **But this is a small issue, and it did not affect my result**

If the paths are changed then the result should hopefully be self-explanatory 😊

Output Sample

Post an output sample of your code here:

I have attached all the solutions in a folder called **SnapShots**