ENPM 673 - Perception for Autonomous Robots

Hello, World!

Due on: 7:00 PM, Wed 02/07/2018

1 Welcome

This "assignment" serves as a warm welcome to the course. The aim of this assignment is for you to evaluate yourself, familiarize yourself with the tools you will be using . This assignment, will give you a fair idea of the minimum requirements and knowledge required to perform the rest of the projects assigned during the course. While not graded, it will serve as a means of getting you acquainted with the input and output specifications that will accompany each project .
Ideally, this shouldn't take more than a week to complete. Now is the time to ask us any and all queries you may have regarding this.

1.1 Note on Programming Environment

The official programming environment for this class is Matlab, and projects should be submitted in Matlab.
As a Roboticists, you are encouraged to familiarize yourself with using Python with OpenCV. When providing instructions, sometimes we will refer to OpenCV manuals.
The best way to install OpenCV is from the Github repositorya dn use version 3.4.0:
https://github.com/opencv/opencv/tree/3.4.0

2 Pin It!

You are given an image of colored objects on a white background, as included in the file named `TestImgResized.jpg`. Your task is to segment out the objects, count the number of colored objects and also count the objects of the same color, i.e., green, blue, yellow and red. To have some fun, we also threw in a white object and a transparent object (we really want you to try to get these as well to make your fundamentals stronger).

2.1 Submission Deadline

Submissions are expected on or before ***Wednesday, 8th of February, 2018.*** Considering this is a very simple and ungraded assignment, there will be no extension of deadlines provided. This project is the your chance to clear all doubts regarding submissions and programming environments and similar issues since we would like to avoid such problems once the actual projects are released.

2.2 Functions you are allowed

For this project, no additional toolkits will be necessary. Only the Image Processing Toolbox (included with MATLAB) will be necessary. Any built-in Matlab function except the colorThresholder App (`http://www.mathworks.com/help/images/ref/colorthresholder-app.html`). If you have a doubt whether a function can be used or not e-mail Kanishka at `kganguly@terpmail.umd.edu` or Anton Mitrokhin amitrokh@umd.edu via Canvas.

2.3 Various Steps Involved

2.3.1 Denoise Images

You can use any denoising filter like a gaussian or a median filter to 'smooth out' the image to reduce noise.

2.3.2 Find total number of colored objects (excluding white and transparent pin)

You can use a combination of morphological operations and blob based properties (`regionprops`) to do this.

2.3.3 Find individual colored objects - Red, Green, Blue and Yellow

Find and count individually red, green, blue and yellow objects. Use color information in any color space you want in conjunction with the previous step output to do this.

2.3.4 EXTRA: Detect the white and transparent colored pins

Do anything you want to find this. (If possible, avoid hard-coding the thresholds).

2.4 Submission Guidelines

Submit your codes (`.m` files) with the naming convention
`YourDirectoryName hw0.zip` on Canvas (**Please compress it to .zip and no other format**). Your `DirectoryName` is the username to your UMD e-mail ID. Your zip file should have the following things: -

- Folder named `Code` with all your code.
- Folder named `Output` with your output image(s).
- A `Readme.txt` file on how to run your code.

3 Allowed Matlab functions

`imfilter, conv2, imrotate, im2double, rgb2gray, rgb2lab, rgb2ycbcr, rgb2hsv, kmeans` and all other plotting and matrix operation/manipulation functions are allowed.
`fspecial, imgaussfilt` are **NOT ALLOWED**!

4 Collaboration Policy

The code you turn-in should be your own and if you **DO USE** other external codes/codes from other students - do cite them. For the honor code refer to the UMD Honor Pledge website here http://shc.umd.edu/SHC/HonorPledgeUse.aspx.