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ENPM 673 – Perception for Autonomous Robots

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Project 3 - Color Segmentation

Part 0: Data Preparation and Vanilla Approach

0.1 Training frames are saved in path 'ColorSeg/Images/TrainingSet/Frames/<FrameNo.>.jpg' and Test frames are saved in path 'ColorSeg/Images/TrainingSet/Frames/<FrameNo.>.jpg'.

The images for cropped Buoys are saved in path 'ColorSeg/Images/TrainingSet/CroppedBuoys/<color>_<FrameNo.>.jpg'.

0.2 The script averageHistogram.m is reading all the cropped testing files and making plots for yellow buoy, red buoy and green buoy. I then plot the average color histogram of each colored buoy and fit a gaussian curve on the histogram for the respective buoy.

0.3 After getting the color distribution, I have converted the buoy images to L.A.B. color space to enhance the buoy detection and the output frames are saved in 'ColorSeg/Outputs/Part0/<Frame_NO.>.jpg'

Color representation scheme used here is RGB representation of images. Other color spaces are La*.b*, hsv. After trial, La*b* color space proves to be better for this project. L for lightness and a and b for the color-opponents green-red and blue-yellow. Lab color is designed to approximate human vision.

Separating Buoys based on RGB color scheme was not working properly. Using La*b* color space, the component of Luminosity plays an important role for differentiating buoys.

Part 1: Gaussian Mixture Models and Maximum Likelihood Algorithm
Part 2: Color Model Learning
Part 3: Buoy Detection

Data samples have been generated using 3 1D Gaussians, Color Samples are then used to learn color model and Buoys are then detected using GMM.

The output video is saved in the output folder.

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Fig. 1: Contoured Buoys

Conclusion:

The buoys have been detected and contoured, but the contours are not tight fit on the buoys. One possible reason for this might be the lack of color model accuracy.