

ENPM 673 – Perception for Autonomous Robots

Spring 2018

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.

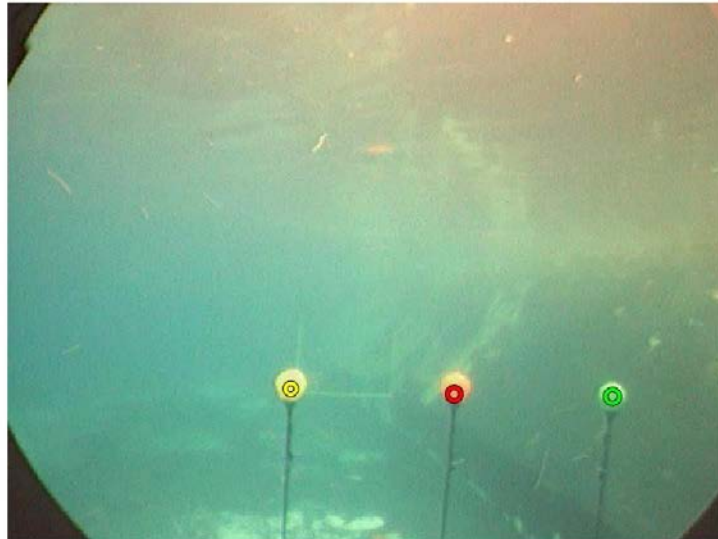


Fig. 1: Contoured Buoys

#### 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.