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EE 576 - Hw 3

The goal of this project is to make you work with finding segments in an image and deriving their representations. Pls consider the given image set. The images are organized into several folders. The folder name corresponds to the classname of the object within the green region. Write C/C++ code that will do the following:

(a) Write a function that segments the green region in the given images and then finds it outer and inner boundaries. You may write your own connected components algorithm or use an available algorithm (ie. OpenCV, external). If you use an external segmentation code, make sure you given the reference for it. Create a 2 $\times$2 image array and show the original window on the first (1,1) slot and the thresholded image showing the segment in the (1,2) slot.

(b) Now write a function that finds the inner and outer boundaries of the green segment. Display the resulting boundaries on the (2,1) window.

(c) Write a function that finds the object inside the green region. Considering the horizontally aligned object to have 0 degrees rotation, find the orientation of the object and undo the rotation. Display the resulting rotated object on the (2,2) window.

(d) Repeat (a)-(c) for all the images provided. Save the images in folders named LearningData/Classname. Referring to these images as learning images, obtain the BOW words. Pls consider three alternative number N of words. Following obtain BOW representation of the learning images. For each class, find the average BOW descriptor. For each N, construct an similarity matrix (13×13) matrix with each entry corresponding to the average dissimilarity ξ_{ij} between two classes defined as: $\xi_{ij} = \frac{1}{M_i M_j} \sum_{k=1}^{M_i} \sum_{l=1}^{M_j} \|d_k - d_l\|$ where M_i, M_j refer to the number of samples of class i and j and d_k and d_l refer to the descriptor associated with the BOW representation of k^{th} and l^{th} samples from each class respectively. For this part, pls use the OpenCV API.

Write a very short report (1-2) in latex that discusses your algorithms for each part, sample results for parts (a)-(c) and the three adjacency matrices for the three N values you have selected. Evaluate the performance of the BOW descriptors you have designed.