

Background Subtraction (100 points)

For this problem, you are given a set of 100 images of background, $I_1, I_2, \dots, I_{100}$, and one test image, J . These are in BackgroundImages.zip and foreground_image.bmp. The images are in color, but you should convert them to grayscale. Your task is to classify each pixel in the test image as either foreground or background. Suppose pixel $J(x,y)$ has intensity k . To classify it, you should compute:

$$P(J(x,y) = k) = \sum_{i=1}^{100} \frac{1}{100\sigma\sqrt{2\pi}} \exp\left(-\frac{(k - I_i(x,y))^2}{2\sigma^2}\right)$$

Once you've computed this for each pixel, you'll need to choose a threshold, T , so that you classify all pixels as foreground when $P(J(x,y)=k) < T$. Choose values of T and σ by hand that seem to produce pleasing results. Our results are in BackgroundSubtractionResults.jpg. Turn in your code, a picture of your result, and indicate which values you used.

Submit your homework (PDF) including all your outputs and MATLAB codes in one .rar/.zip/.tar.gz file to ``cmssc426.sp2016@gmail.com``. Please name your archive file as ``yourname-yourlastname-hw3``. All MATLAB codes should be well-documented and are included in your PDF file. Please also include the pencil and paper section in the PDF.

Grading Policy: There will be six assignments/projects in the class accounting for 60% of the grade. There will be a midterm and a final exam each accounting for 20% of the grade. Assignments handed in by the deadline will receive a 5% bonus.