Shreyasi Pal
ID 5483657

Homework 1

CSCI 5561
February 15, 2019

The task of calculating and visualizing the HOG for a particular image can be divided into the following subtasks:

1) Get filter for calculating gradient in x and y direction The filter chosen for gradient computation are:

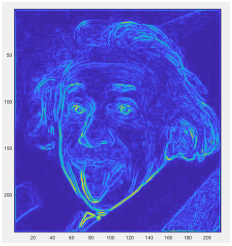
$$filter\_x = \begin{bmatrix} -1 & 0 & 1 \\ -1 & 0 & 1 \\ -1 & 0 & 1 \end{bmatrix} and\ filter\_y = \begin{bmatrix} -1 & -1 & -1 \\ 0 & 0 & 0 \\ 1 & 1 & 1 \end{bmatrix}$$

2) Using $filterImage()$, calculate the gradient of the image in x and y direction. The function $getGradient()$ computes the gradient magnitude and the corresponding angle.

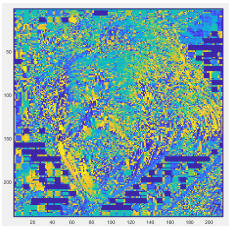
3) From the gradient, calculate the program according to the grad_angle. The histogram has been plotted in 6 bins as shown in class.

4) The histogram is further locally normalized to get the HOG descriptor by first concatenating HOG belonging to the cells in patch of size $block\_size \times block\_size$, and the normalizing the histogram according to equation (2) in hw1. The value of e is assumed to be 0.001.

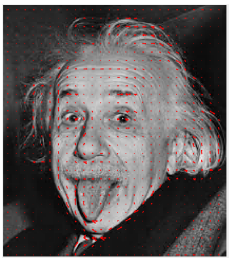
5) The visualization has been done using $quiver()$(for drawing the gradient directions and magnitude like vectors) and $meshgrid()$(for creating the vectors containing the midpoint of each cell where the gradients will be plotted). The vectors are then plotted on the original image and the angle of direction of the vectors becomes the mid angle of each bin angle. For bin 1, plot along 0°, for bin 1 along 30°and so on. The line directions are perpendicular to the gradient to show edge alignment.



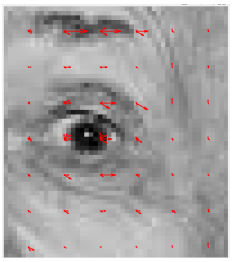
(a) Magnitude



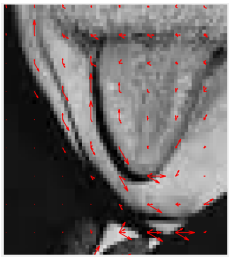
(b) Angle



(c) HOG



(d) Zoomed eye



(e) Zoomed neck