Exercise Sheet Computer Vision 8

Submission: 07.07 (20 Points)

Exercise 1 Gradient orientation (14 Points)

a) What is a histogram? How is it used for computer vision purposes? (3 Points)

b) Given the following matrix compute the average gradient direction and the gradient direction histograms of 2x2 patches. (Hint: gradients equal to zero should be approximated and be equal to 1, gradient direction \( \theta = \arctan(dy/dx) \))

\[
\begin{bmatrix}
0 & 0 & 0 & 0 \\
255 & 255 & 255 & 255 \\
255 & 255 & 255 & 255 \\
0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0
\end{bmatrix}
\]

(8 Points)

c) Why is it important to compute the gradient direction of a patch? (3 Points)

Exercise 2 Sift detection (6 Points)

a) Write and comment the pseudo code for the first two phases of SIFT features detection:

- Scale octave computation
- Local non-maxima suppression

(6 Points)