Computer Vision
EMARO- *European Master on Advanced Robotics*
Robotics Engineering *Master Degree*

Lab Session n. 5

The following items are the steps that you must do in this lab session:

<u>NCC-based segmentation</u>

- Select a window around the red car on the street (in the gray scale image "ur_c_s_03a_01_L_0376.png") and apply the NCC (normalized cross correlation, *normxcorr2*), in order to find the template in all the 6 images (consider the same images of Lab4). Show the template. Show the position of the maximum of the score map and a box corresponding to the size of the template for all the 6 images (as in Fig.1).
- Do the same for the dark car that turns on the left.
- Compare the results of this Lab (NCC-based segmentation) with the ones of Lab4 (color-based segmentation). *Note: This task is only for the report. Do not submit the code for color-based segmentation.*
- Consider three different sizes of the window (centered around the dark car that turns on the left): discuss the results in terms of computation time and accuracy of detection.

<u>Harris corner detection</u>

- Implement the Harris corner detector. Apply the developed corner detector on the "image i235.png". Show the partial derivatives of the image and the Gaussian filter. Show the R score map and the corner regions. Show the detected corners overlapped to the image (see Fig.2). Tips: to look at the *harris_corner.m* available on AulaWeb; threshold for the corner regions 0.3*M, where M is the maximum value of R map; to use *regionprops()* function to get the centroids of the blobs in the corner regions map.

Notes:
- **This Lab will be evaluated (continuous assessment) and will count for the final score of the exam.**
- You have to write a report that describes your work and the obtained results (please include the most relevant figures). In the report you must indicate all the surnames of the participants (not other names, e.g. the teachers).
- About the code (the code must be M-files):

- o You have to use relative paths.
  - o You have to write and use functions.
  - o You have to provide us a main script to test your code.
- All the files (M-files, images, and report) have to be compressed in a single file named "surnames_labxx.zip/tgz" (all the surnames of the participants have to be indicated), and then the compressed file has to be uploaded on AulaWeb.
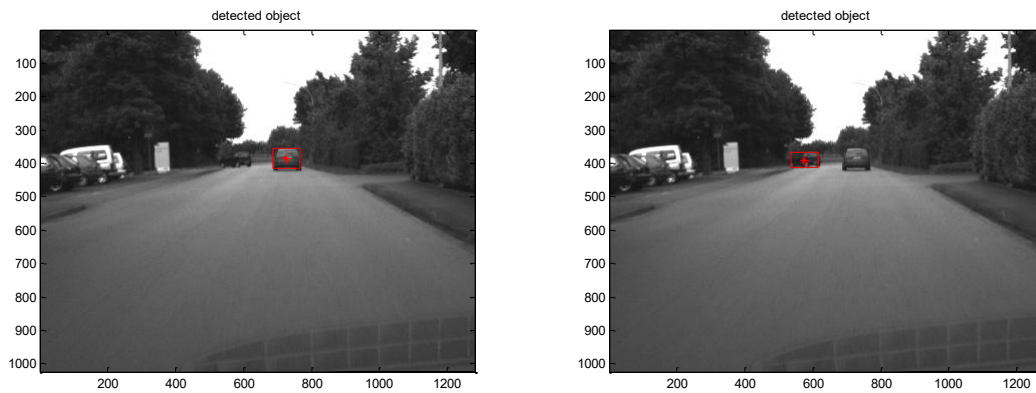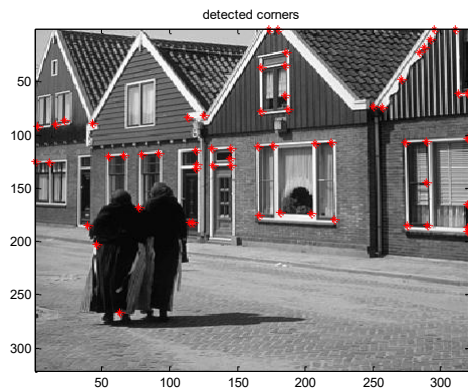- All group members must submit on Aulaweb individually.

Fig.1: Segmentation examples.

Fig.2: Corner detection example.