Image and Video Analysis (P. Zanuttigh)

Homework 5 (Delivery 19/5)

LABORATORY 5

Background subtraction

The target of this laboratory is the implementation of some simple motion detection algorithms. After loading the videos acquired in the laboratory (or the ones provided by the teacher) into the Matlab environment, implement three simple algorithms in order to detect moving objects.

In order to read the videos the sample "read_video.m" script can be used (other alternative solutions exist, see Matlab documentation). The videos to be processed are in the "video" folder. A function for real-time acquisition from a webcam is also provided.

Algorithm to be developed:

Write a simple Matlab (or Java/C++) function for the detection of the movement in the acquired videos.

1) Try to detect the pixels corresponding to moving objects using a simple thresholding of the intensity difference in two subsequent frames (*optional: use the color difference in a uniform color space or an average of the differences on R,G and B*).
2) Estimate the background, e.g., using the running mean, and compare the background and the current frame for the motion estimation. Comment on the behaviour of the algorithm when the learning rate α varies (*optional: use the mean or the median on a set of previous frames for background construction*).
3) Try to use the simple probabilistic approach based on the mixture of Gaussians model presented in the lectures. Comment on the dependency of the on the behaviour of the algorithm when the number of considered frames (R) and the Gaussian standard deviation (σ) vary *(optional: use some adaptive parameters taking ideas from Stauffer and Grimson approach*).
4) (*optional*) Develop a simple motion detection scheme in order to detect when there is movement in the scene (e.g., based on the number of foreground pixels or on the presence of connected set of moving pixels larger than a certain size).
5) *(optional)* Combine with LAB6 for tracking of moving objects.