Technische Hochschule Ostwestfalen-Lippe
Fachbereich Elektrotechnik und Technische Informatik
Prof. Dr. Helene Dörksen

Exercises and Labs 4 for Lecture "Authentication „ (M.Sc.)

Lab 4.1 Image Segmentation (Otsu's Method)

a) Familiarize yourself with the theoretical basics of the threshold procedure by Otsu (so-called Otsu's Method).

b) In the script *otsu_method_1.m* set the different values for the variable $SHIFT$, e.g. between -0.3 and $+0.3$ and observe the impact on image segmentation.

c) In the script *otsu_method_2.m* analyse the application of the image segmentation to the different CT (Computer Tomography) and US (Ultrasound) image regions.

Lab 4.2 Image Segmentation (K-means Clustering, Feature Extraction)

a) In the script *clusters_1.m* you will find an implementation of K-means Clustering for $K = 2$ and $K = 3$. Extend the implementation for $K = 4$ (without plot), such that for any element $x \in X$ the cluster membership is determined.

b) In the script *clusters_2.m* two CT image sections (PART1 and PART2) and a US image section (PART3) have been defined. Perform for these sections the 2− resp. 3−means clustering (in the feature space) for the following features (based on the 8-neighborhood):

PART1: $std(N_8)$, $median(N_8)$;
PART2: $\mu(N_8)$, $std(N_8)$, $median(N_8)$;
PART3: $std(N_8)$, $median(N_8)$.

Show the results of the clustering in the image space.

Lab 4.3 Texture analysis (for advanced self-study)

a) Familiarize yourself with the topic *gray-level co-occurrence matrix from image* (s. MATLAB function *graycomatrix.m*).

b) Write a program for the calculation of *Haralick Texture Features* of the co-occurrence matrix.

c) Given are two RGB images *Texture 1* and *Texture 2*. Apply the program from b) for the calculation of Haralick Texture Features for these examples.

d) Visualize the features in pairs or triplets and decide within which features the textures can be best classified.