Identification Systems

Exercises 7

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1. Load the image of the original and the noised copies of the exact same signature. Check which of the features you may easily extract with out denoising, propose preprocessing and feature extraction operations for the others:

   - aspect ratio of the signature
   - mean line width and the standard deviation of the line width
   - x and y coordinates of the center of mass of the signature
   - histogram of oriented gradients
   - local binary pattern
   - coefficients of the DCT of the signature

2. Make several signatures on various surfaces – plain monochromatic sheet, sheet of a similar color to the ink, checkered sheet (intersect the grid lines), coffee-or-tea-stained sheet, on a crumpled sheet of paper, try to extract signature samples from each of the surface.

3. Use skeletonization algorithm from Exercises 6 to thin out signatures from the database.

4. Implement simple HOG-based identification procedure. Verify the procedure on the dataset2 from the database.

5. Implement a multi-feature identification procedure that utilizes uniform segmentation and aspect ratio of the signature, length of a line in a segment, normalized gradient in a segment and center of mass of a skeletonized signature sample. Verify the procedure on the dataset3 from the database.

6. Transform the signature using selected RBF and use linear matching (skip the non-matching points in case of different length) to validate the genuine and forged samples against the enrolled signatures `00501005`, `00502005`, `00503005`

and 00601006, 00603006 00605006 from dataset2 of the database. How wide should be the accepting interval to accept all the genuine samples of the respective users, how many forgeries (random and skilled) fit in the interval?

7. Assume discrete time and transform the samples 00700007, 00703007, 00704007 from dataset1 of the database into the form of $x(t)$ and $y(t)$ by following the line according to N_8 (start in bottom left corner). Using DTW match the genuine samples of the set.

8. Use the database to train the recognition system based on neural network. Compare the FAR and FRR, and time requirements of the identification algorithms form the list with the neural network-based.