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Exercises for Multimedia Databases

Sheet 1 (until 12.11.2009)

Please note that you need **50%** of all exercise points to be admitted for the final exams. Exercises have to be turned in until **Thursday** before the next lecture and should be completed in teams of two students each. Write both names and "Matrikelnummer" on each page. If you have multiple pages, staple them together! Please hand in your solutions on **paper** into the mailbox at the IFIS floor or to our secretary (Mühlenpfordtstraße 23, 2nd floor). You may answer in either German or English.

Exception: Taking into consideration that you need more time to get and install Matlab, as well as make yourself familiar with the language, the deadline for this exercise is not before the next lecture (05.11.2009), but on 12.11.2009, before lecture number 4, together with the solution for the next homework.

Exercise 1: (20P)

In the lecture, you have learned about different distance measures for histograms. The purpose of this exercise is to apply them practically on a collection of sample images. At the following URL: "http://r0k.us/graphics/kodak/", you will find a collection of Kodak Lossless True Color 24 photographs. Please consider only the first 10 for this exercise.

Please write a program that performs the following steps:

a) Create a representation of the photos in the HSV color model. Quantize the images in HSV coordinates as presented in the lecture-slide 53 (using 18 segments for hue, 3 for saturation and 3 for value). Leave out the additional 4 gray segments, so that you obtain a 162 segment for each image (a 162 column histogram per image). Provide as result, on paper, the graphical representation of the resulting histograms for images 2 and 9. (15 P)

b) Calculate the distance between histograms with the following measures: L_1-norm and L_2-norm. Which images are most similar to picture 9 with respect to the 2 measures? (5 P)

Note: I strongly recommend using Matlab for resolving not only this, but also the exercises to follow. It is freely available for our students through the Rechenzentrum licensing system (http://www.tu-braunschweig.de/it/services/software/liste#M). If you have any questions please send me an e-mail.

Hints: Helpful Matlab functions for this task are: **imread, rgb2hsv, gray2ind, imhist**.

Idea: After you have read the images and transformed them into HSV color space, extract each component from the HSV matrix (H, S, and V, respectively) and perform the quantization using the grey2ind function. After you have obtained quantized components, you need to assemble them into a histogram containing 18*3*3 columns per image!