Computer Vision II

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Assignment 1: Submission date (Moodle): November 10th, 2022, 12:00.

1 Motion representation in image sequences (4 points)

In this task the structure of spatio-temporal changes is illustrated. Two series of images in PNG format are used as input (one shows a moving Zebra [1], the other is a time-lapse of a skyline [2,3]).

1. Write a Julia function `readseq` which reads in a sequence of images of uniform size and saves them as a 3D matrix I: `I(x,y,t)` denotes the pixel in image t at location (x,y). We call this matrix the image sequence. The names of the PNG files have to comply with the scheme `name_%03i.png`, where `i` is replaced by the number of that image in the sequence.

   ```
   # EXAMPLE
   # Read in 63 images of size 160x120
   B = readseq('zebra_%03i.png', 0, 62)
   size(B) # result: (160, 120, 63)
   ```

2. Plot horizontal x-t sections through both image sequences for 14 different vertical positions (with distance h/14).
3. Describe the patterns you observe in the x-t image sections and explain how these patterns arise (written text, about half a page for both sequences in total).

Hint: you can use the function `format` from the `Printf` to parse the format string.

2 Reichardt half- and full detector (6 points)

Implement a Reichardt detector which detects a translatory motion of $\Delta = 5$ pixels (rightward motion) in an image pair. As input, use the images `line01.png` and `line02.png`, which show two subsequent time steps.

1. Implement a simple half-detector which compares the brightness of pixel x in image 1 to the brightness of pixel x+5 in image 2.
2. Apply this half-detector at every pixel `x=[1:100]` of the image pair and plot its response as a function of x.

3. Extend your half-detector to a full detector, which examines motion to the left and to the right. The full detector should respond positively for a motion to the right.
4. Apply this detector to the image pair and explain its response properties (written text, not more than half a page).

References

[1] http://www.junglewalk.com

[2] WILD (Weather and Illumination Database). Computer Science, Columbia University

[3] Srinivasa G. Narasimhan, Chi Wang and Shree K. Nayar.*All the Images of an Outdoor Scene. Proc. of European Conference on Computer Vision (ECCV 02), Copenhagen, May2002*

Submission procedure

- Please work in groups of 2 students. Submission exclusively in Moodle (it is sufficient if one group member submits the solution in Moodle).
- Please name all Matlab main script files with the current assignment and exercise number, e.g. `sh01ex02.m` for the second assignment of the first assignment sheet.
- Please present your results in a pdf-document with
  - the names of all group members
  - and a brief description of your results and images.
- Please submit all files as a zip-document.

Have fun!