CS-E4850 Computer Vision
Exercise Round 8

The following instructions are for the Matlab version. The instructions for the Python version are in Github. Matlab is available on Aalto computers and also for students' own computers via `https://download.aalto.fi`.

The problems should be solved before the exercise session and solutions returned via the MyCourses page. Upload one PDF file containing your written answers to all tasks.

Exercise 1. Face tracking example using KLT tracker. (Matlab exercise)

This exercise is based on the built-in Matlab face tracking example[1]. You get the example data by downloading `Exercise08.zip` from the MyCourses page.

Note: Apparently there is a bug in the newest Aalto Matlab version and the built-in example may not work correctly. Hence, you need to use an older Matlab version in Aalto Linux environment (e.g. in Paniikki classroom where this has been tested) by typing the following commands in the terminal window:

```
module load matlab/2016b
matlab &
```

Run the example as instructed below and answer the questions.

(a) Run the built-in Matlab example script `FaceTrackingUsingKLTExample`.

(b) Run the modified version `FaceTrackingUsingKLTExampleB` from `Exercise08.zip`. The modified version executes the same algorithm as step *(a)* but this time for a smartphone video (`obama.avi`). (There is also an mp4 version `obama.mp4` which is supported by some operating systems, but the avi format should work in Matlab in the Aalto Linux environment.)

(c) What could be the main reasons why most of the features are not tracked very long in case *b)* above?

(d) How one could try to avoid the problem that the features are gradually lost? Suggest a one or more improvements.

(e) Voluntary task: Capture a video of your own face or of a picture of a face, and check that whether the tracking works for you. That is, replace `obama.avi` with your own video.

[1] `https://se.mathworks.com/help/vision/examples/face-detection-and-tracking-using-the-klt-algorithm.html`

Exercise 2. Kanade-Lucas-Tomasi (KLT) feature tracking (Pen & paper problem)

Read Sections 2.1 and 2.2 on pages 2 and 3 from the paper `BakerMatthews.pdf`, which is given in `Exercise08.zip`. Show that the Equation (10) in the paper gives the same solution as the equations on slide 25 of Lecture 7, when the geometric warping $\mathbf{W}$ (between the current frame and the template window in the previous frame) is a translation.