CS 763 Assignment 5

Due Date: 2 April, 23:00

March 23, 2018

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1. **Kanade Lucas Tomasi (KLT) Feature Tracker**
   As a part of this assignment you will implement KLT tracker. Please follow the following instructions:

   (a) Read the frames from **input** folder.

   (b) Display major features points overlay-ed on the first frame, for feature point detection you can use Harris corner detector or SURF; both are inbuilt in MATLAB.

   (c) Select those feature points with good structure tensors (recall the class). There can be multiple points qualifying the criterion so there should be a parameter to choose how many feature points are to be tracked.

   (d) For every feature point you will take a template patch centered around that point. Patch size should be a parameter but, ideally, you should start around 40 pixels.

   (e) Your motion model for creating the Jacobian matrix should be affine, this motion model will also result in six parameters to be tuned.

   (f) Now for every frame:-

      i. Warp and crop part of frame based upon the updated parameters of affine matrix.

      ii. Calculate the error by subtracting the above patch from template patch.

      iii. Compute gradients (tip: try smoothing the gradients)

      iv. Compute the Jacobian, Gradient and Hessian and update the parameters of motion model.

   Note: The solution is iterative, so use a threshold and max iteration parameters for convergence check. Actual trajectory of the motion will be obtained by storing the relevant parameters of motion model from each frame. Also, after every 10 to 20 frames you should extract a new template, since the patch may have changed a lot. Finally your script should dump the overlay-ed trajectory on image in **output** folder frame by frame. Also you can use inbuilt functions for image warping and feature detector. [**100 points**]