

MACHINE VISION.

Lab07: Stitching Image Panoramas

BACKGROUND.

In Lecture 7 we looked at estimating homographies between images that have been taken by a rotating camera. In this lab you will write a program to process a video sequence, track the features, and create an image panorama for selected frames. You will need to adapt and extend the KLT feature tracking of Lab06 to process the video **courtyard.mp4** available on Canvas.



Task 1.

Adapt your KLT tracking implementation from the previous Lab06 to track features across the whole image sequence of the file **courtyard.mp4**. Make sure that there is sufficient feature overlap between the first and the middle as well as the last and the middle frame of the sequence.

Task 2.

Use the extracted feature tracks to estimate the homographies between the first and the middle as well as between the last and the middle frame using the Direct Linear Transformation (DLT) algorithm. Be careful to use consistent image coordinate systems (`cv2.goodFeaturesToTrack()` and `cv2.calcOpticalFlowPyrLK()` use x,y image coordinates, while the underlying numpy arrays use row,col coordinate systems; the easiest is to swap x,y coordinates at this point and work with row,col from here on).

Task 3.

Use the homographies calculated in task 2 to determine the coordinates of the corners of the first and the last frame when transformed into the coordinate system of the middle image. Create a target image that is sufficiently large to contain all three images transformed into the coordinate system of the middle image.

Task 4.

Extract the first, middle, and last image from the image sequence. For each pixel of the target image created in task 3 determine the coordinates in the first, middle, and last frame of the sequence using the homographies calculated in task 2. If any of these coordinates falls within the respective image, copy the colour value into the target image. Use nearest neighbour interpolation for simplicity. Save the resulting target image.