

HW #6

0. **Project Proposal:** Please remember to submit project proposal by October 13.

1. Image Stitching (60%)

- Take a series of overlapping photos of a map or magazine as if you are taking multiple scans of a document but make sure there is enough overlap of the scans to ensure enough common features.
- Use the feature detector and descriptor to match features among the images.
- Compute a global translation for each image by minimizing the least square error $E_{PLS} = \sum_{ij} \| (t_j + x_{ij}) - x_i \|^2$. Here t_j is the location of the j th image coordinate frame in the global composite frame, and x_{ij} is the location of the i th matched feature in the j th image.
- Compute the size of the resulting composite canvas and resample each image into its final position on the canvas.

2. **Homography (40%)** maps images of points that lie on a world plane from one camera view to another. A projective transform matrix is represented by a 3x3 matrix with 8 degrees of freedom

$$\begin{bmatrix} x^C \\ y^C \\ 1 \end{bmatrix} = \begin{bmatrix} 1 + h_{00} & h_{01} & h_{02} \\ h_{10} & 1 + h_{11} & h_{12} \\ h_{20} & h_{21} & 1 \end{bmatrix} \begin{bmatrix} x^R \\ y^R \\ 1 \end{bmatrix}$$

- We need to establish the correspondences between at least 4 non-aligned points on Reference and Camera image, please pick corresponding coplanar points on two images - [image1](#) and [image2](#), and write down the coordinates.
- please calculate, $h = \begin{bmatrix} h_{00} \\ \vdots \\ h_{21} \end{bmatrix}$