Computer Vision AI – Assignment 3

May 16, 2014

Students will work on this assignment for the next two practical courses..

1 Structure from Motion

Use the feature points found by your implementation of Assignment2 as input for the affine structure from motion procedure described in your lecture notes (Week #4). Remember to enable a sufficient number of points that persist throughout the sequence to perform the factorization on a dense matrix. There is no need to fill in missing data for this problem. Use the following scheme:

1. Normalize the point coordinates by translating them to the mean of the points in each view (see lecture for details).

2. Apply SVD to the $2M \times N$ data matrix to express it as $D = U * W * V'$ where U is a $2M \times 3$ matrix, W is a 3×3 matrix of the top three singular values, and V is a $N \times 3$ matrix. Derive structure and motion matrices from the SVD as explained in the lecture.

3. Use `plot3` to display the 3D structure (in your report, include snapshots from several viewpoints to show the structure clearly). Discuss whether or not the reconstruction has an ambiguity.

2 Building 3D Model

Using the 3D point clouds given, build a printable 3D model.

1. Build a mesh using triangulation from these point clouds.

2. Repair the mesh by filling the holes (e.g. watertight).

3. View 3D model.