Autonomous Robotics - Practical Session #1
«Projective Reconstruction»

1. Simulate a simple 3D scene and stereovision system, assuming that all the parameters are known (intrinsic and extrinsic parameters). Compute the resulting images (projections of the scene onto the two camera planes).

2. Compute the fundamental matrix from the known parameters and the following equations : http://en.wikipedia.org/wiki/Fundamental_matrix_(computer_vision).

3. Estimate the fundamental matrix from the two images (you can use Salvi's toolbox).

4. Compute the 3D scene from the canonical representation. Comments.

5. Compute the residual error (2D error). Comments.

6. Refine the 3D estimation through a Levenberg-Marquardt algorithm. Compute the 3D scene and residual error. Comments.

7. Compare the estimated 3D scene with the initial one (fixed in question 1). Comments.

Autonomous Robotics - Practical Session #2
«Calibrated SfM»

1. Start from the very same simulation done in #1. Consider that your system is calibrated. Compute the Essential Matrix E, knowing R and T (ground-truth of your simulation).

2. Based on this paper, extract R and T from E.

3. Use the so-called cheirality constraint to choose between the four putative solutions.

4. Compute and display the 3D reconstruction of a scene. Compare with the ground-truth. Comments.

5. Estimate the essential matrix from a set of 2D correspondences. Same questions as above (3 and 4).

PROVIDE A COMMENTED REPORT WITH RESULTS, DISCUSSION, INTERPRETATION