Frequent asked questions (FAQ) on stereo, ver.0.a

Question1 from a student: After calculate the matrix E from the fundamental matrix F, we can generate the R and T for the camera 2 (right camera), I wonder is there any relationship between this R, T and the rotation matrix Rc and the translation matrix Tc in chapter 2, is this R,T which generate from matrix E equal to the R, T below?

Answer for question1:  yes, slide15 of ch8 is actually showing the relation.

Rc and Tc are those used in ch2. So here, R=Rc, T= -R\*Tc (Be careful this T is the transition between the two cameras, not the object motion)

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Question2 from a student: So, the T and R generate matrix E is equal to the R, T here?  Why not just calculate the R, T using the chapter 2’s method, but using matrix E to calculate T and R?

Answer for Question 2:

Ok, Ch2 and Ch8 have different problems.

In ch2, near the end of the chapter, there is a method of camera calibration that you need a calibration object (3D cube with checker boards on the surface) of known dimension.

Then you can object the Rotation, Translation of how the camera is relative to the object center (assume the global reference center is at one of the corners of the camera calibration object cube) as well as the camera intrinsic parameters such as focal length and camera center. It is a specific method to find the camera parameters (focal length etc.) and, R, T is a by product

In ch8 (stereo), your two cameras are looking at any object (no need to be a cube with checker boards), you only need to have the correspondences of the points, say a set of corresponding corner feature points of a building as in slide 35 of ch8. Then you can find F (fundamental matrix) then E (essential matrix), with Kint1(left camera intrinsic parameters) and Kint2(right) you can recover R,T (usually we assume the global reference is at the world center or the camera center of the left camera). By using R,T you can reconstruct (the method of triangulation, see slide55 ch8) the positions of the features in 3D.

What is it used for? If you have a robot with a pair of cameras in a stereo setup, you can use it to find the structure of any object in-front of the robot. And use the information to plan how much your robot can move (because by triangulation --slide 55 ch8, you can find the 3D object position relative to the left camera) before hitting the object. It is called robot navigation. For example, you may use it in automatic driving systems.