

COMP70058 Computer Vision

Tutorial 5 - Computational Stereo

Sample Answers

1. Since the cameras are in correspondence, the y coordinate of the position of each line is the same. Choose an arbitrary origin such that $c_y = 0$. The epipolar line is the line of intersection of the image plane of the other camera, and the line through the camera positions and the projected point. For each of the points given, that is the horizontal plane through the centre of the cameras. The epipolar line, in both cases will therefore lie on the x axis of the other camera's image plane. For the case where the points are taken from the left hand camera image, the corresponding epipolar lines in the right hand camera will extend from the left hand edge of the image to the points $[-4,0]$ and $[5,0]$ respectively.

2. A plane in 3D coordinate space is determined by a point and a vector that is perpendicular to the plane. The plane where the epipolar line lies is formed by vectors $(P_i - C_R)$ and $(C_R - C_L)$. The normal vector to this plane is defined as $n = (P_i - C_R) \times (C_R - C_L) = [0, 10Z_i, -10Y_i]$. So for a point $P = [X, Y, Z]$ which lies on the above plane, the plane equation is defined as: $(P_i - P) \cdot (P_i - C_R) \times (C_R - C_L) = 0$.

$$Y_i - Y) Z_i = (Z_i - Z) Y_i$$

$$Y_i Z_i - Y Z_i = Y_i Z_i - Z Y_i$$

$$Y Z_i = Z Y_i$$

$$Y = Z (Y_i / Z_i)$$

3. The epipolar line intersects the plane $Z=7$, so it is $Y=7Y_i / Z_i$.

