

Exercise 2 Transformation from object- to pixel coordinates Using projection matrix P

Projecting points on image. We need pre-knowledge of interior orientation of the camera, and the exterior ones. In the file '.ori' it's given all these information. The camera matrix ' K ' describes the interior orientation of the used camera. The exterior orientation of the camera describes the relation between the World coordinates space and the camera system. The translation vector ' \tilde{X}_0 ' is given a coordinates in the world coordinates space, we have to transform it to the image space by multiplying it with $-R$. Thus, the projection matrix is given by the following equ.

$$P = K[R|t]; [R|t] = [R \quad -R.\tilde{X}_0]$$

Now the transformation equ.

$$x = P.X$$

The file '*Signalized_Points_R0020851*' provides the points coordinates. However, if we want to use this coordinates in the transformation equation, the coordinates should be homogeneous coordinates. We added one to each point and transports the matrix. Hence each column represent a coordinate for one point. The outcome of the multiplication of the projection matrix and the points in the object space should be normalized w.r.t the last row. In order to have the homogeneous coordinates in the image space.



Fig.1: Projecting Points on the Image