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Image Based Data Collection
Exercise 3 Spatial Resection and DLT

We have the coordinates in the object space and in the image space. We need to compute the P projection matrix. We have to use the homogeneous coordinates. We have the transformation equ. That relates these coordinates with the projection matrix.

$$x = P.X$$

Representing the equation by the cross products between the object and the image coordinates vectors. Now we can write the equ. In this formulation and compute it with the SVD.

$$A.P = 0$$

The projection matrix is (3x4), the last column is the translation vector($\tilde{X}_0$). The camera exterior and interior orientation is hidden in the lifted part of the matrix. We extract them by the Matlab command 'qr'.

3497,487	2083,002	1869,392	-1,3E+10
2323,735	-3332,1	997,5443	1,69E+10
0,113063	-0,0513	0,992262	219946,3

P matrix

1,64E-07	9,74E-08	8,74E-08	-0,61283
-1,09E-07	1,56E-07	-4,67E-08	-0,79021
-5,29E-12	2,40E-12	-4,64E-11	-1,03E-05

P matrix_ computed

-0,82757	-0,55753	0,065471
0,549858	-0,82857	-0,10549
0,113063	-0,0513	0,992262

Rotation matrix

-0,82757	-0,55753	0,065471
0,549858	-0,82857	-0,10549
0,113062	-0,0513	0,992263

Rotation matrix_ computed

-3933,36	0	2143,5
0	3933,364	1423,5
0	0	1

K matrix

3933,356	4,03E-05	-2143,5
0	3933,357	1423,497
0	0	1

K matrix computed

The computed projection matrix is the same but with a scaling factor. But I have to refer her to a strange minus sign. The rotation matrices are the same. The computed K matrix is the same but also with a different sign on the first row (don't know how to explain this!). Also we can see the sheer value but it is really small so it can be neglected.

The difference between the image coordinates and the computed one:

diff_x	-0,03008	0,074431	0,086931	-0,04522	-0,06008	0,020625	0,026088
diff_y	0,047423	0,044042	0,168095	0,027604	0,104168	0,15137	0,150653

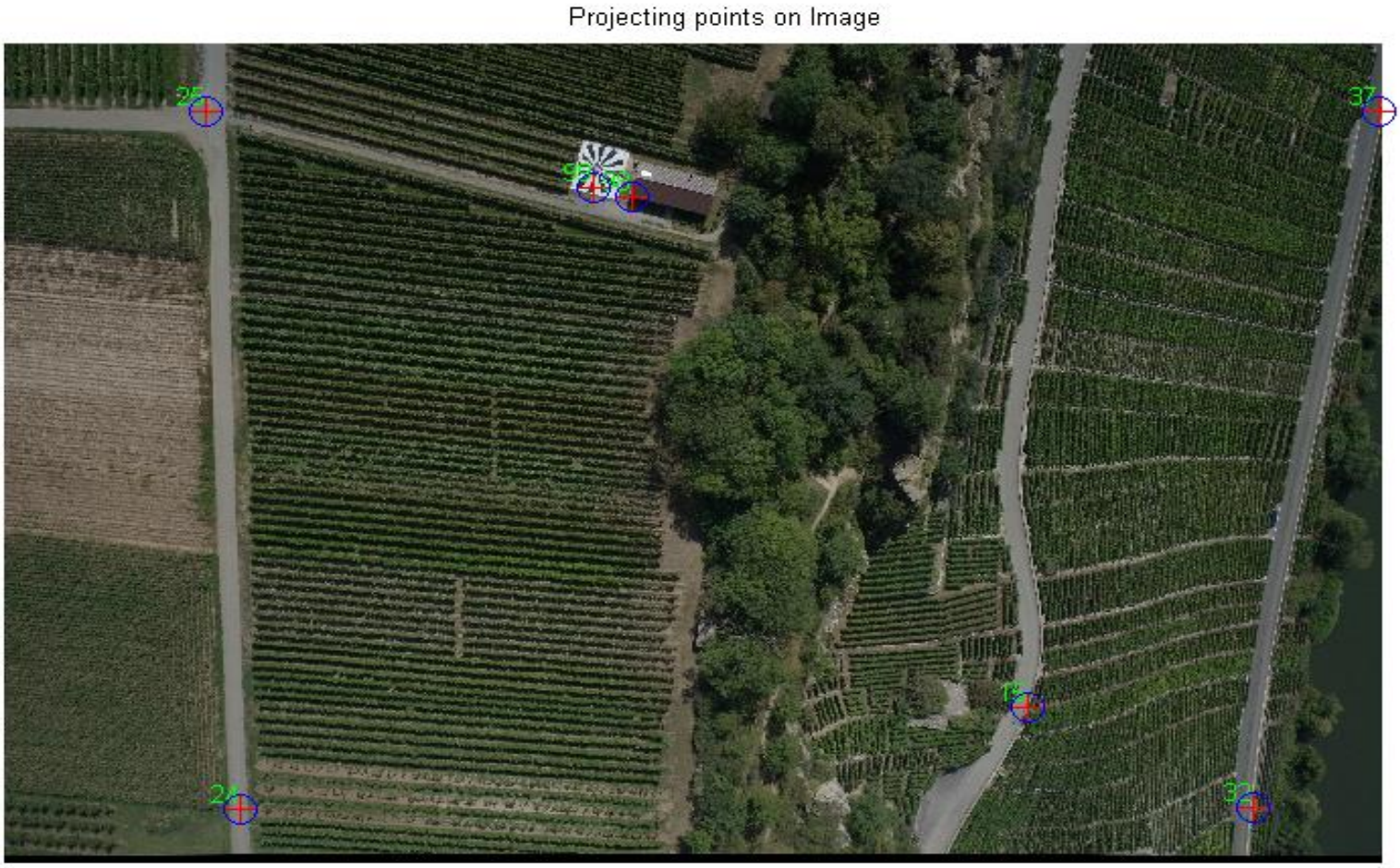

Fig.1- The image coordinates and the computed image coordinates.