Image Based Visual Servoing Practice

by Cansen Jiang and Omar Tahri
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Please follow this question sheet to understand the IBVS.

1. Loop of IBVS:
Run visual servoing in a loop, and observe the changing of the features, plot the control law (*vx, vy, vz, wx, wy, wz*), and their their errors. What do you observe?

2. Understanding Interaction Matrix:
Compute the interaction matrix using the image features of current camera pose during the looping, compare the interaction matrix in different iterations. Repeat the same steps using the feature points of the desired camera pose, what can you remark? Explain your remarks.
The interaction matrix is like a 'tangent' of the function, which gives the direction of the camera motion.

3. Simulation of various situation:
Change the pose of the camera, observe and analyze the visual servoing results.

3.1 Loosing Features
Change the pose of the camera with fewer features captured, e.g. 3 features, 2 features, what can you conclude?

```
3 features u_AR = [ 1; 0; 0.3]; theta_AR = -125*deg2rad;
2 features u_AR = [ 1; 0; 0]; theta_AR = -130*deg2rad;
```

3.2 Coplanar Problem
Setting the initial pose of camera as follows, and analyze the result.

```
u_AR = [ 0.0000, 0.7071, 0.7071]; theta_AR = pi;   t_AR = [ 0.3; 0.2; 0.8 ];
u_BR = [ 1.0000, 0.0000, 0.0000]; theta_BR = pi/2; t_BR = [ 0.3; 0.0; 0.8 ];
u_CR = [ 1; 0; 0]; theta_CR = 90*deg2rad; t_CR = [ 0.2; 0.9; 0.7 ];
```

3.3 Local Minimum
Change the original pose of the camera, and observe the performance.
u_AR = [-0.8348, -0.3893, 0.3893]; theta_AR = 1.7504; `t_AR = [ 1.0; -.10; 1.0];`
u_AR = [-0.8348, 0.3893, -0.3893]; theta_AR = 1.7504; `t_BR = [ -0.5; 0.1; 1.0];`

```
t_CR = [ 0.2; 0.9; 0.9 ];
```

3.4 Divergence
Change the position of the camera as follows:

```
u_AR = [-0.9351, -0.2506, 0.2506]; theta_AR = 1.6378; t_AR = [ 1.0; -.10; 1.0];
u_BR = [-0.8348, 0.3893, -0.3893]; theta_BR =  1.7504; t_BR = [ -0.5; 0.1; 1.0];
u_CR = [ 1; 0; 0]; theta_CR = 90*deg2rad; t_CR = [ 0.2; 0.9; 0.7 ];
```

4. Please submit a report answering all the above questions with specific analysis **before Jan.4th 2015** via **Edmodo**.