Computer Vision
and Geometry Lab

Computer Vision

Exercise Session 4 (Discussions)

Fundamental matrix

- Epipole is the projection of other's camera center ! => you are able to tell if it should be in the image or not.

- More constraints on Fh means epipolar lines cannot go through clicked points.

Essential matrix

- Also need to normalize and denormalize for SVD

- More constraints on Eh means epipolar lines cannot go through clicked points...

  ... but this is a better physical explanation of the scene !

- Comparison of F/Fh/E/Eh is meaningless if not normalized

Decomposition of E

$$E = [t]_{\times}R = R[R^T t]_{\times} = USV'$$

- Choose one of the following:
  - t1=U(:,end)=t and $P = [R|t1] = [R|t]$
  - t2=V(:,end)=$R^T t$ and $P = R[I|t2] = [R|RR^T t] = [R|t]$

But no mix !!

$R[I|t1] = [R|Rt]$ is wrong

$[R|t2] = [R|Rt]$ is wrong

Decomposition of E

- RHS coordinate:
  - We want our 2nd Camera to have RHS.
  - If det(R)<O (=det(UV)) this is not the case.
  - Take –R then.

This is the same as taking svd(-E)
[E is up to scale anyway]

Decomposition of E

- The good P:
  - Check for which P the 3D points are in front.
    i.e. X(3)>0 and [PX](3)>0

That is it !!!

Notice that PX is the coordinate of X in camera P

Note that triangulateLinear take normalized 2D points as arguments