Image-based Visual Servoing

Solving for Twist Given Pixel Velocities

k - number of features tracking
m - dimension of camera velocity vector
$L \in \mathbb{R}^{2k \times m}$

$2k < m$ - system is underconstrained

$$\xi = L^{+}\dot{s} + (I_m - L^{+}L)b$$

where L^{+} is the pseudoinverse for L and is defined as:

$$L^{+} = L^{T}(LL^{T})^{-1}$$

Solving for Twist Given Pixel Velocities

k - number of features tracking
m - dimension of camera velocity vector
$L \in \mathbb{R}^{2k \times m}$

$2k = m$ - system has unique solution

$$\xi = L^{-1}\dot{s}$$

$2k > m$ - system is overconstrained

$$\xi = L^{+}\dot{s}$$

where L^{+} is the pseudoinverse for L and is defined as:

$$L^{+} = (L^{T}L)^{-1}L^{T}$$

But how do we pick $\dot{s}$?

$$\xi = L^{+}\dot{s}$$

let our error in pixel space be defined as (order is backwards from book)

$$e(t) = s_d - s(t)$$

if we want the error to decrease in a way similar to what we've done before, we can pretend that we are using a spring force (or proportional controller) on error

$$\xi = L^{+}\lambda e(t)$$