

Adjustment

- Low speed operation
 - Inverse speed can cause numerical instability
 - Add softening constant to controller

$$\delta(t) = \psi(t) + \tan^{-1} \left(\frac{ke(t)}{\underbrace{k_s}_{\text{softening}} + v_f(t)} \right)$$

- Extra damping on heading
 - Becomes an issue at higher speeds in real vehicle
- Steer into constant radius curves
 - Improves tracking on curves by adding a feedforward term on heading