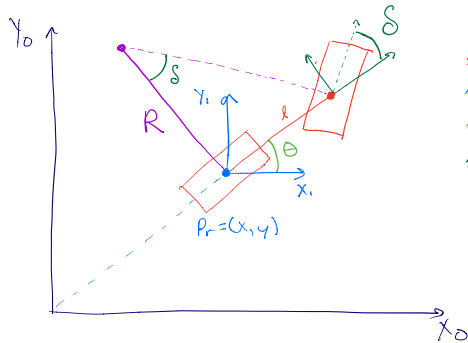


# Dubin's Car



vehicle length:  $l$   
 position:  $p_r = (x, y)$   
 orientation/heading:  $\theta$   
 steering:  $\delta$   
 turning radius:  $R$   
 speed:  $v$

$\left. \begin{array}{l} \text{position: } p_r = (x, y) \\ \text{orientation/heading: } \theta \end{array} \right\} \text{pose: } [x, y, \theta]^T$

Dynamics:

$$\begin{aligned} \dot{x} &= v \cos \theta \\ \dot{y} &= v \sin \theta \end{aligned} \quad \left. \begin{array}{l} \text{from physical intuition} \\ \text{of motion} \end{array} \right\}$$

$\star \quad \dot{\theta} = \frac{v}{l} \tan \delta \rightarrow \text{how to get this?}$

① note that:  $dp_r = R d\theta$   
 and that:  $v = \frac{dp_r}{dt}$

$$\left. \begin{array}{l} dp_r = R d\theta \\ v = \frac{dp_r}{dt} \end{array} \right\} \rightarrow \frac{dp_r}{dt} = \frac{R d\theta}{dt} = R \dot{\theta} = v$$

↓ how to compute?  
 ← assumed given!

② recall some trig:  $\tan \delta = \frac{l}{R} \rightarrow R = \frac{l}{\tan \delta}$

rearranging ① and ② gives  $\star$ !