

# Differential Drive

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## Inverse kinematics

From the image we can infer that:

$$V = \frac{V_R + V_L}{2}$$

$$V_R = \omega \left( R + \frac{L}{2} \right)$$

$$V_L = \omega \left( R - \frac{L}{2} \right)$$

If we try to calculate the  $\omega$  we have:

$$\frac{V_R}{R + \frac{L}{2}} = \frac{V_L}{R - \frac{L}{2}}$$

$$(V_R - V_L)R = VL$$

$$\frac{V_R - V_L}{L} = \omega$$

Calculate velocity for each wheel:

$$V_R = \omega L + V_L$$

$$V_R = \omega L + 2V - V_R$$

$$V_R = V + \frac{\omega L}{2}$$

$$V_L = V - \frac{\omega L}{2}$$

$$\omega_R | \omega_L = \frac{V \pm \frac{\omega L}{2}}{r}$$

Also we can calculate the angle :

$$\theta = \frac{D}{R}$$

