1 Kinematics for omniwheel

Kinematics of four wheel omni wheel robot

$$
\begin{bmatrix} \omega_1 \\ \omega_2 \\ \omega_3 \\ \omega_3 \end{bmatrix} = \frac{1}{R} \begin{bmatrix} \sin(\alpha_1) & \cos(\alpha_1) & L_1 \\ \sin(\alpha_2) & \cos(\alpha_2) & L_2 \\ \sin(\alpha_3) & \cos(\alpha_2) & L_3 \\ \sin(\alpha_4) & \cos(\alpha_2) & L_4 \end{bmatrix} \begin{bmatrix} V_x \\ V_y \\ \theta \end{bmatrix} \tag{1}
$$

1.1 Bot dimension

- R (wheel radius) = 29mm

- $\alpha_1 = 0$

- $\alpha_2 = \frac{\pi}{2}$

- $\alpha_3 = \pi$

- $\alpha_2 = \frac{3\pi}{4}$

On equating **??** we get

$$
\begin{bmatrix} \omega_1 \\ \omega_2 \\ \omega_3 \\ \omega_3 \end{bmatrix} = 1/R \begin{bmatrix} V_y + L\theta \\ -V_x + L\theta \\ -V_y + L\theta \\ V_x + L\theta \end{bmatrix} \tag{2}
$$

2 PID tuning

- Increase the proportional constant by factor of 10 until you get closer oscilation to the set state

- Increase the derivative constant by factor of 10 until the oscilation dampens

- increase p and d slowly and proportionaly until the procces state gets closer to set value

- Increase i slowly to get required state