pileec2223_move_robot_gotoxy

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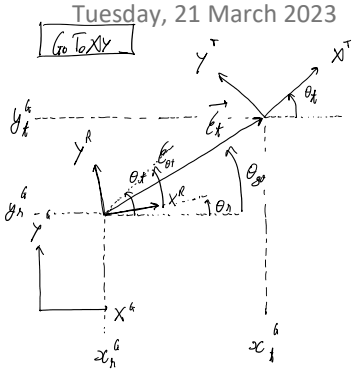

$\{X^T, Y^T\}$ → coordinate frame of the robot/user for the GoToXY controller
$\{X^G, Y^G\}$ → global coordinate frame
$\{X^R, Y^R\}$ → robot local coordinate frame

$X^G_{robot} = \begin{bmatrix} x_R^G \\ y_R^G \end{bmatrix}$ (position of the robot relative to the global coordinate frame)

$X^G_{target} = \begin{bmatrix} x_t^G \\ y_t^G \end{bmatrix}$ (target/goal position relative to the global coordinate frame)

$\Downarrow$

$\vec{\varepsilon}_t = X^G_{target} - X^G_{robot} = \begin{bmatrix} x_t^G - x_R^G \\ y_t^G - y_R^G \end{bmatrix}$ → We want the velocity vector pointing along this direction

$\theta_{go} = \text{atan2}\left(\varepsilon_{t,y}, \varepsilon_{t,x}\right) = \text{atan2}\left(y_t^G - y_R^G,\ x_t^G - x_R^G\right)$ ↓

$\|\vec{v}\| = v_{max}$

However, this definition, $\vec{v}^G$, is relative to the global coordinate frame ⟵ $\vec{v}^G = \|\vec{v}\| \cdot \hat{v} = v_{max} \cdot \begin{bmatrix} \cos(\theta_{go}) \\ \text{sen}(\theta_{go}) \end{bmatrix}$

(we want to know the v, v_n components in the robot coordinate frame)

$\Downarrow$

$\vec{v}^R = \begin{bmatrix} v \\ v_n \end{bmatrix} = v_{max} \begin{bmatrix} \cos(\theta_{go} - \theta_R) \\ \text{sen}(\theta_{go} - \theta_R) \end{bmatrix}$

What about the orientation?

- omnidirectional robot decouples $\vec{v}$ from ω
- We can control independently $\vec{v}$, ω !

θ_t = desired/target orientation

$\varepsilon_{\theta t} = \theta_t - \theta_R$ ⟶ $\omega = f\left(\varepsilon_{\theta t},\ \dot{\varepsilon}_{\theta t}\right)$

reference; measured/estimated orientation of the robot