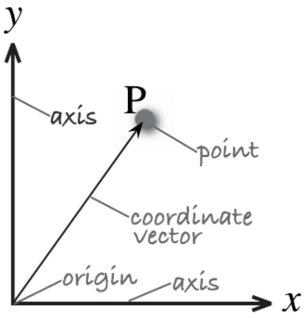
Cinemática - Representación de posición y orientación

Kjartan Halvorsen

February 15, 2022

Definiciones



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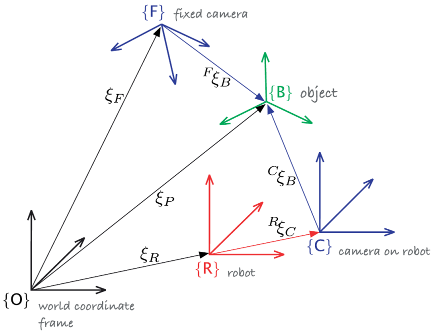
Uso de sistemas de referencia en robótica



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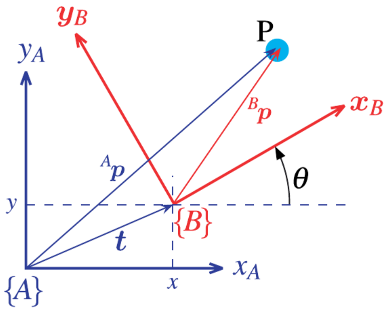
Pose en 2D



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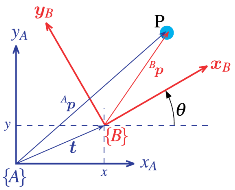
Pose en 2D

El vector $\vec{x_B}$ en sistema $\{A\}$:

$$\vec{x_B} = \cos\theta \vec{x_A} + \sin\theta \vec{y_A} = \begin{bmatrix} \vec{x_A} & \vec{y_A} \end{bmatrix} \begin{bmatrix} \cos\theta \\ \sin\theta \end{bmatrix}$$



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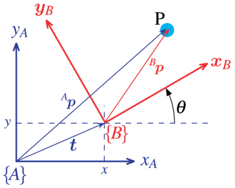
Pose en 2D



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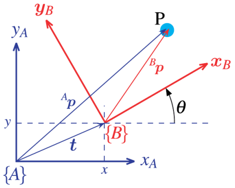
El vector $\vec{y_B}$ en sistema $\{A\}$:

$$\vec{y_B} = -\sin\theta \vec{x_A} + \cos\theta \vec{y_A} = \begin{bmatrix} \vec{x_A} & \vec{y_A} \end{bmatrix} \begin{bmatrix} -\sin\theta \\ \cos\theta \end{bmatrix}$$

Pose en 2D



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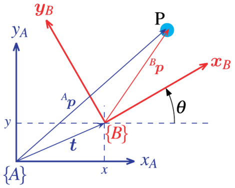
El punto P en sistema $\{A\}$:

$$^A\vec{p} = ^A p_x \vec{x_A} + ^A p_x \vec{y_A} = \begin{bmatrix} \vec{x_A} & \vec{y_A} \end{bmatrix} \begin{bmatrix} ^A p_x \\ ^A p_y \end{bmatrix}$$

Pose en 2D



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El punto P en sistema $\{A\}$:

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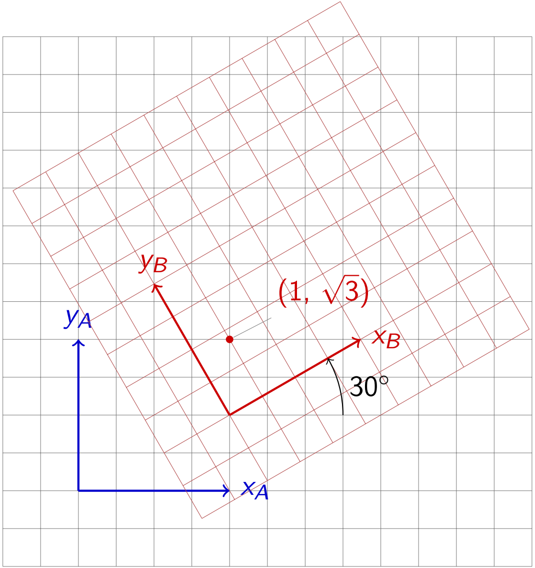
So

$$^A\vec{p} = t +^B \vec{p} = \begin{bmatrix} x \\ y \end{bmatrix} + \begin{bmatrix} \vec{x_B} & \vec{y_B} \end{bmatrix} \begin{bmatrix} ^B p_x \\ ^B p_y \end{bmatrix} = \begin{bmatrix} x \\ y \end{bmatrix} + \begin{bmatrix} \vec{x_A} & \vec{y_A} \end{bmatrix} \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix} \begin{bmatrix} ^B p_x \\ ^B p_y \end{bmatrix}$$

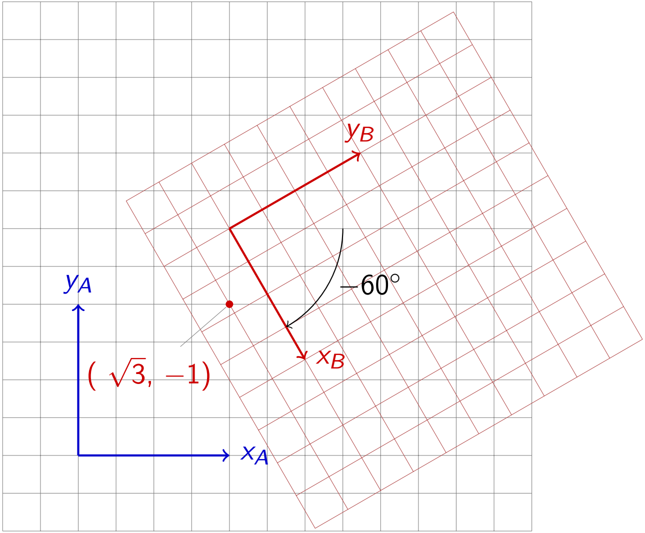
Ejemplo



Determine la matriz de rotación R_{ab} y la translación t_{ab} que definen la transformación entre $\{B\}$ y $\{A\}$. Verifique que

$$
\begin{aligned}
{}^{A}p = \begin{bmatrix} 4 \\ 4 \end{bmatrix} &= R_{ab}^{B}p + t_{ab} \\
&= R_{ab} \begin{bmatrix} 1 \\ \sqrt{3} \end{bmatrix} + t_{ab}
\end{aligned}
$$

Ejercicio



Determine la matriz de rotación R_{ab} y la translación t_{ab} que definen la transformación entre $\{B\}$ y $\{A\}$. Verifique que

$$
\begin{aligned}
{}^{A}p = \begin{bmatrix} 4 \\ 4 \end{bmatrix} &= R^{B}_{ab} p + t_{ab} \\
&= R_{ab} \begin{bmatrix} \sqrt{3} \\ -1 \end{bmatrix} + t_{ab}
\end{aligned}
$$

Programar