Kinematic calculations for mobile robots using Omni/Meccanum wheels

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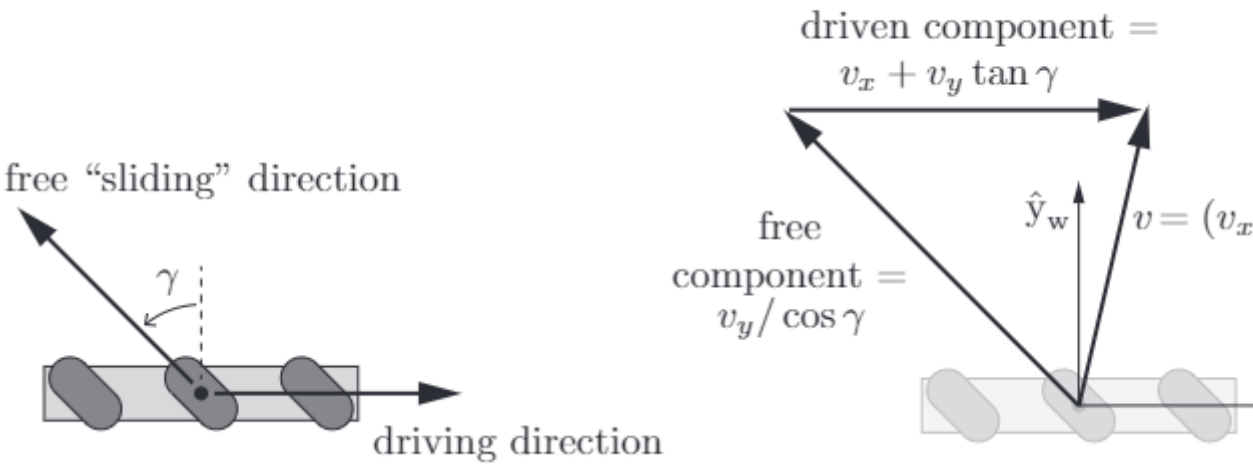
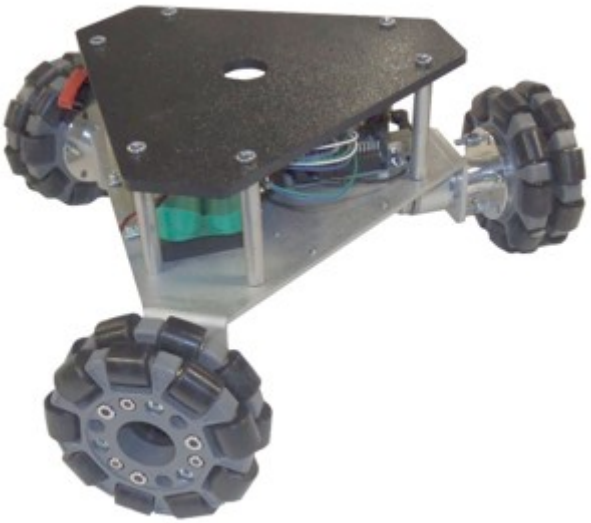
1 Generalized expression

This general expression is taken from the book "Modern robotics mecanics planning and control" by Kevin M Lynch, Frank C Park, page no 512, please refer this section for more details.



2 Three wheel omnidirectional robot



$$h_1(0)\mathcal{V}_b = \frac{1}{r_i}\begin{bmatrix} 1 & \tan\gamma_i \end{bmatrix}\begin{bmatrix} \cos\beta_i & \sin\beta_i \\ -\sin\beta_i & \cos\beta_i \end{bmatrix}\begin{bmatrix} -y_i & 1 & 0 \\ x_i & 0 & 1 \end{bmatrix}\mathcal{V}_b \tag{1}$$

$$\gamma_1 = 0, \beta_1 = 0 \tag{2}$$

$$= \frac{1}{r_1}\begin{bmatrix} 1 & 0 \end{bmatrix}\begin{bmatrix} \cos 0 & \sin 0 \\ -\sin 0 & \cos 0 \end{bmatrix}\begin{bmatrix} -y_1 & 1 & 0 \\ x_1 & 0 & 1 \end{bmatrix}\mathcal{V}_b \tag{3}$$

$$= \frac{1}{r_1}\begin{bmatrix} 1 & 0 \end{bmatrix}\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}\begin{bmatrix} -y_1 & 1 & 0 \\ x_1 & 0 & 1 \end{bmatrix}\mathcal{V}_b \tag{4}$$

$$= \frac{1}{r_1}\begin{bmatrix} 1 & 0 \end{bmatrix}\mathcal{V}_b \tag{5}$$

$$r_i = r_1 = r_2 = r_3 = r \tag{6}$$

$$h_1(0)\mathcal{V}_b = \frac{1}{r}\begin{bmatrix} 1 & 0 \end{bmatrix}\mathcal{V}_b \tag{7}$$

3 Four wheel omnidirectional robot