Abbreviations

ropod Robotic Pod.

SW Smart wheel.

Nomenclature

$(*)^I$ Superscript describing that $(*)$ is expressed in the Inertial coordinate frame.

$(*)^R$ Superscript describing that $(*)$ is expressed in the Robot coordinate frame.

$(*)_i^W$ Superscript and subscript describing that $(*)$ is expressed in the coordinate frame of Smart-Wheel i.

C Center of mass of the robot frame.

O Center of the intertial coordinate frame.

W_i Point at which Smart-Wheel i is connected to the Robot frame.

δ_i Orientation angle of the Smart-Wheel coordinate frame with respect to the robot coordinate frame.

θ Orientation angle of the robot in the intertial coordinate frame.

$\varphi_{i,l/r}$ Rotation angle of the left/right wheels in a Smart-Wheel from an observer situated at W_i and looking towards axis X_i^W.

d_w Distance between wheels in a smartwheel.

q position vector of the robot in generalized coordinates i.e. in the intertial coordinate frame.

r_w Wheel radius.

s_w Offset of the rotation point of the smartwheel relative to the axis connecting the wheels.

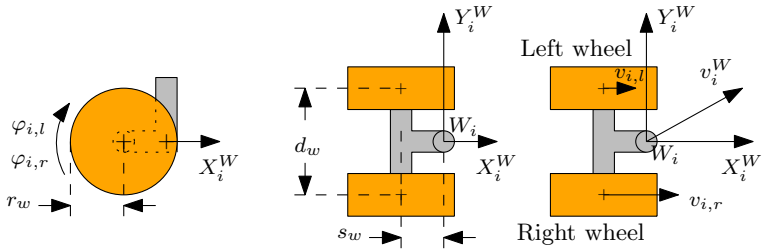
v vector comtaining all wheels velocities of a ropod.

$v_{i,l/r}$ Translation velocity of the left/right wheel in a Smart-Wheel from an observer situated at W_i and looking towards axis X_i^W.

x x-position of the robot center of mass C in the intertial coordinate frame.

y y-position of the robot center of mass C in the intertial coordinate frame.

The Smart wheel (SW) and its respective coordinate frame are shown in Fig. 1.



a) Side view b) Top view c) Velocity vectors

Figure 1: Smartwheel

The wheels of the SW have rotation angles $\varphi_{i,l/r}$ for the left and right wheel respectively. The corresponding wheel translation velocities are denoted by $v_{i,l/r}$, these are scalars since at this point no wheel sleep is considered.

A Robotic Pod (ropod) consists of several SWs attached with a rigid frame with center of mass located at C. The initial design of a ropod have four SWs and are ordered as depicted in Fig.2.

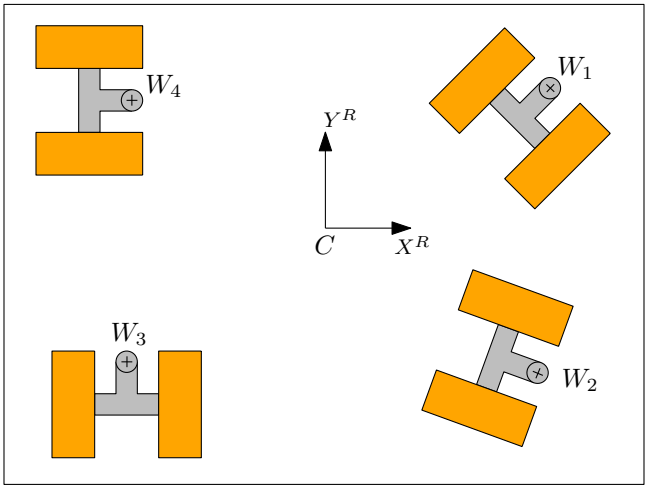


Figure 2: Smart-wheel order convention

The relation between the SW, robot and inertial coordinate frames is shown in Fig.3.

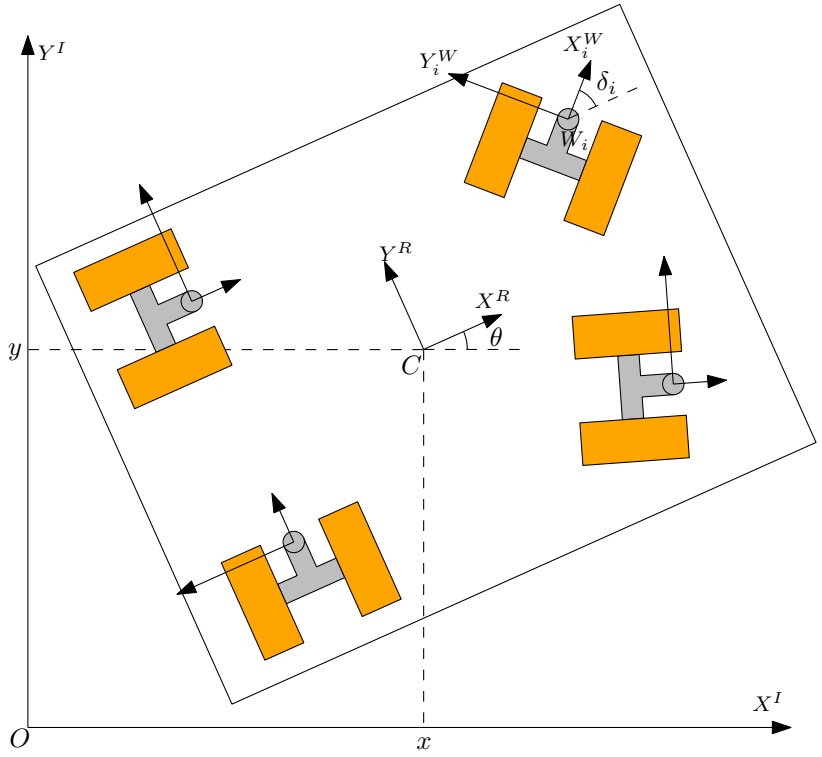


Figure 3: RoPod coordinate frames convention.