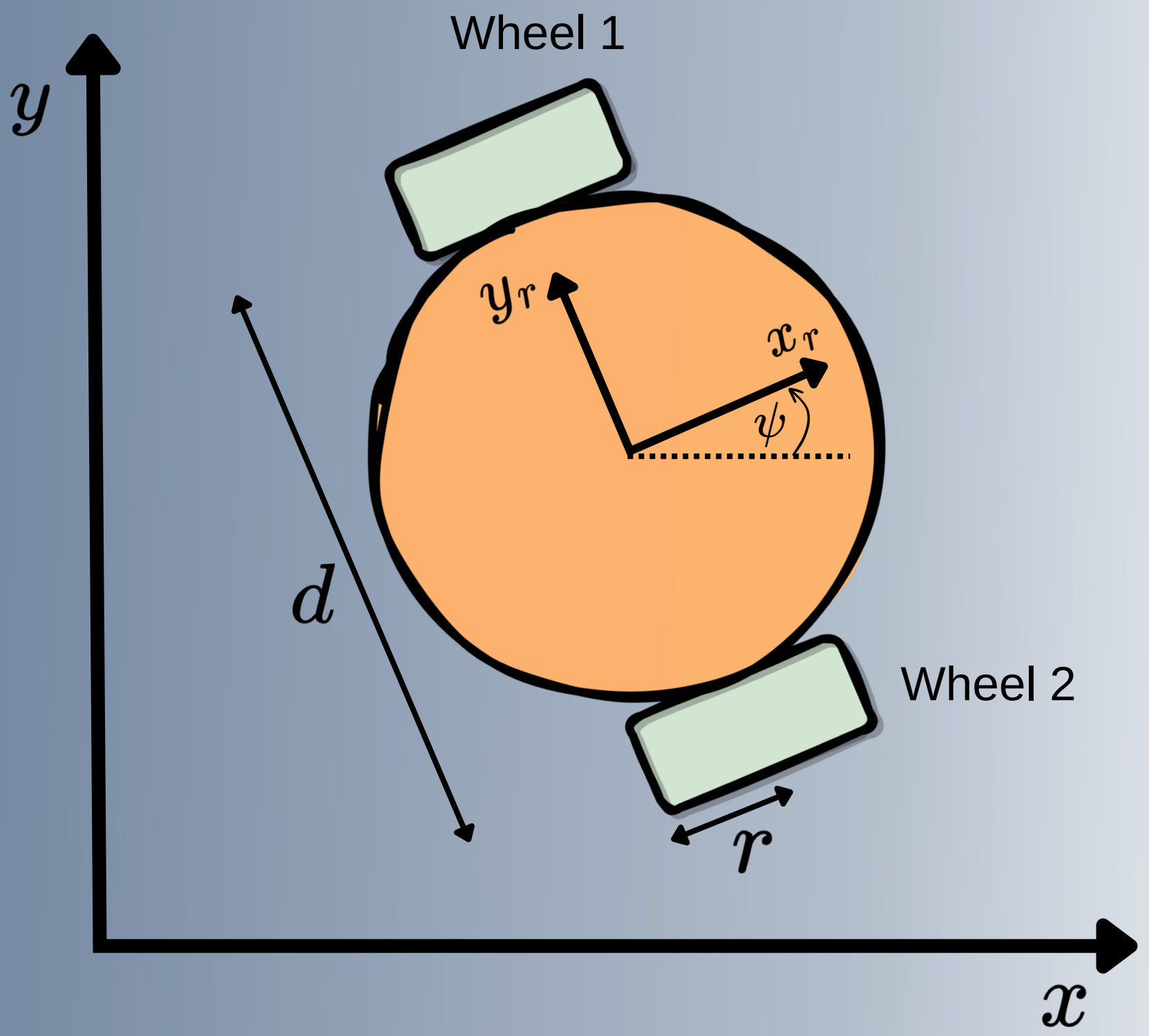
# Wheeled robot kinematic model




Simone Bertoni

Code
https://github.com/simorxb/Wheeled-robot-model

# Differential equations of motion

Assuming a kinematic model where the two wheels can only move along $x_r$ when they are spinning (i.e. they don't slip) and calling $\omega_1$ and $\omega_2$ the angular speed and $u_1$ and $u_2$ the linear speed of respectively wheel 1 and wheel 2, we have:

$$u_1 = \omega_1 r$$
$$u_2 = \omega_2 r$$

Let $u$ and $v$ be the linear speed of the centre of mass of the robot along $x_r$ and $y_r$, then:

$$u = \omega_1 \frac{r}{2} + \omega_2 \frac{r}{2}$$
$$v = 0$$

And finally the differential equation of motion, where the state variables are $[x, y, \psi]$:

$$\dot{x} = u \cos(\psi)$$
$$\dot{y} = u \sin(\psi)$$
$$\dot{\psi} = \omega_2 \frac{r}{d} - \omega_1 \frac{r}{d}$$

Being a kinematic model we can assume that each wheel's speed controllers are ideal and our system's input commands are $\omega_1$ and $\omega_2$.

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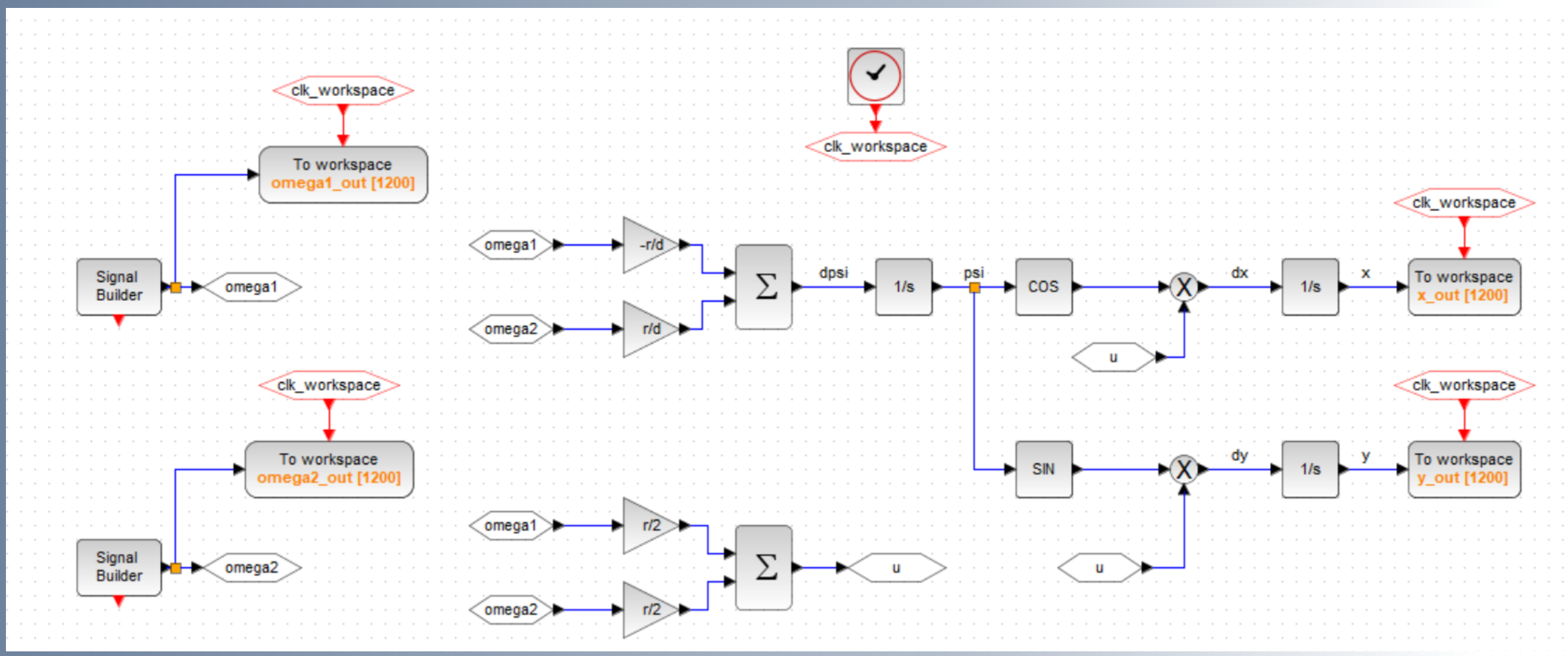
# Xcos model

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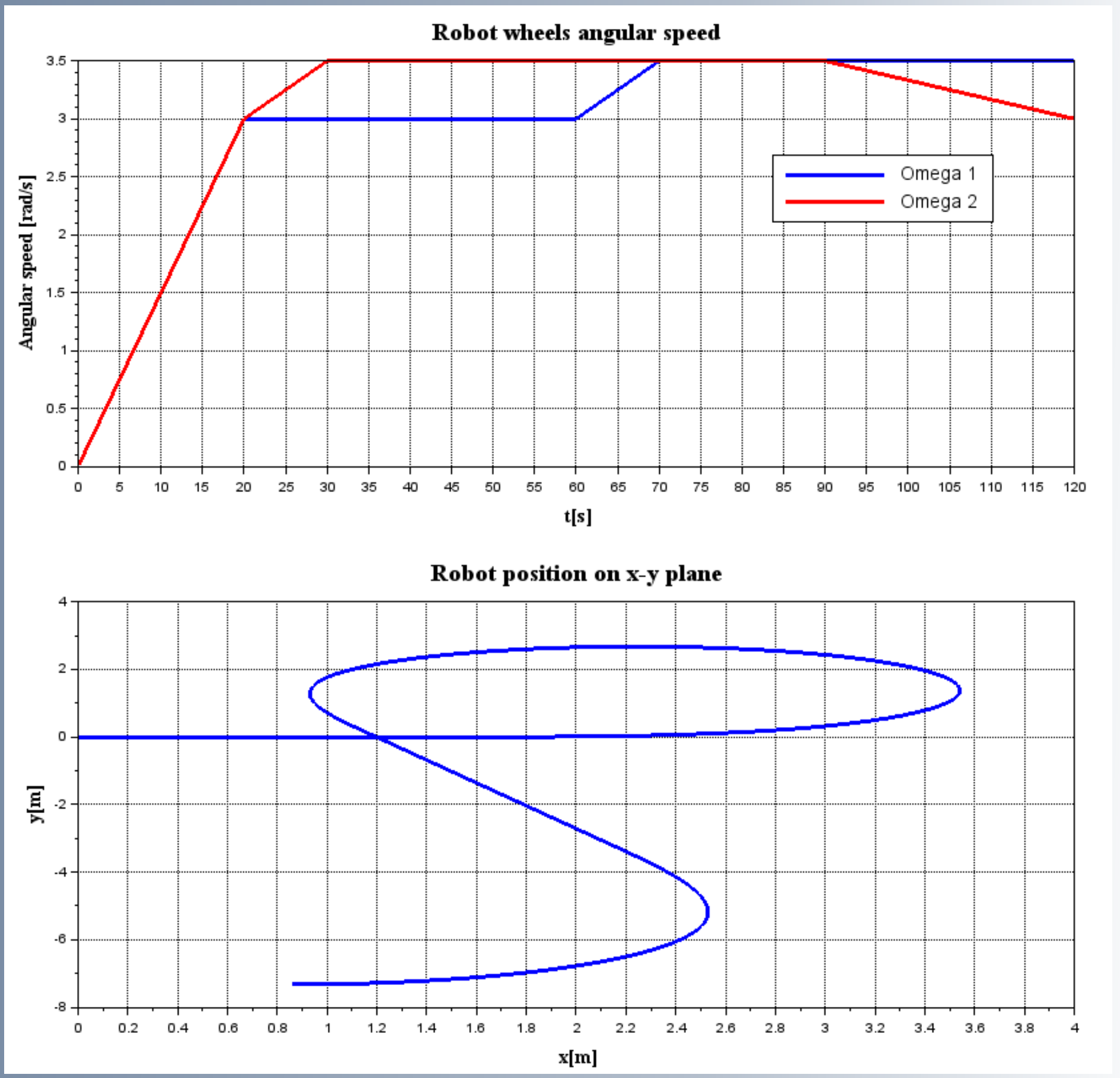
# Simulation


Robot wheels angular speed
Angular speed [rad/s]
t[s]
Omega 1
Omega 2
Robot position on x-y plane
y[m]
x[m]