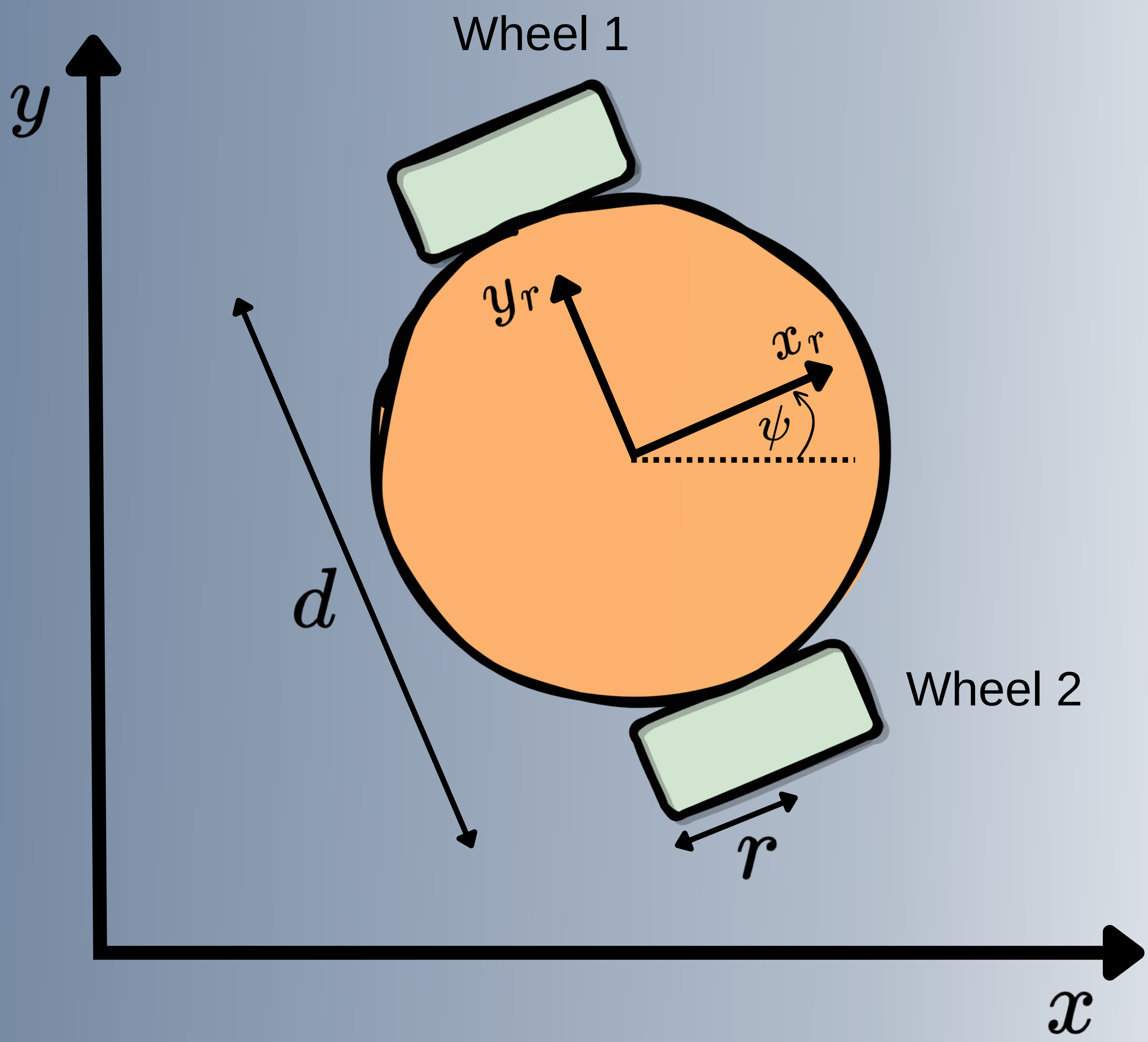
Wheeled robot kinematic model



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 ω_1 and ω_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:

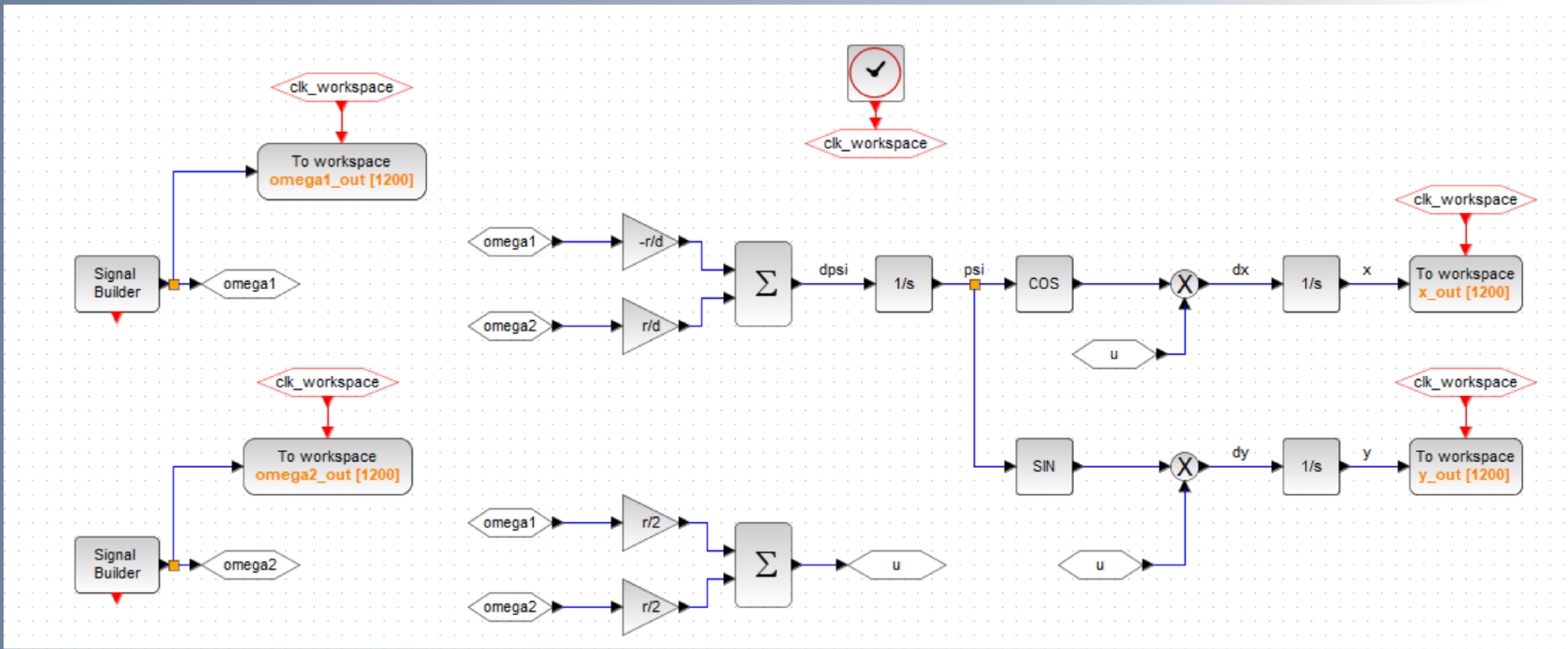
$$u = \omega_1 \frac{r}{2} + \omega_2 \frac{r}{2}$$
$$v = 0$$

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

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

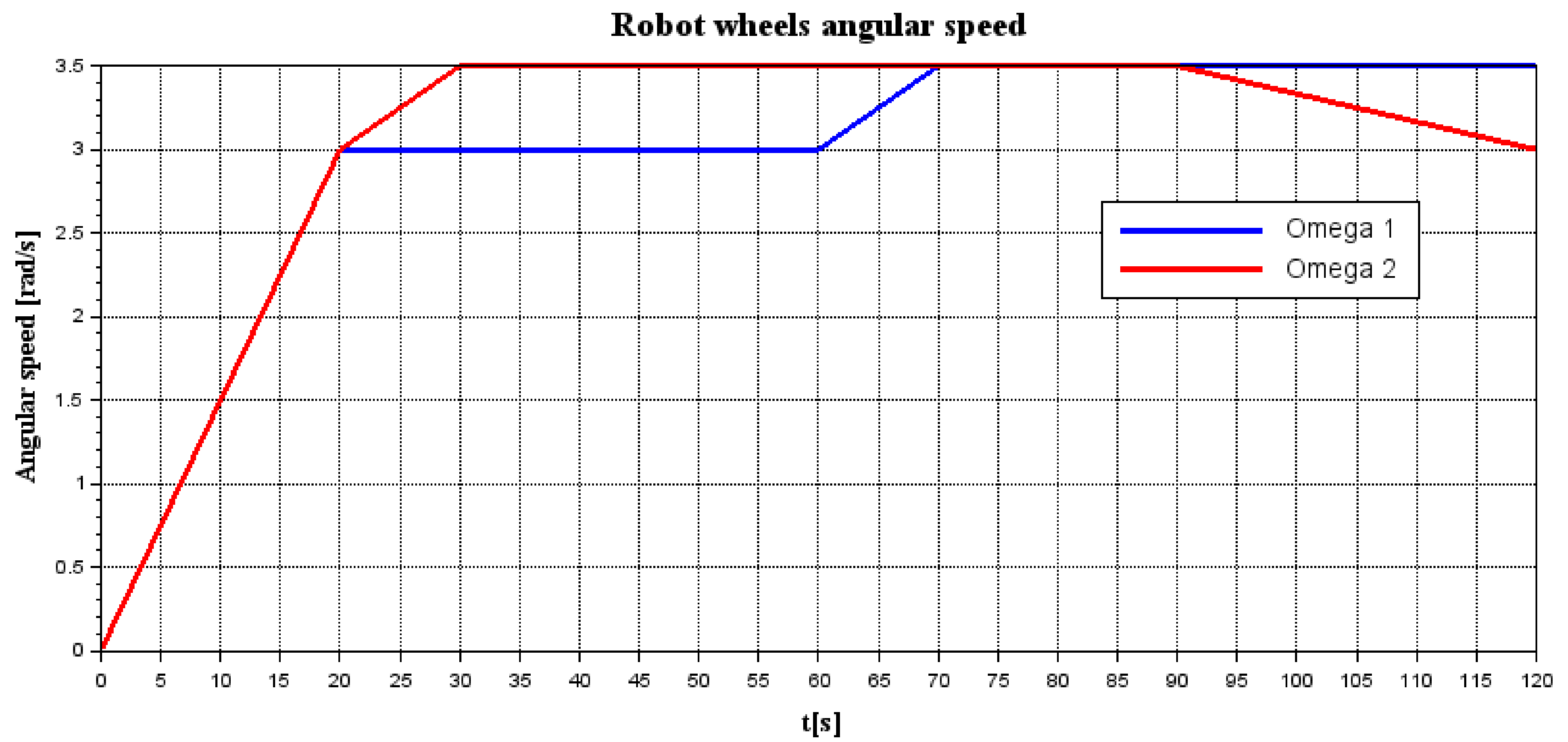
Being a kinematic model we can assume that each wheel's speed controllers are ideal and our system's input commands are ω_1 and ω_2.

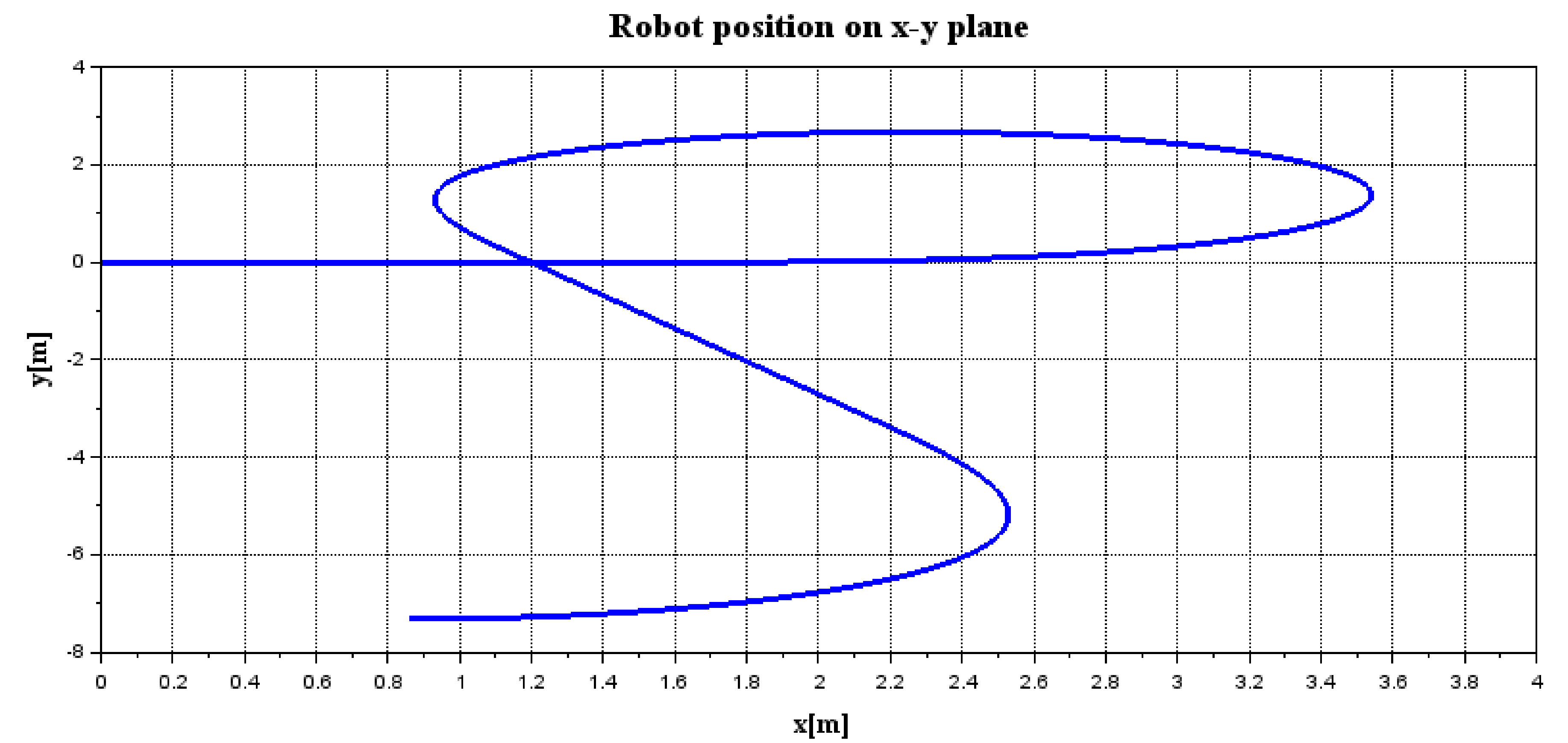
Xcos model



Simone Bertoni

Simulation





Simone Bertoni