Implement via software the Cartesian regulator to bring the unicycle from the point $q_i = [x_i \quad y_i \quad \theta_i]^T = [\alpha + 1 \quad 2 \quad {}^{\pi}/_{2}]^T$, with α the last digit of your matriculation number, to the origin.

The regulation problem takes care of bringing the robot to a given configuration. The aim of this exercise is to bring the unicycle from the point q_i =[x_i y_i θ_i]=[5 2 $\frac{\pi}{2}$] (because my matriculation number end with 4) to the origin , through the Cartesian Regulation.

The position error is

$$e_p = [-x \quad -y]^T$$

Recall the kinematic model of the unicycle, the following regulation controller is designed

$$\begin{cases} v = -k_1(x\cos\theta + y\sin\theta) \\ \omega = k_2(atan2(y,x) + \pi - \theta) \end{cases}$$

With $k_1, k_2 > 0$

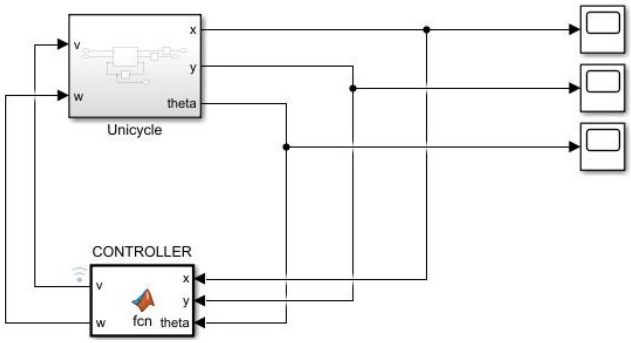

Figure 1:scheme of the fourth exercise

I chose $k_1 = 1$ and $k_2 = 6$

The implementation is present in the file Cartesian_regulation_for_the_unicycle.slx, the results are:

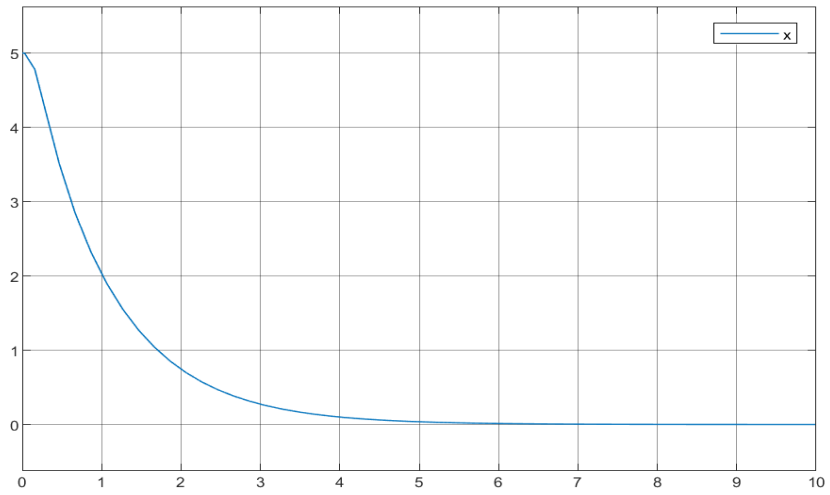

Figure 2:path of the x

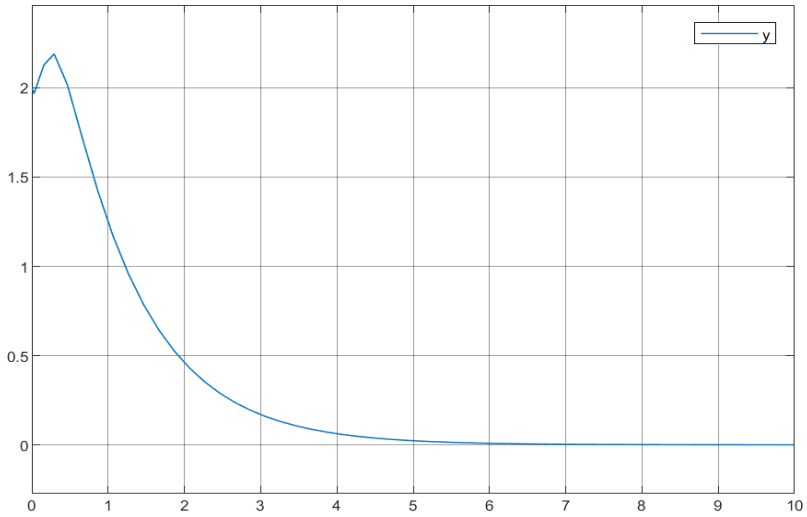

Figure 3:path of the y

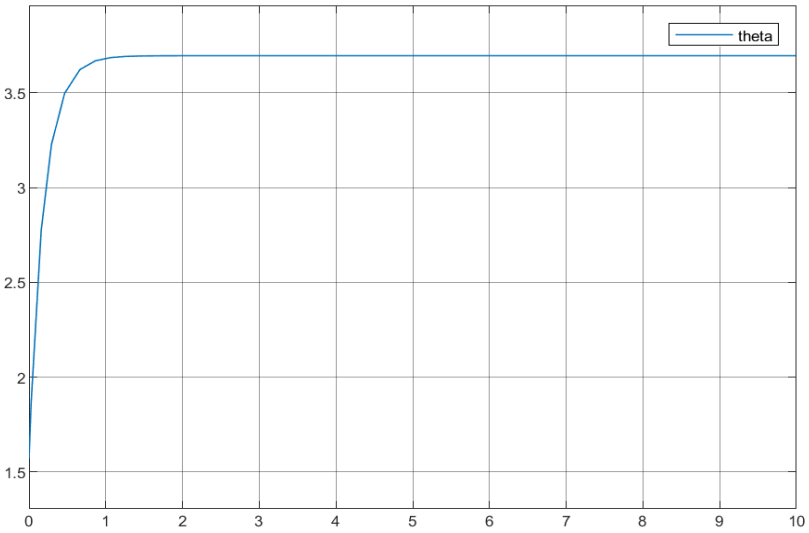

Figure 4:path of theta

How it is easy to see the x and the y signals can reach the origin, while θ assumes a constant value of approximately 3.7.

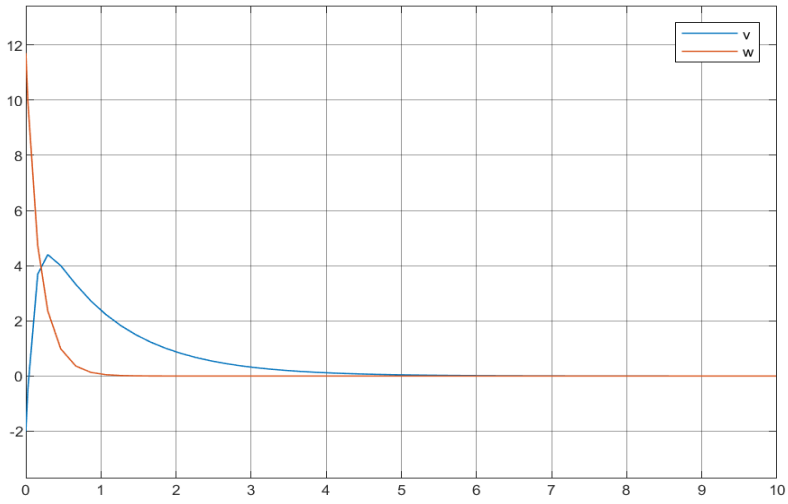

Figure 5: heading and angular velocity

the v starts from a negative value, this means that it initially moves backward, while the w takes on a value approximately equal to 12