Examen sur la commande non-linéaire des robots mobiles
ENSTA-Bretagne, UV 4.7.

Jeudi 02 juin 2016.

Consider a group of $m = 20$ robots the motion of which is described by the state equation

$$\begin{cases} \dot{x}_1 &= x_4 \cos x_3 \\ \dot{x}_2 &= x_4 \sin x_3 \\ \dot{x}_3 &= u_1 \\ \dot{x}_4 &= u_2 \end{cases}$$

where (x_1, x_2) corresponds to the position of the corresponding cart, x_3 to its heading and x_4 to its speed.

Provide a controller for each of these robots so that the ith robot follows the trajectory

$$\begin{pmatrix} \cos(at + \frac{2i\pi}{m}) \\ \sin(at + \frac{2i\pi}{m}) \end{pmatrix}$$

where $a = 0.1$. As a consequence, after the initialization step, all robots are uniformly distributed on the unit circle, turning around the origin. Simulate all the controlled robots with ROS. For this purpose you will have to build two nodes: one for the robot and one for the controller.

Some help can be found via the video: https://youtu.be/1Of1htovXp4.
