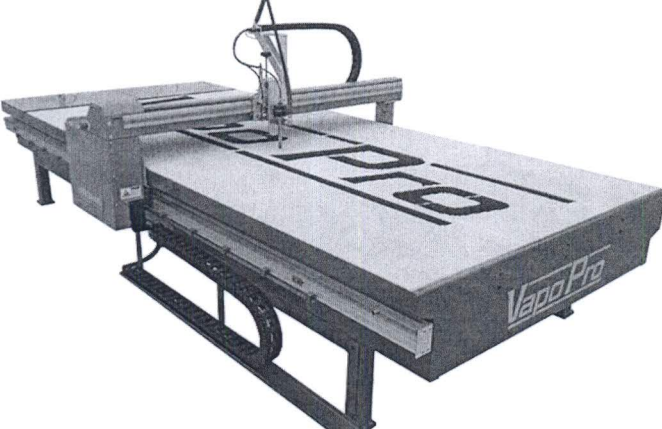# Master degree in Automatic Control and Robotics
# RKD&C

24th January 2017

Kinematic, Dynamic and Control design of a water jet cutter machine like the one shown in the next figure.

Features:

The robot has only 2 prismatic joints moving on X and Y axis. The distance on Z is a fixed height.
Mass of the Links:
- Link_1_x=25Kg
- Link_2_y=10Kg

Effective working area:
- Length=8m
- Width= 2.5m

Questions:

1. What is the Robot Morphology?
2. Draw a sketch and make the frame assignment you consider.
3. Derive the Forward Kinematics.
4. Derive the Invers Kinematic.
5. Does the robot have any singularity?. Justify the answer.
6. What will be the maximum speed reached by the axes, if the maximum restriction is imposed by the movement from point $(0\ 0\ 0)^T$ to point $(2.5\ 8\ 0)^T$ with a tf = 3 seconds?[1]. Justify the answer.
7. What are the required torque to each motor?. In order to ensure the above restriction.[2]. Simplify your answer considering punctual masses.
8. Justify differences and similarities in control architecture, if we use stepper motors or continuous DC motors to move the links.

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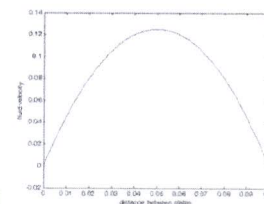
[1] Assuming a cubic interpolation.: Velocity profile: $t \in [0\ t_f]$

[2] Consider the working área as it were on the floor.