# HyQ2Max in Mechanical Explorer

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## Introduction

This is a tutorial to use the HyQ2Max model in the Mechanical Explorer on Matlab. The files were genereted automaticaly from the URDF files of HyQ2Max, obteined from the GitHub page.

## Installation

1) Download the files to your preferred folder;

2) In the Matlab, go to "Set Path" -> "Add with subfolders..." and pick the folder "hyq2max_description".

## Firts steps

For using the mechanical model in simulations, first execute the “VarsInit.m” file, them open the .slx file, acording to the Matlab version.

There will be two blocks: "Impedance Control" and "HyQ2Max". The first one is a Matlab function to evaluate the the joint torque for a refrence joint. The second one is the mechanical model.

In the HyQ2Max we found the following blocks:

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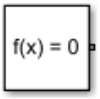
|   | Solver configuration: solver general configurations. |
|  | Mechanism Configurations: set the gravity properties. |
|   | Create a world frame. |

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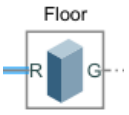
|   | Floor: a rigid body to simulate the floor. It is possible to edit the size of the ground. |

There are other three kinds of subsystem: 6 DoF, Base and legs. Inside of the first one, is it where the virtual joint between the world and base frames is set. There also a “tranform sensor” block.

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|   | 6 DOF: In this block, is possible to set the inicial conditions like position, orietation, velocty and son on. |
|   | Transform Sensor: Is used to read some variables like linear velocity and angular velocity. To use these values in the simulation, it is necessary to use the block “PS_Simulink” to convert the sinal. |

In the second subsystem is it where the tranformations from base to the leg’s and the torso CoM.

Lastly, the legs block contain the iformation about the legs dynamics.

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|   | Revolute joit: It is possible to cconfigure the initial conditions. It is necessary to set actuation type: torque or position. In this HyQ2Max files is defined torque as actuation. Also, it is possible to define the sensors for the postion, velocity, aceleration and torque aplied to the joint. |

Other very importante block is the “Spatial Contact block”. This block is inside each mechanical part, and is the reposable to applies the forces between the environment and the robot parts.

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|   | Statial Contact: Applies the forces between two bodies. It is also possible to change the values of stiffness and damping, friction coefficients and enable the sensing of normal and frictional forces. |

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