FL. 2018 ESE 447.02 Robotics Lab

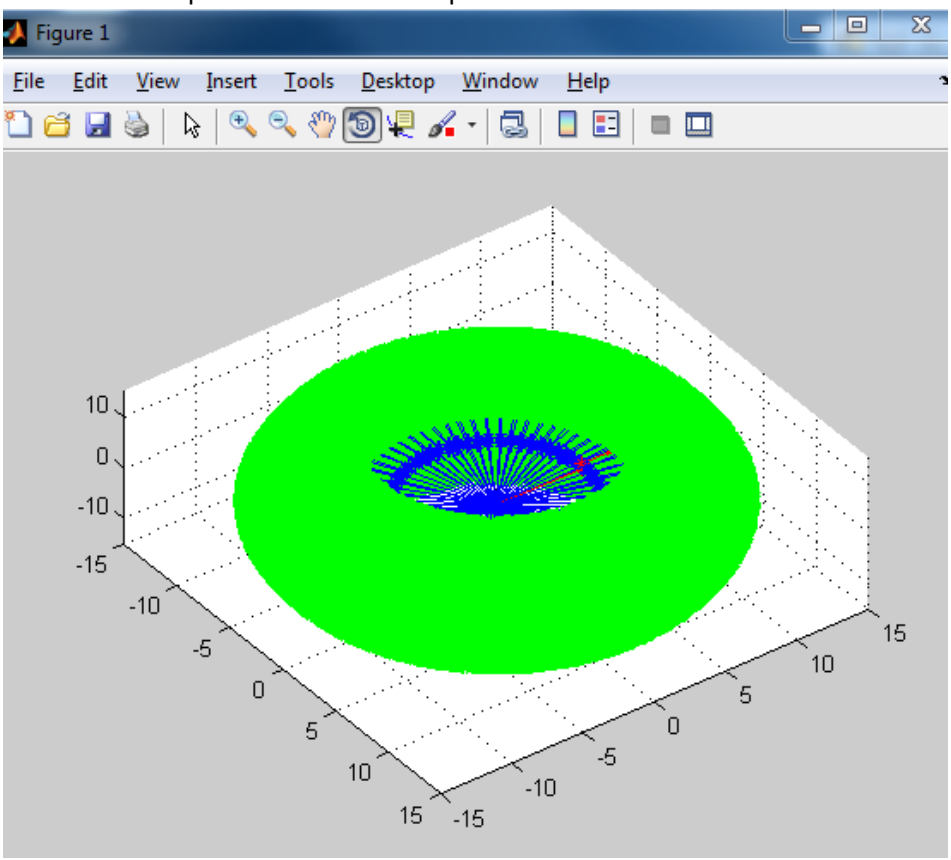
Lab Journal 6

10/21/2018

1. Exercise 3 Continued. Task 5.

(1) Input both angles into program and animate robot.
To animate the robot, we used a while loop and the pause function in Matlab to plot the robot time after time when it is simulated. The program pauses for 0.1 seconds in each while loop iteration and it is plotted in each iteration so we can observe the position change of the robot in the 3D space.

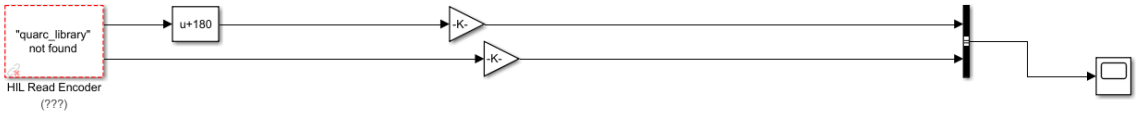
(2) What is the shape of the work envelope of this two-link robot?



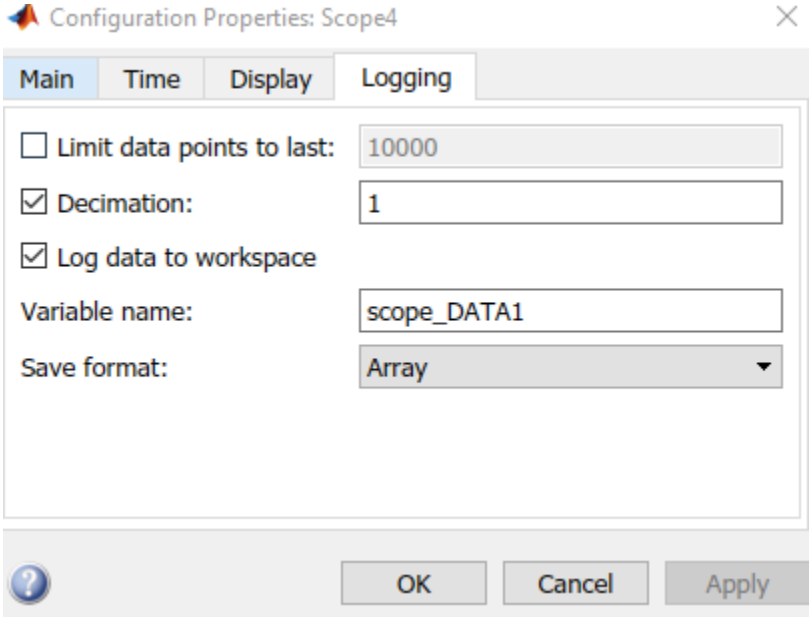
The work envelope of this robot is shown in the picture above. The blue lines indicates the links itself and the green envelope was formed by tracking the locations of the endpoint over time. To get the proper envelope, we had to move both of the links to all positions they can reach and plot all the endpoints. As shown in the figure, the green shape is formed by moving the endpoints to all the possible locations and plotting it every time it reaches a new location and keep them on the plot. The shape looks like a ring.

2. Exercise 3. Task 6.
Using Simulink, Quanser Pendubot, and your MATLab program, move pendubot “by hand” to check simulation. The encoders are serving as the ‘theta1’ and ‘theta2’ inputs to your program.
*NOTE: This is a two part process. The first step is to use a Simulink program to collect data for the real hardware. The second step is to use another Simulink program to playback this data.

The first part of this task is to record the data from the physical system while moving the links by hand. The Simulink model used to record the data is shown below.



Here we used a bias block for theta2 to make the real system consistent with the simulation since the simulated second link's original position is at pi position. The two gain blocks were used to convert the units of theta 1 and theta 2 to radiance. To record the data in a form that can be recognized by Matlab, we simply changed the settings of the scope so that the scope can put the data in an array. To change the settings of the scope, double-click on the scope block and click on the setting icon on the newly opened window. Find the Log data to work space option and check it, define the variable name you want to use and the save format as array.



Click on OK and the model is ready to record data. To record, run the model and stimulate the links with your hands and the data points for theta 1 and theta 2 will be recorded.
After we recorded the data, we used the same function to plot the data except that we did not use a pause function and we used the data points we recorded as the input. The simulation shoed that the links moved in the exactly same track as we observed for the physical system. In fact, this simulation is simply an animation of the physical system since we were just plotting the links using the theta values we recorded.