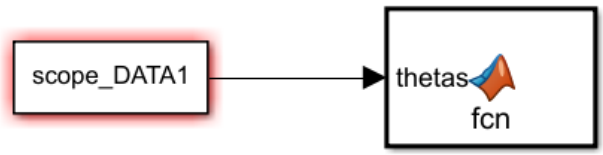
FL. 2018 ESE 447.02 Robotics Lab

Lab Journal 8

10/2/2018

1. Play back data for Exercise 3.
   The Simulink model used to play back the data recorded in the previous lab is simply as shown below.



The scope_DATA1 was saved as an array in workspace in Matlab and we can directly use this variable as the input for another function. The block on the left is the FromWorkspace block, which can read the data from the workspace. The function block is just the function used for previous labs to plot the data with transformation matrices.

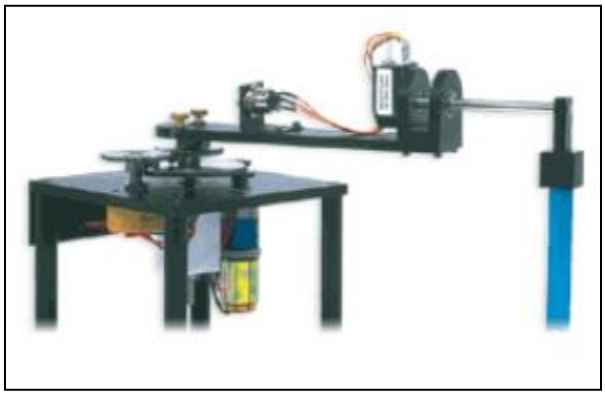
The Matlab function code is as follows.

```
function  fcn(thetas)
A=[0 0 0 0 0];
B=[0 0 6 6 8];
C=[0 -1 -1 0 0];
D=[1 1 1 1 1];

A2=[0 0];
B2=[0 12];
C2=[0 0];
D2=[1 1];
L1=6;

L2=2;
%First Link

 theta1=thetas(1);
 theta2=thetas(2);
 newpoints=trans(theta1,A,B,C,D);
 p= (newpoints(1:1,1:5));

 q= (newpoints(2:2,1:5));

 r= (newpoints(3:3,1:5));
```

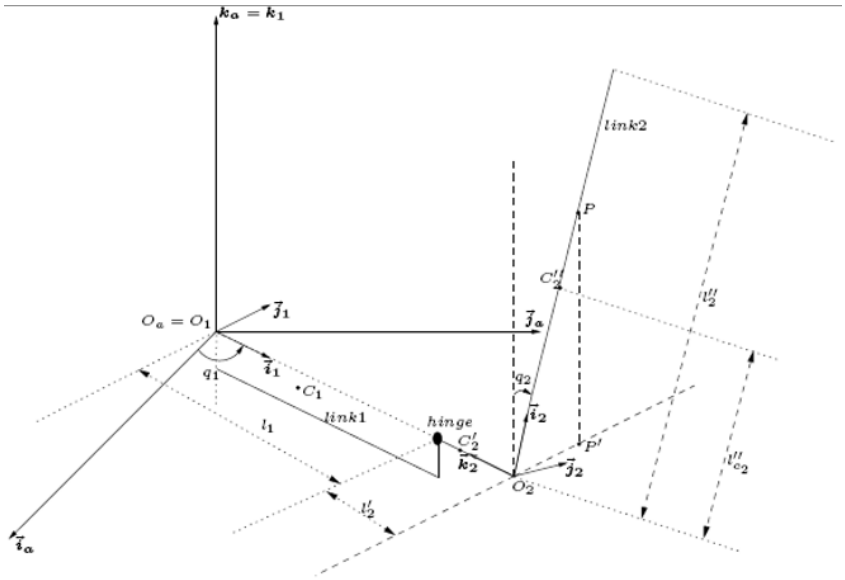
```
% Second Link

new2=trans2(theta2,L1,L2,A2,B2,C2,D2);
%Frame 1 to frame 0
 x2= new2(1:1,1:2);
 y2= new2(2:2,1:2);
z2= new2(3:3,1:2);

new3 = trans(theta1,x2,y2,z2,D2);
%ABC values of Link 2 in frame 0
p2= (new3(1:1,1:2));

q2= (new3(2:2,1:2));

r2= (new3(3:3,1:2));

plot3(p,q,r,'-b*',p2,q2,r2,'-g*');
end
```

By playing back the data recorded in the workspace, we got an animation for the two-link system that has exactly the same movement with that of the real system. Whatever movement we made the system do, we can record the data from the real system and play that back in our animation in Matlab.

2. Dynamics exercise
   This exercise aims to add dynamic motion to the “Robot” model. The actual system is shown in the picture below.



   The generalized coordinates is shown in the picture below.



Where q1 and q2 are the joint angles, i.e. theta1 and theta2 from previous exercises.
We used the Lagrangian approach to do the calculations. The Lagrangian deals with kinetic energy and potential energy. We also included friction and actuator effects for this exercise. The purpose of this exercise was to generate the simulation for a robot system that has the given properties. The properties were indicated by six parameters: $\theta_i (i = 1,2,3,4,5,6)$. Given the property parameters. We were able to calculate the Lagrangian dynamics for the simulation and make an animation for the system with different voltage inputs.