Forward Kinematics (Denavit-Hartenberg convention)

Exercise 1 :

Get Robotics Toolbox for Matlab (http://www.petercorke.com/Robotics_Toolbox.html).

Do as they say on website : "

1. To install the Toolbox simply unpack the archive which will create the directory (folder) `rvctools`, and within that the directories `robot`, `simulink`, and `common`.

2. (optional) Adjust your MATLABPATH to include rvctools
3. Execute the startup file `rvctools/startup_rvc.m` and this will place the correct directories in your MATLAB path.
4. Run the demo `rtbdemo` to see what it can do

"

Try out a few of the demos.

Exercise 2 (MANDATORY – SEE JOURNAL REQUIREMENTS BELOW..) :

In this exercise, you have to make a kinematic model of the CrustCrawler robot.

It may be a good idea to do exercise 2 and 3 in the same time – ie. start to model/simulate the robot in Matlab for a joint/link at a time, to make sure that you are doing it right.

To summarize, in this exercise, you have to :

1. Measure lengths and angles of links and joints in the robot
2. Use Denavit-Hartenberg convention to establish coordinate frames for the robot
3. Extract the DH parameters from the model
4. Calculate the transformation A-matrices between frames
5. Calculate the full transformation T_n^0 between base and end effector frames

Steps 4 and 5 may be carried out in Robotics Toolbox.

Exercise 3 (MANDATORY – SEE JOURNAL REQUIREMENTS BELOW..) :

In this exercise, you have to simulate the Crustcrawler robot by using the Robotics Toolbox for Matlab.

You may use the "Human_Arm_test.m" as inspiration.

At a start, simply try to plot the robot (e.g. step-by-step as you build the model in exercise 1).

Next, try to move some joints in the simulation – e.g. try to change joint 1 (q1) to make the robot turn around its first axis of rotation. Also test the other joints.

Finally, try to use the built-in (iterative methods) in Robotics Toolbox to make the robot follow a trajectory (as in "Human_Arm_test.m").

JOURNAL REQUIREMENTS :

(This is what you have to upload to "Crustcrawler Kinematic Model" on Blackboard)

Basically, you should be able to understand what is going on (both in theory and practice), if you look at the journal in 5-10 years from now.

1. Drawing of Crustcrawler robot + attached frames/joints/links (ie. kinematic model) (handwritten is fine..)
2. Description of what you have done in the exercises – with explanations of the essential matlab code and theory.
3. Matlab code attached