MAE 6245 (Spring 2020)
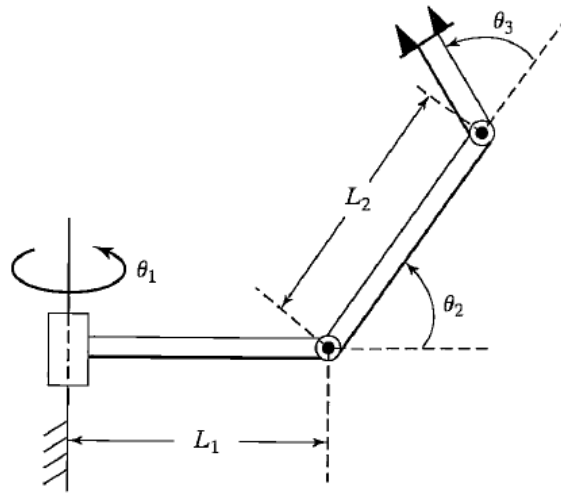
Robotic Systems

Assignment # 6

Bonus Assignment

[25 points]

1) For the 3R nonplanar arm studied in one of the previous assignments, and shown below:

Find the velocity kinematic equations using any method of choice (not MATLAB) (recommended technique is the use of propagation equations discussed in class). Also find the Jacobian in the end effector frame (only translational velocity Jacobian is sufficient). **[15 points]**

2) For the problem above, write functions in MATLAB to find the velocities of end effector in reference frame using recursive propagation of equations (use the general equations in the function, instead of hardcoding the closed form solution obtained above). Now, for L_1 = 10, L_2 = 10, L_3 = 0, θ_1 = 30 degrees, θ_2 = 45 degrees, θ_3 = 0 degrees, find the end effector velocities using this code. Then compare it with direct computation of closed form solution above. Is the result the same? **[10 points]**