ELEC442
Assgt #2
Due Oct 24, 2017 (11:59pm)

- All policies from Assgt #1 apply (i.e., you may submit your work through Connect in teams of up to 3 individuals, be sure to document your code, etc.).

Write a Matlab program that provides all solutions to the inverse kinematics problem of the PUMA 560 robot of Assignment #1. Prompt the user for the desired end-effector location ($\boldsymbol{o_d}$), approach vector ($\underline{\mathbf{k}}_{\mathbf{d}}$) and sliding vector ($\underline{\mathbf{j}}_{\mathbf{d}}$) (all expressed w.r.t. the base frame; your code should enforce that $\underline{\mathbf{k}}_{\mathbf{d}}$ and $\underline{\mathbf{j}}_{\mathbf{d}}$ are normalized and orthogonal). Output all valid sets of joint angles (in degrees) which achieve this.

DH Parameter	$\boldsymbol{\theta_i}$	$\mathbf{d_i}$ **(mm)**	$\mathbf{a_i}$ **(mm)**	$\boldsymbol{\alpha_i}$	**Joint Motion Range**
Link 1	(θ_1)	0	0	-90°	-160°→160°
Link 2	(θ_2)	0	430.0	180°	-225°→45°
Link 3	(θ_3)+90°	-149.1	20.3	90°	-135°→135°
Link 4	(θ_4)	435.0	0	90°	-110°→170°
Link 5	(θ_5)	0	0	-90°	-100°→100°
Link 6	(θ_6)	60.00	0	0°	-266°→266°

Verify that your program works for at least three distinct sets of inputs by feeding each of your solutions into the forward kinematics of homework #1 (briefly explain how you chose the inputs). Use the Matlab "diary" command to record your results. Submit a sheet showing your derivation of the inverse kinematics calculations and label/highlight the most pertinent equations. Document your code, referencing the equations, as appropriate.

NB: For joint 3, the intention is for $-135° \le \theta_3 \le 135°$, not $-135° \le \theta_3 + 90° \le 135°$.

Hint: Very carefully consider how many possible solutions there are, especially in view of the motion range of joint 6. E.g., for od=[317;506;673]mm, kd= [0.769;0.401;0.498] and jd=[-0.389;-0.325;0.862], you should display the maximum 12 possible sets.