Small write up:

The robot in question is of type 4R spatial. Following are the DH parameters. The robot at its home position had few initial values.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Link | Alpha | a | d | Theta | Initial value |
| 1 | 90 degrees | 0.0 | 2.5 | Variable | 90 degrees |
| 2 | 90 degrees | 0.0 | 0.0 | Variable | 90 degrees |
| 3 | -90 degrees | 3.5 | 0.0 | Variable | 0 degree |
| 4 | 0.0 | 3.0 | 0.0 | Variable | 0 degree |

The translation co-ordinates from the homogeneous transformation matrix (HTM) of the robot are derived as below.

Translation coordinates from HTM:

Rx =

Ry =

Rz =

At its home position when all the variable angles are 0.0 radian the coordinates are derived as [0.0,0.0,9.0] which is correct as the end-effector is 9.0 units away along the Z axis.

The Jacobian of the robot is derived as below which was used for the closed loop PD controller.

Jacobian:

Should be in the following format.

|J11 J12 J13 J14|

|J21 J22 J23 J24|

|J31 J32 J33 J34|

J11 =

J12 =

J13 =

J14 =

J21 =

J22 =

J23 =

J24 =

J31 =

J32 =

J33 =

J34 =