Robotics Toolbox

# **Team Member –**

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4. Amaan Khan
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# **Contributions –**

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| Homogeneous Transformation | Tanmay Dhanote |
| Euler Angles | Amaan Khan |
| Forward Kinematics | Laukik Mujumdar |
| Workspace | Malay Nagda |
| Inverse Kinematics | Ravendra Raghavendra |
| Differential Kinematics | Malay Nagda |
| Inverse Diff. and Inverse using Jacobians | Ravendra Raghavendra |
| Manipulator Dynamics | Laukik Mujumdar |
| Manipulator Control | Amaan Khan |
| GUI | All Member starting with Tanmay Dhanote |

# **How to use the Toolbox –**

1. Description of Frame
   1. First enter the number of rotations.
   2. Then enter the rotation number in accordance with the total rotations
   3. Enter the axis and angle of rotation and select either fixed or current frame
   4. Then enter the translational position of the frame (i) with respect to (i-1)
   5. Click on update after entering all the values but do no change the number of rotations.
2. Transformation Operator
   1. First enter the number of rotations.
   2. Then enter the rotation number in accordance with the total rotations
   3. Enter the axis and angle of rotation and enter the vector position
   4. Click on update to fill in the data
   5. Click on transform vector to plot the given operator.
3. Transformation Mapping
4. Homogeneous Transformation
5. Rotation Matrix
   1. First enter the number of Transformations.
   2. Then enter the rotation number in accordance with the total rotations
   3. Enter the axis and angle of rotation and select either fixed or current frame
   4. Click on update after entering all the values but do no change the number of rotations.
6. Euler Angles
7. Forward Kinematics
   1. First Select either you know DH parameters of robot or not before clicking on Forward Kinematics button
   2. Enter the robot definition accordingly that is being asked under link definition panel, remember value of link type is case sensitive.
   3. Click update after entering each links definition, when the link no. reaches same value as number of links the DH parameters will be displayed.
   4. After that enter the joint variables one by one and run after each, when joint number reaches same value as number of links transformation will given and plots will be plotted.
8. Inverse Kinematics
   1. First Select either you know DH parameters of robot or not before clicking on Forward Kinematics button
   2. Enter the robot definition accordingly that is being asked under link definition panel, remember value of link type is case sensitive.
   3. Click update after entering each links definition, when the link no. reaches same value as number of links the DH parameters will be displayed.
   4. Enter the end effector pose and select which Euler angles describe the end pose and click on run
   5. The values for the joint variables will be displayed accordingly from joint 1 - n
9. Differential Kinematics
   1. First Select either you know DH parameters of robot or not before clicking on Forward Kinematics button
   2. Enter the robot definition accordingly that is being asked under link definition panel, remember value of link type is case sensitive.
   3. Click update after entering each links definition, when the link no. reaches same value as number of links the DH parameters will be displayed.
   4. Click on run above Jacobian to display it
   5. Then enter a pose of end effector to calculate singularity for that defined pose.
10. Inverse Differential Kinematics
    1. First Select either you know DH parameters of robot or not before clicking on Forward Kinematics button
    2. Enter the robot definition accordingly that is being asked under link definition panel, remember value of link type is case sensitive.
    3. Click update after entering each links definition, when the link no. reaches same value as number of links the DH parameters will be displayed.
    4. Enter the end effector Final velocities, and click on run
    5. The values for the joint velocities will be displayed from joint 1 - n
11. Inverse Kinematics using Jacobians
    1. First Select either you know DH parameters of robot or not before clicking on Forward Kinematics button
    2. Enter the robot definition accordingly that is being asked under link definition panel, remember value of link type is case sensitive.
    3. Click update after entering each links definition, when the link no. reaches same value as number of links the DH parameters will be displayed.
    4. Enter the end effector pose in X, Y, Z directions and click on run.
    5. The values for the joint variables will be displayed accordingly from joint 1 - n
12. Workspace
13. Manipulator Dynamics
14. Manipulator Control