Robotics Toolbox

# **Team Member –**

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4. Ravendra Raghavendra
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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 to be performed.
   2. Then enter the rotation number.
   3. Enter the axis and angle of rotation and press update.
   4. Repeat step b-c for each rotation to be performed.
   5. Enter the translational position of the frame (i) with respect to (i-1)
   6. Press Fixed Frame or Current Frame to obtain the transformation matrix and plot.
2. Transformation Operator
   1. First enter the number of rotations to be performed.
   2. Then enter the rotation number.
   3. Enter the axis and angle of rotation and press update.
   4. Repeat step b-c for each rotation to be performed.
   5. Enter the Vector A position
   6. Press Transform Vector to obtain the transformation matrix and plot.
3. Transformation Mapping
   1. First enter the number of rotations to be performed.
   2. Then enter the rotation number.
   3. Enter the axis and angle of rotation and press update.
   4. Repeat step b-c for each rotation to be performed.
   5. Enter the position vector of frame B with respect to A
   6. Enter vector position in frame B
   7. Press map to obtain the transformation matrix and plot.
4. Rotation Matrix
   1. First enter the number of rotations to be performed.
   2. Then enter the rotation number.
   3. Enter the axis and angle of rotation and press update.
   4. Repeat step b-c for each rotation to be performed.
   5. Press Fixed Frame or Current Frame to obtain the rotational matrix and plot.
5. Euler Angles
6. 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.
7. 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
8. 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.
9. 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
10. 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
11. Workspace
12. Manipulator Dynamics
13. Manipulator Control