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```
function [T,gripState] =
 TrajectoryGenerator(Tseinitial,Tscinitial,Tscfinal,Tcegrasp,Tcestandoff,k)
```

Function Descirption:

For this component, you will write a function called TrajectoryGenerator to create the reference (desired) tra- jectory for the end-effector frame {e}. This trajectory should consist of eight concatenated trajectory segments, de- scribed below. Each trajectory segment begins and ends at rest. This function is likely to use either ScrewTrajectory or CartesianTrajectory from the Modern Robotics code library.

Inputs:

Tseinitial - The initial configuration of the end-effector Tscinitial - The initial configuration of the cube Tscfinal - The desired final configuration of the cube Tcegrasp - The configuration of the end-effector relative to the cube while grasping Tcestandoff - The standoff configuration of the end-effector above the cube, before and after grasping, relative to the cube k - The number of trajectory reference configurations per 0.01 seconds

Outputs:

T - Cell array of Transformations at each time step gripState - State of gripper. 1 for closed, 0 for open

Trajectory Steps:

1. Move the gripper from its initial configuration to a ”standoff” configuration a few cm above the block. 2. Move the gripper down to the grasp position. 3. Close the gripper. 4. Move the gripper back up to the ”standoff” configuration. 5. Move the gripper to a ”standoff” configuration above the final configuration. 6. Move the gripper to the final configuration of the object. 7. Open the gripper. 8. Move the gripper back to the ”standoff” configuration.

Trajectory 1: Move the gripper from its initial configuration to a ”standoff” configuration a few cm above the block.

```
Tf = 10; N = Tf*k/.01;
T = ScrewTrajectory(Tseinitial, Tscinitial*Tcestandoff, Tf, N, 5);
gripState = zeros(1,N);
```

Trajectory 2: Move the gripper down to the grasp position.

```
Tf = 2; N = Tf*k/.01;
Tnew = ScrewTrajectory(Tscinitial*Tcestandoff, Tscinitial*Tcegrasp,
 Tf, N, 5);
T = [T Tnew];
gripState = [gripState zeros(1,N)];
```

Trajectory 3: Close the gripper.

```
Tf = 1; N = Tf*k/.01; % Takes about .65 seconds to close the gripper
Tnew = cell(1,N);
for i = 1:N
    Tnew{i} = T{end};
end
T = [T Tnew];
gripState = [gripState ones(1,N)];
```

Trajectory 4: Move the gripper back up to the ”standoff” configuration.

```
Tf = 2; N = Tf*k/.01;
Tnew = ScrewTrajectory(Tscinitial*Tcegrasp,Tscinitial*Tcestandoff, Tf,
 N, 5);
T = [T Tnew];
gripState = [gripState ones(1,N)];
```

Trajectory 5: Move the gripper to a ”standoff” configuration above the final configuration.

```
Tf = 10; N = Tf*k/.01;
Tnew = ScrewTrajectory(Tscinitial*Tcestandoff,Tscfinal*Tcestandoff,
 Tf, N, 5);
T = [T Tnew];
gripState = [gripState ones(1,N)];
```

Trajectory 6: Move the gripper to the final configuration of the object.

```
Tf = 2; N = Tf*k/.01;
Tnew = ScrewTrajectory(Tscfinal*Tcestandoff,Tscfinal*Tcegrasp, Tf, N,
 5);
T = [T Tnew];
gripState = [gripState ones(1,N)];
```

Trajectory 7: Open the gripper.

```
Tf = 1; N = Tf*k/.01; % Takes about .65 seconds to close the gripper
Tnew = cell(1,N);
for i = 1:N
    Tnew{i} = T{end};
end
T = [T Tnew];
gripState = [gripState zeros(1,N)];
```

Trajectory 8: Move the gripper back to the ”standoff” configuration.

```
Tf = 2; N = Tf*k/.01;
Tnew = ScrewTrajectory(Tscfinal*Tcegrasp,Tscfinal*Tcestandoff, Tf, N,
 5);
T = [T Tnew];
gripState = [gripState zeros(1,N)];
```

Save Transformation States to Matrix and Save to File

```
for i = 1:length(T)
    Tse(i,:) = [T{i}(1,1) T{i}(1,2) T{i}(1,3) T{i}(2,1) T{i}(2,2) T{i}
(2,3) T{i}(3,1) T{i}(3,2) T{i}(3,3) T{i}(1,4) T{i}(2,4) T{i}(3,4)
 gripState(i)];
end
writematrix(Tse,'C:\Users\ethan\OneDrive\Documents\MATLAB\MAE
 204\FinalProject\Tse.csv');
```

Copellia Viedo Link

https://drive.google.com/drive/folders/1rGz7sa2HcHKVPKZYq9HZyhNNsDw576cz?usp=sharing

```
end
```

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