

Robot Practical Course

Assignment #3

In this assignment the practical application of trajectory generation and execution.

Task 3.1 Initialize new scene:

- Exchange the `IKSolver.cs` with the new version from the website

```
wget http://tams.informatik.uni-hamburg.de/lectures/2017ss/vorlesung/itr/rpc/IKSolver.cs  
cp IKSolver.cs ~/RPC_Assignment_1/Assets/Plugins/BioIK/AllYouNeed/Components/Solvers/
```

- Open the Unity3D project in your home folder
- Create a new empty scene and save it
- Import the demo script for your preferred language (C#/JS)

```
wget http://tams.informatik.uni-hamburg.de/lectures/2017ss/vorlesung/itr/rpc/SolveIK_CS.cs
```

or

```
wget http://tams.informatik.uni-hamburg.de/lectures/2017ss/vorlesung/itr/rpc/SolveIK_JS.js
```

```
cp SolveIK_*S.*s ~/RPC_Assignment_1/Assets/Assignments/<SCENENAME>/
```

- Import the KUKA LBR IIWA (`Models/Files/KUKA/lbr_iiwa.urdf`) using the URDF Importer.
Note: Set the Mesh Orientation to $[0 \ 90 \ 0]$
- Attach the Robot script to the `kuka_lbr_iiwa_14_r820`
- Attach the `SolveIK_*S.*s` script

Task 3.2 Use IKSolver:

3.2.1: Run the Scene. The Console will print the robot configurations instead of driving the robot to the position.

3.2.2: Adapt the script to return valid waypoints in joint space for the House of Santa Claus problem. Visualize the waypoints by setting the manipulator to the desired points using instantaneous motion with a time interval of one second in joint space control.

Task 3.3 Interpolation:

3.3.1: Switch the joint mode to `realistic`. Reduce the maximum joint speed by factor 10. Repeat the execution of the script.

3.3.2: Adapt your script to run a control loop with an interpolated trajectory. Perform interpolation in cartesian space and ensure that the deviation of the actual robot position and the trajectory step is ≤ 2 mm

3.3.3: Perform the previous task using interpolation in joint space. Explain the differences to a supervisor.



Bonus Task 3.4 IK spiral: Use inverse kinematics to let the tool perform an upwards spiral with decreasing radius

Bonus Task 3.5 FK spiral: Use forward kinematics to let the tool perform an upwards spiral with decreasing radius