

Starting the KRL Script

Start the Orocos scripts on the robot controller. Do not do this alone if you use the robot for the first time. Contact the responsible person listed [here](#).

Running the server side software

This is now the time to start the IISOrocos server side software. The software is run by starting roscore and running an instance of IISOrocos for each arm:

```
$IIS_INCLUDE_PATH/iis_scripts/both_arms.sh
```

Arm Control Topics

The topic names have the following structure (according to the lab internal convention orocos topic names have been changed compared to older versions):

```
$execution_type$/hardware$/control_type$/control_topic$
```

```
execution_type = {simulation, real}  
hardware = {right_arm, left_arm, right_sdh, left_sdh, kinect1, kinect2}  
control_type = {joint_control, cartesian_control, settings, sensing}
```

Message Types

todo

Readable Topics

joint_control/get_state

Returns the current joint positions of the arm

Message type:

```
sensor_msgs/JointState
```

Sample call:

```
rostopic echo /real/right_arm/joint_control/get_state
```

Sample output:

```
header:  
  seq: 26774  
  stamp:  
    secs: 0  
    nsecs: 0  
  frame_id: dummy_frame_id  
name: ['arm_0_joint', 'arm_1_joint', 'arm_2_joint', 'arm_3_joint',  
'arm_4_joint', 'arm_5_joint', 'arm_6_joint']  
position: [-0.025538215413689613, 0.8757621049880981, 1.995240569114685,  
0.5836411118507385, -0.18975336849689484, 0.7183101773262024,  
1.3192434310913086]  
velocity: [0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0] <-- not working currently  
effort: [0.24101980030536652, 0.2610560357570648, 0.6392512917518616,  
-0.3438339829444885, -0.23192289471626282, 1.0096474885940552,  
-0.44344362616539]
```

joint_control/get_impedance

Returns joint impedance values

Message type:

```
iis_orocos/FriJointImpedance
```

Sample call:

```
rostopic echo /real/right_arm/cartesian_control/get_impedance
```

Sample output:

```
stiffness: [250.0, 250.0, 250.0, 250.0, 250.0, 250.0, 250.0]  
damping: [0.699999988079071, 0.699999988079071, 0.699999988079071,  
0.699999988079071, 0.699999988079071, 0.699999988079071, 0.699999988079071]
```

cartesian_control/get_impedance

Returns Cartesian impedance values

Message type:

```
iis_orocos/CartesianImpedance
```

Sample call:

```
rostopic echo /real/right_arm/cartesian_control/get_impedance
```

Sample output:

```
stiffness:
  linear:
    x: 1000.0
    y: 1000.0
    z: 1000.0
  angular:
    x: 100.0
    y: 100.0
    z: 100.0
damping:
  linear:
    x: 0.3
    y: 0.3
    z: 0.3
  angular:
    x: 0.3
    y: 0.3
    z: 0.3
cpmaxdelta: 0.0
maxforce: 0.0
axismaxdeltatrq: 0.0
```

cartesian_control/get_pose

Returns cartesian pose of the arm

Message type:

```
geometry_msgs/Pose
```

Sample call:

```
rostopic echo /real/right_arm/cartesian_control/get_impedance
```

Sample output:

```
position:
  x: -0.671013116837
  y: 0.200215816498
  z: 0.752071797848
orientation:
  x: 0.452136724939
  y: 0.0641745917401
  z: -0.889025856601
  w: 0.0331853931426
```

cartesian_control/get_velocity_limit

Returns Cartesian velocity limit (see cartesian_control/set_velocity_limit)

Message type:

```
std_msgs/Float32
```

Sample call:

```
rostopic echo /real/right_arm/cartesian_control/get_velocity_limit
```

Sample output:

```
data: 0.0
```

joint_control/get_velocity_limit

Returns joint velocity limit (see joint_control/set_velocity_limit)

Message type:

```
std_msgs/Float32
```

Sample call:

```
rostopic echo /real/right_arm/joint_control/get_velocity_limit
```

Sample output:

```
data: 0.10000000149
```

Writable Topics

cartesian_control/move

Trajectory movement in cartesian space. The trajectory has to be provided in small pieces. This must **not** be used for ptp movement as it can yield high accelerations. It accepts the pose in which the arm should be after the next cycle (one cycle has a duration between 1 and 20 ms)

Message type:

```
geometry_msgs/Pose
```

Sample call:

```
The following is not recommend to use outside of a program providing proper trajectories, as it can yield high accelerations when used wrongly  
TODO
```

cartesian_control/ptp

Movement in cartesian space for point to point movement

Message type:

```
std_msgs/Float64MultiArray
```

Sample call:

```
TODO
```

cartesian_control/set_impedance

Sets cartesian impedance values (stiffness, damping, cpmaxdelta, maxforce, axismaxdeltatrq)

Message type:

```
iis_orocos/CartesianImpedance
```

Sample call:

```
rostopic pub /real/right_arm/cartesian_control/set_impedance
iis_orocos/CartesianImpedance "stiffness:
  linear: {x: 1000.0, y: 1000.0, z: 1000.0}
  angular: {x: 100.0, y: 100.0, z: 100.0}
damping:
  linear: {x: 0.3, y: 0.3, z: 0.3}
  angular: {x: 0.3, y: 0.3, z: 0.3}
cpmaxdelta: 0.0
maxforce: 0.0
axismaxdeltatrq: 0.0"
```

cartesian_control/set_velocity_limit

Sets maximum velocity limit for trajectory movements in cartesian space (cartesian_control/move). It expects the maximum allowed absolute Cartesian moving distance within one cycle.

Message type:

```
std_msgs/Float32
```

Sample call:

```
rostopic pub /real/right_arm/cartesian_control/set_velocity_limit
std_msgs/Float32 0.0
```

settings/switch_mode (write)

```
modes:  
  10   Position Controller  
  20   Cartesian Stiffness Controller (be careful in mode 20 -  
calibration seems to be not complete for right arm - drifting observed)  
  30   Axis-specific Stiffness Controller  
 101   Gravity Compensation
```

```
usage example:  
  rostopic pub /real/right_arm/settings/switch_mode std_msgs/Int32 10
```

sensing/cartesian_wrench (read)

```
returns forces and torques
```

sensing/state (read)

```
returns int array containing robot state  
[0] power  
[1] control  
[2] error  
[3] warning
```

sensing/temperature (read)

```
returns temperature of robot joints in float array
```

joint_control/get_impedance (read)

```
returns joint impedance values
```

settings/get_command_state (read)

```
returns current command state in float32multiarray ([0] --> 0 = monitor  
mode, 1 = command mode; [1] --> number of control mode)
```

joint_control/move

```
movement in joint space
```

joint_control/get_state

returns joint pose of the arm

joint_control/set_impedance

sets joint impedance values

joint_control/set_velocity_limit

sets maximum velocity limit for movements in joint space

From:

<https://iis.uibk.ac.at/> - IIS

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