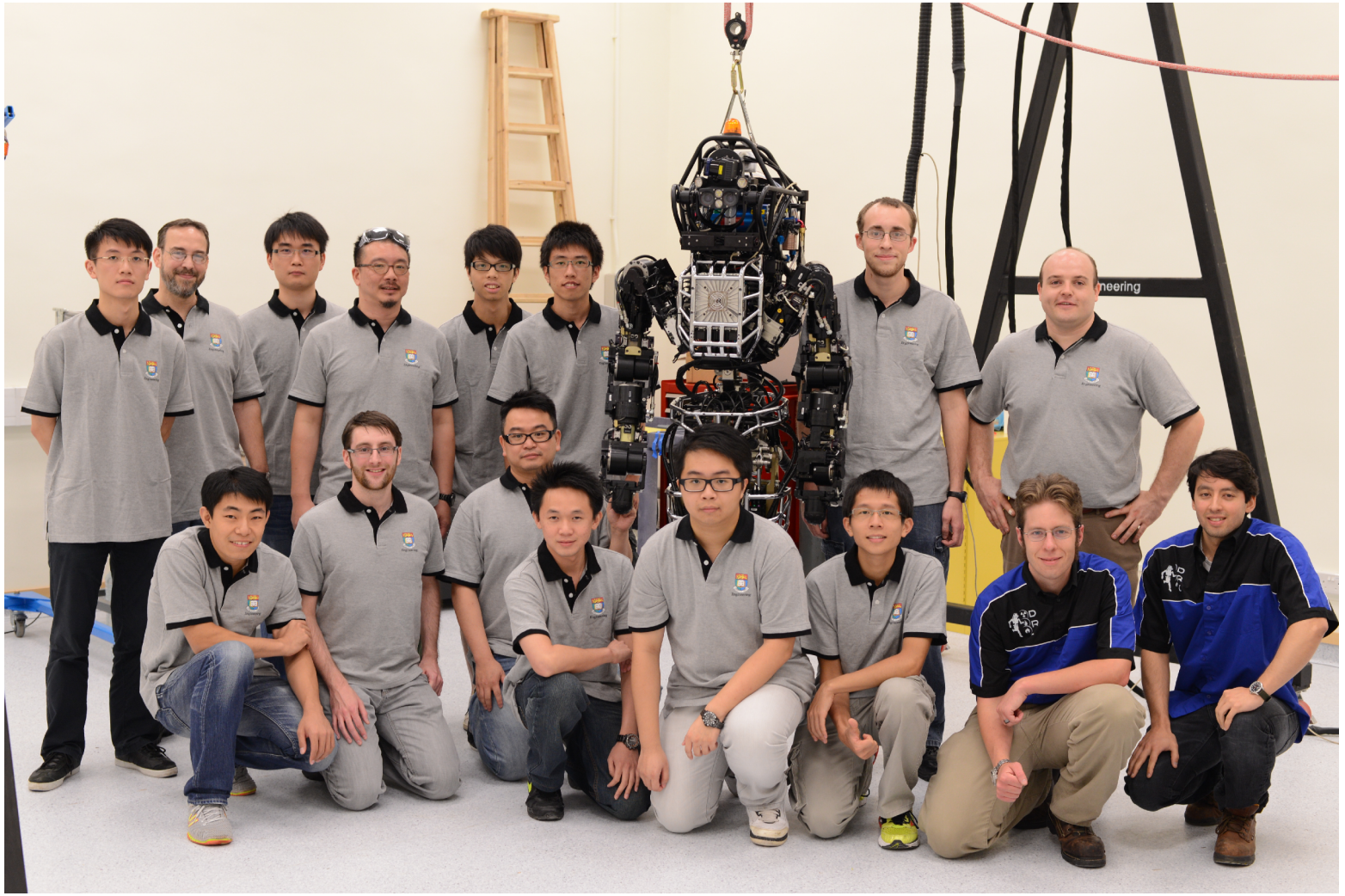
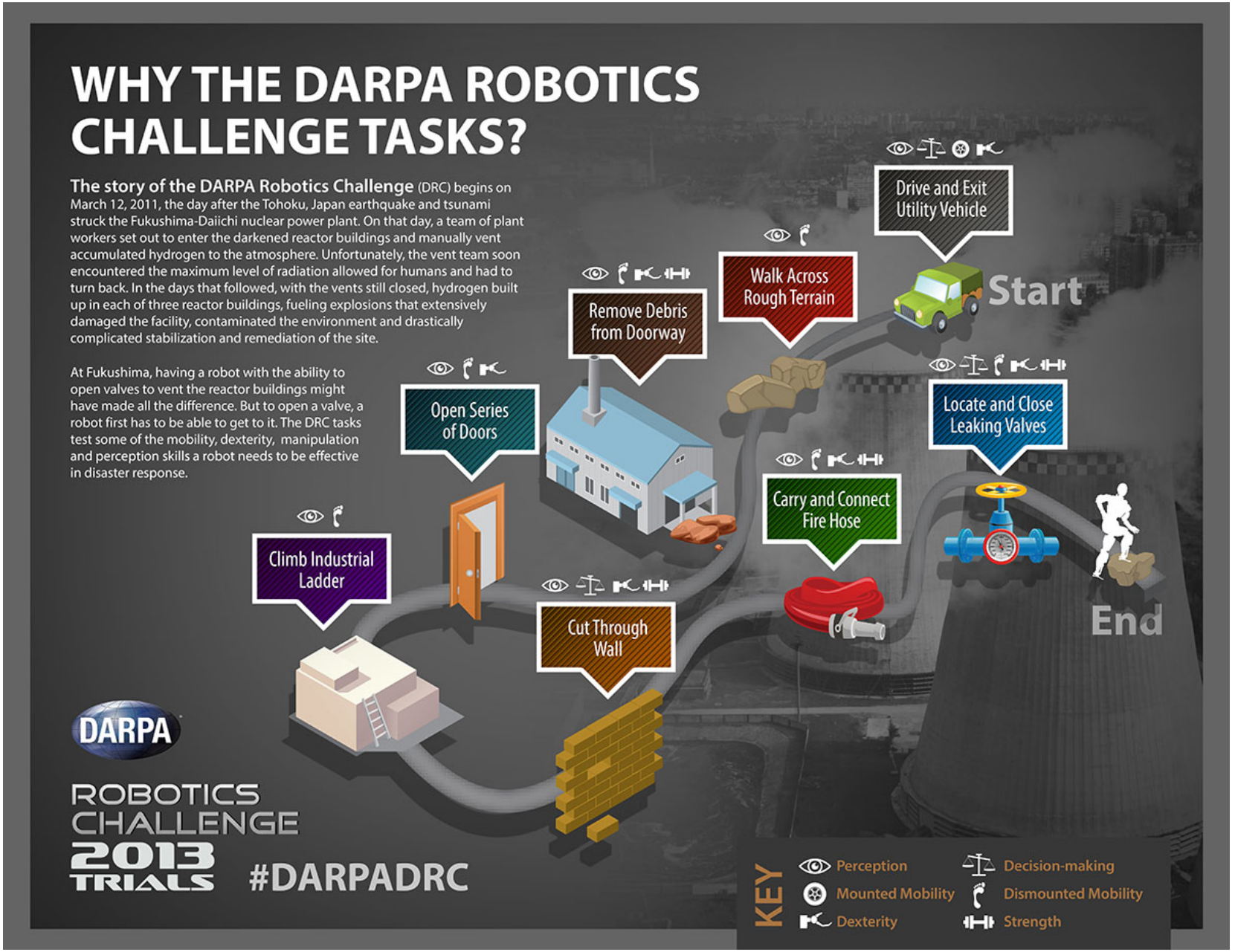
ROS, Atlas and the DARPA Robotics Challenge

Chris Swetenham
Research Associate
Advanced Robotics Laboratory
HKU

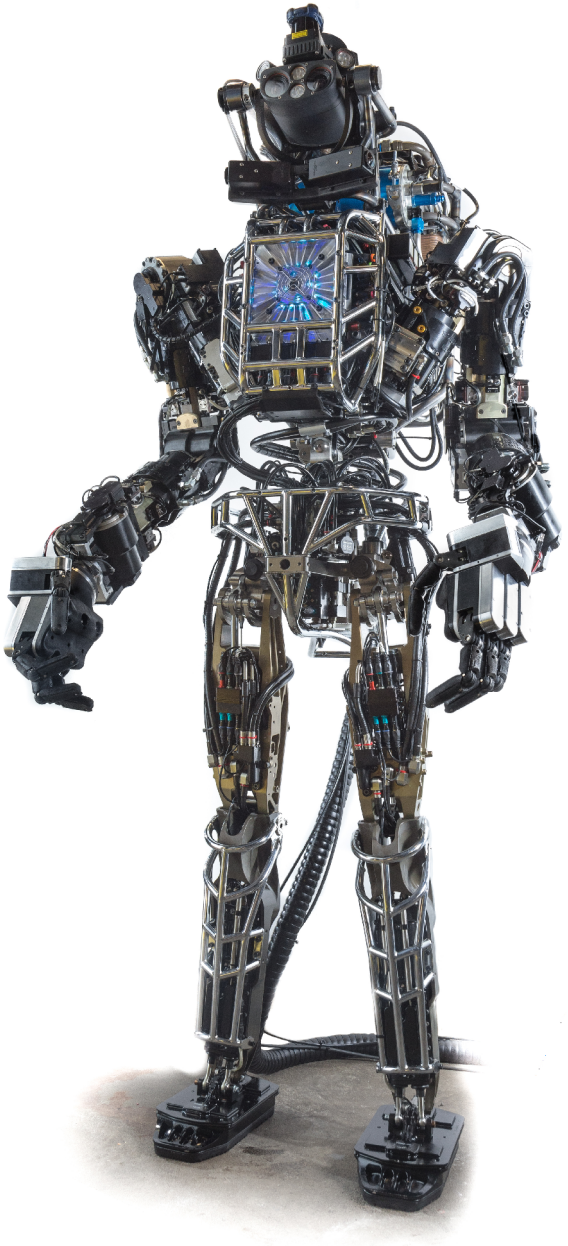
Team HKU



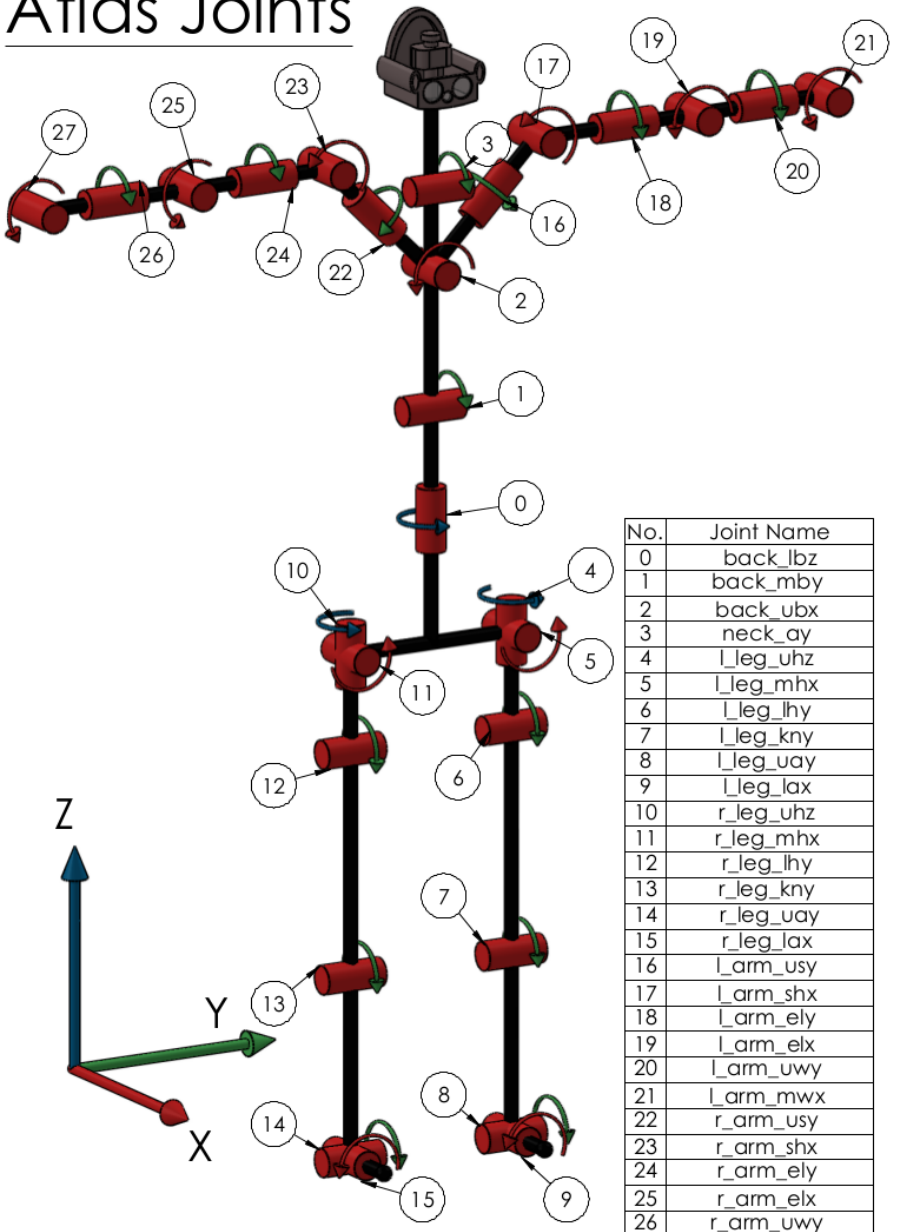
DARPA Robotics Challenge



Atlas

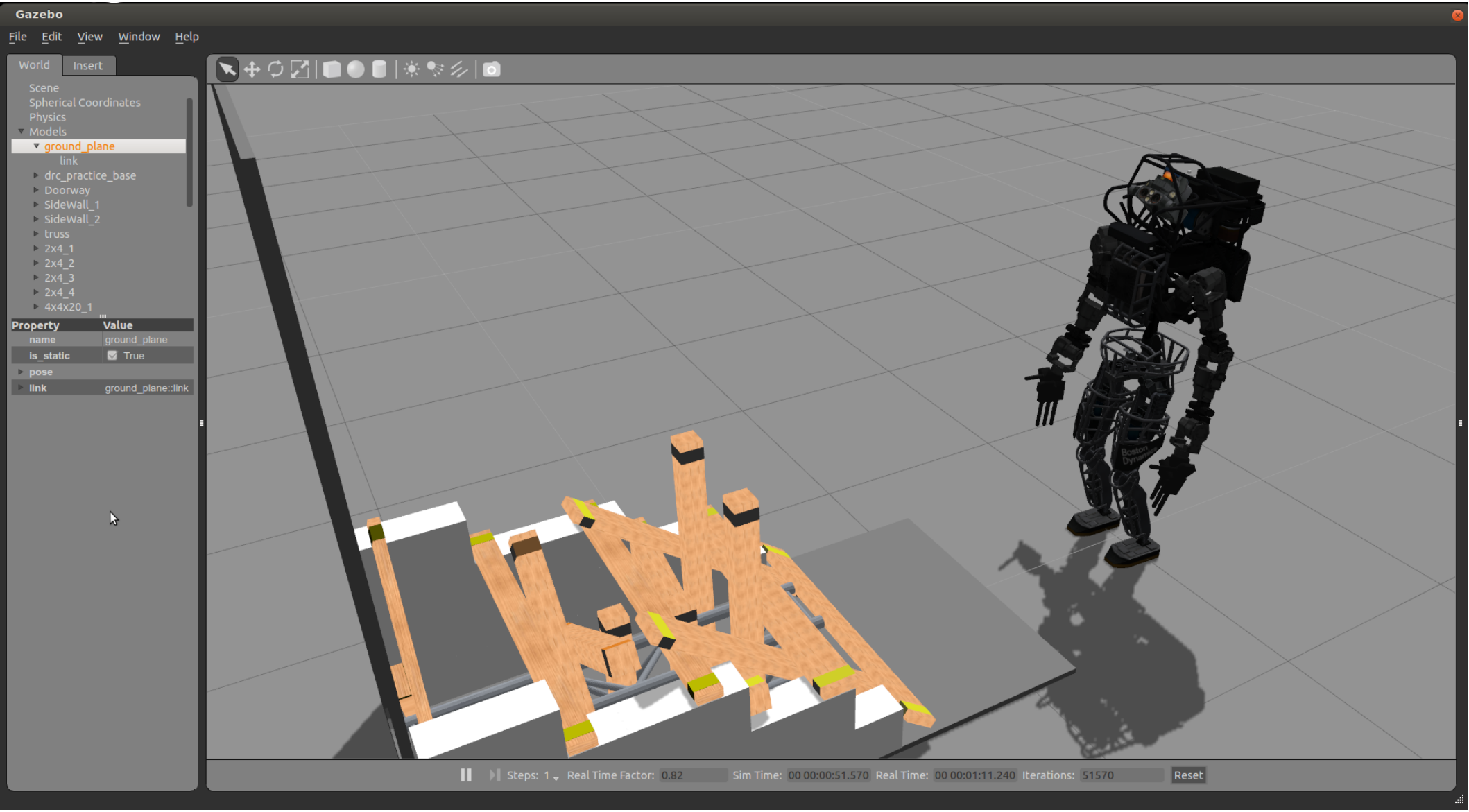


Atlas Joints

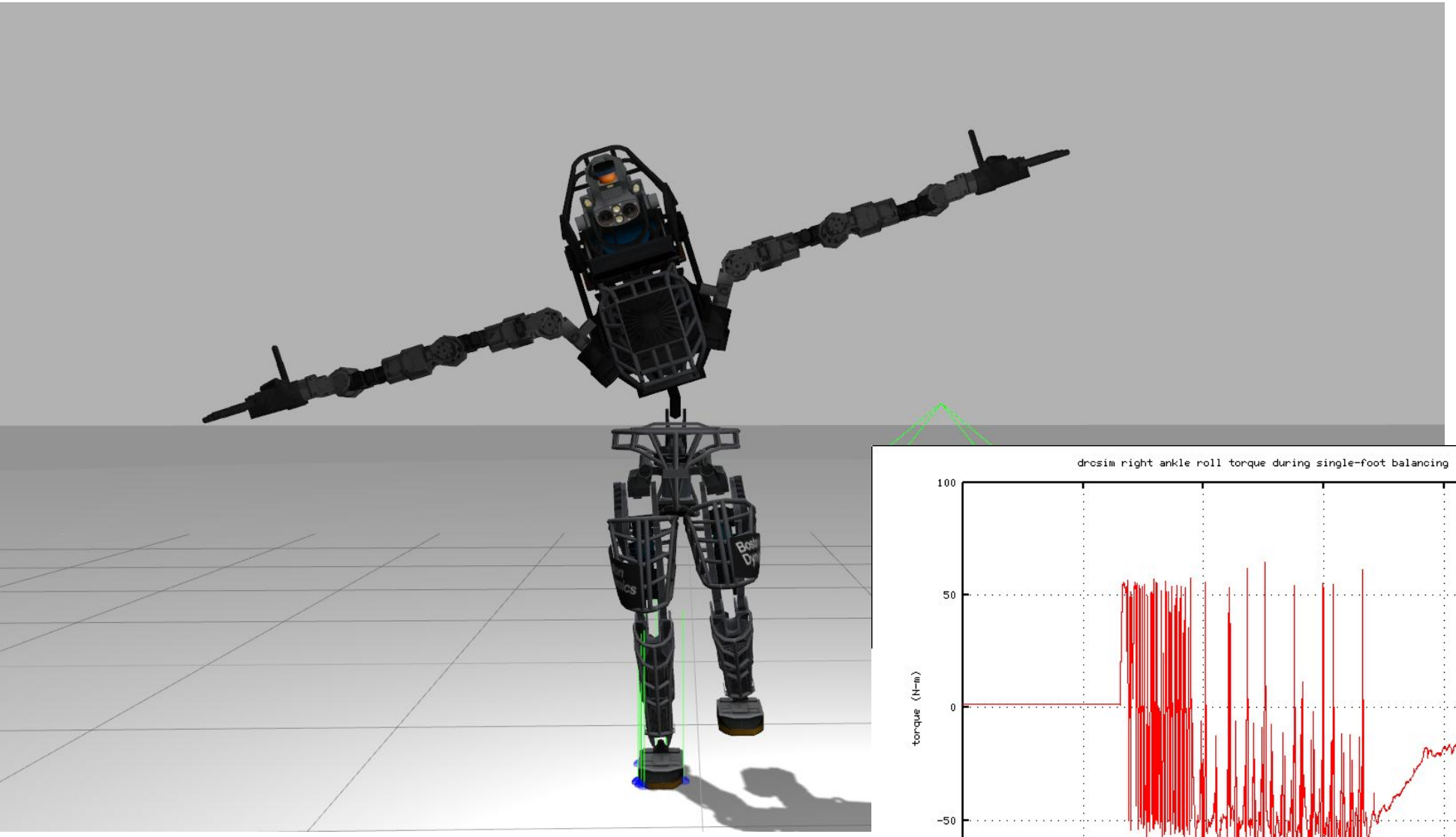


No.	Joint Name
0	back_lbz
1	back_mby
2	back_ubx
3	neck_ay
4	l_leg_uhz
5	l_leg_mhx
6	l_leg_lhy
7	l_leg_kny
8	l_leg_uay
9	l_leg_lax
10	r_leg_uhz
11	r_leg_mhx
12	r_leg_lhy
13	r_leg_kny
14	r_leg_uay
15	r_leg_lax
16	l_arm_usy
17	l_arm_shx
18	l_arm_ely
19	l_arm_elx
20	l_arm_uwy
21	l_arm_mwx
22	r_arm_usy
23	r_arm_shx
24	r_arm_ely
25	r_arm_elx
26	r_arm_uwy
27	r_arm_mwx

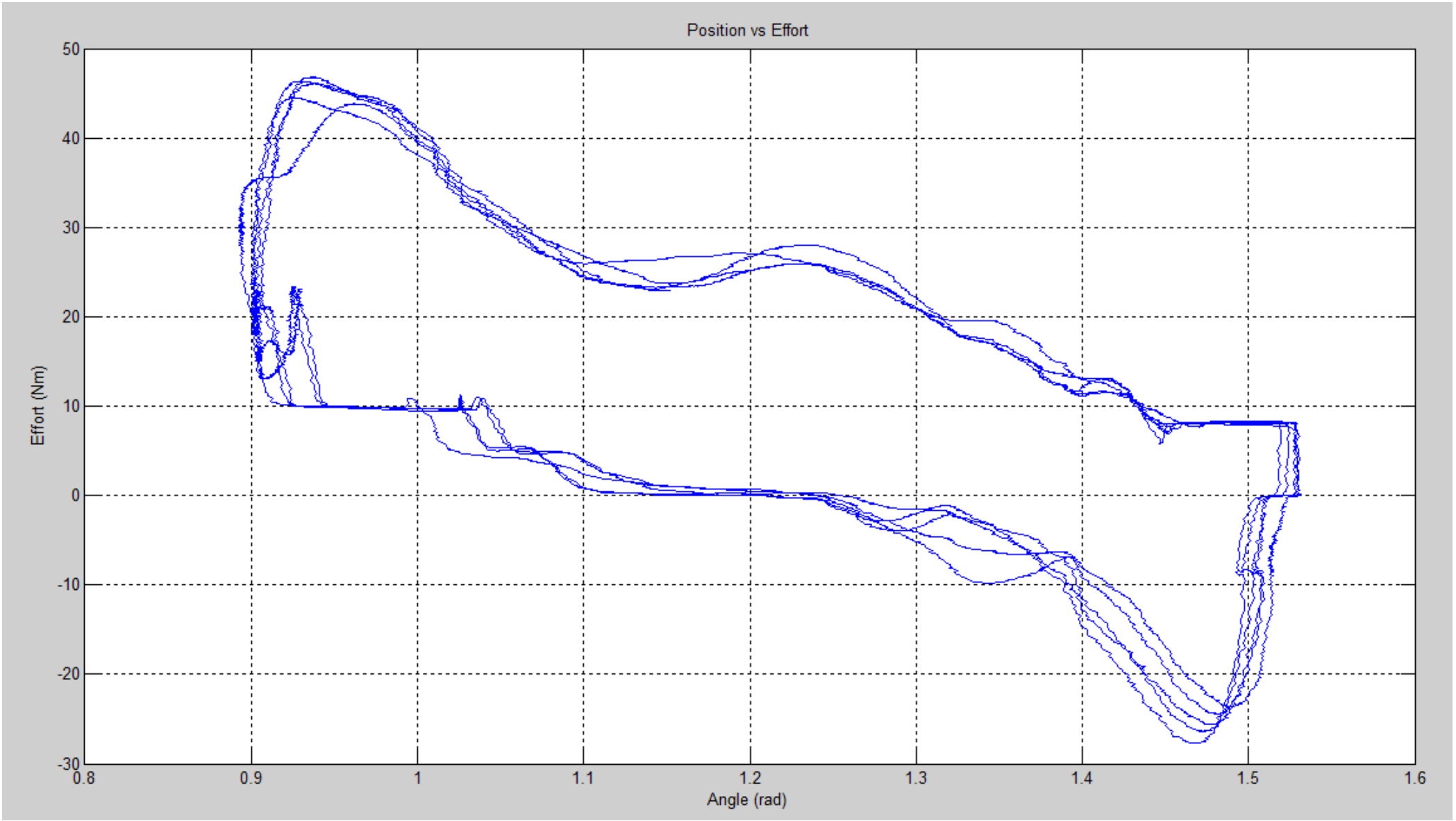
Gazebo + DRCSim



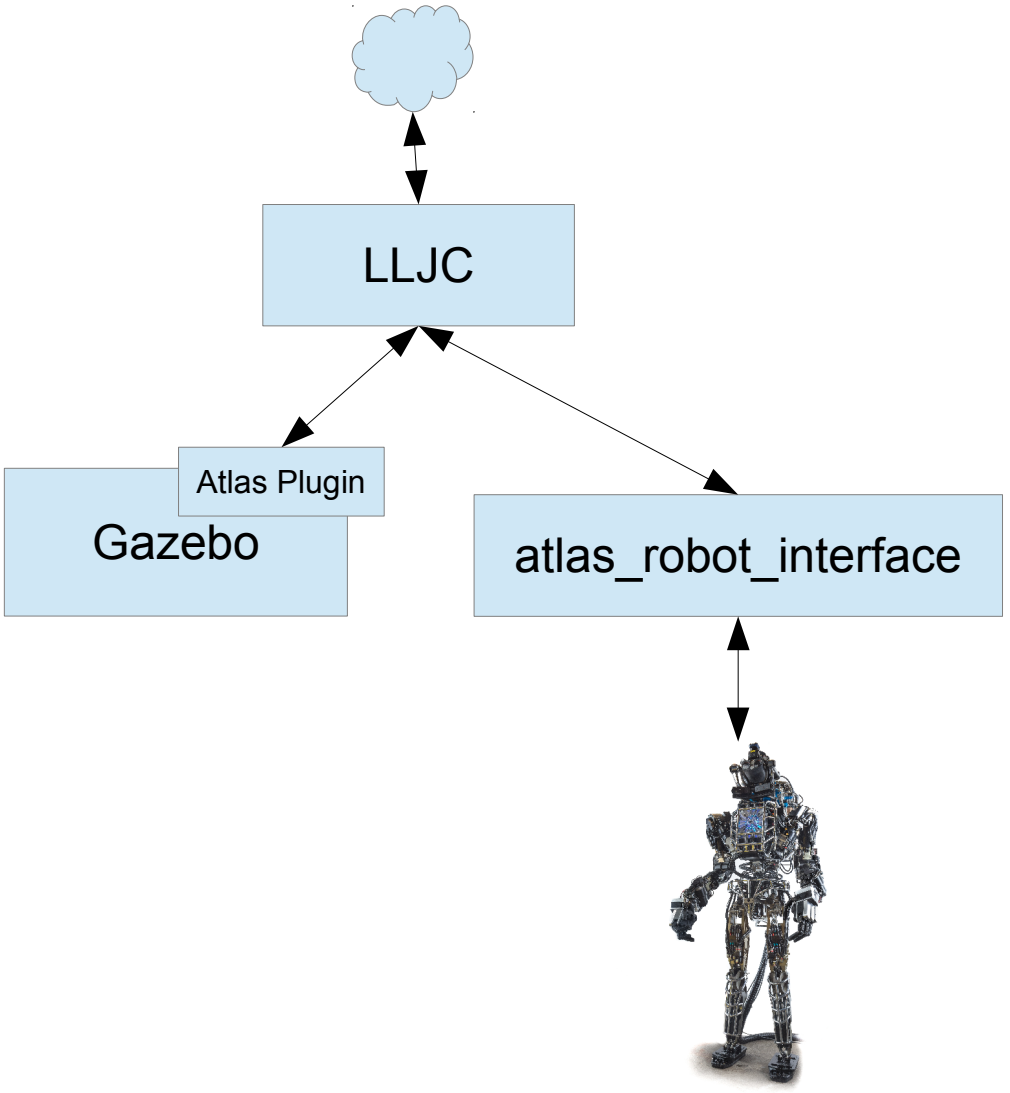
Gazebo + DRCSim



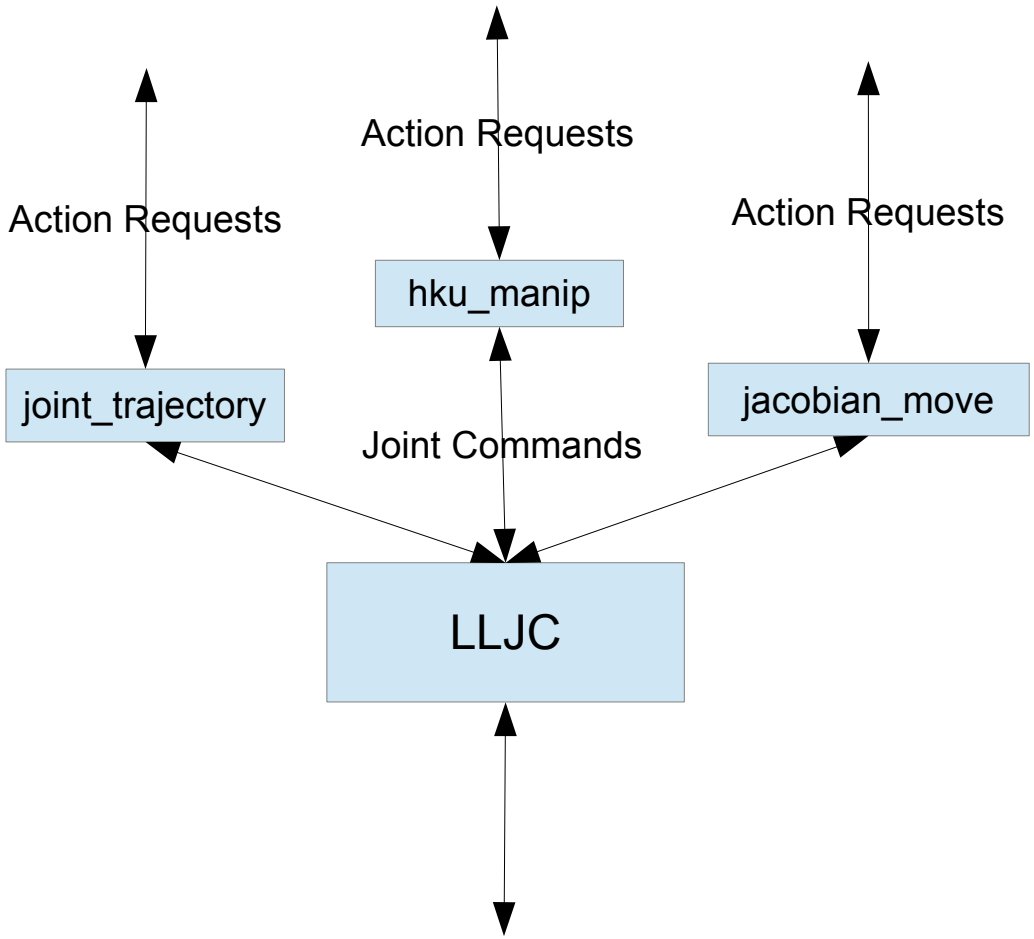
Gazebo + DRCSim

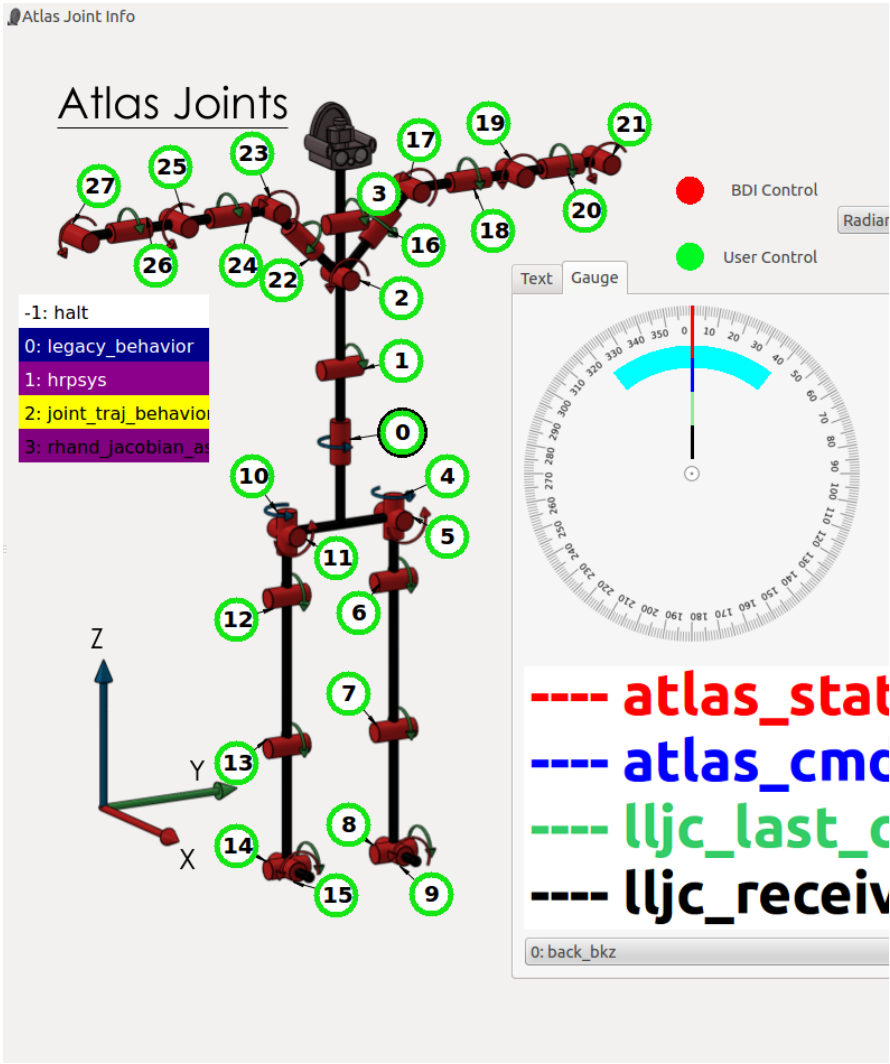


Controlling Atlas

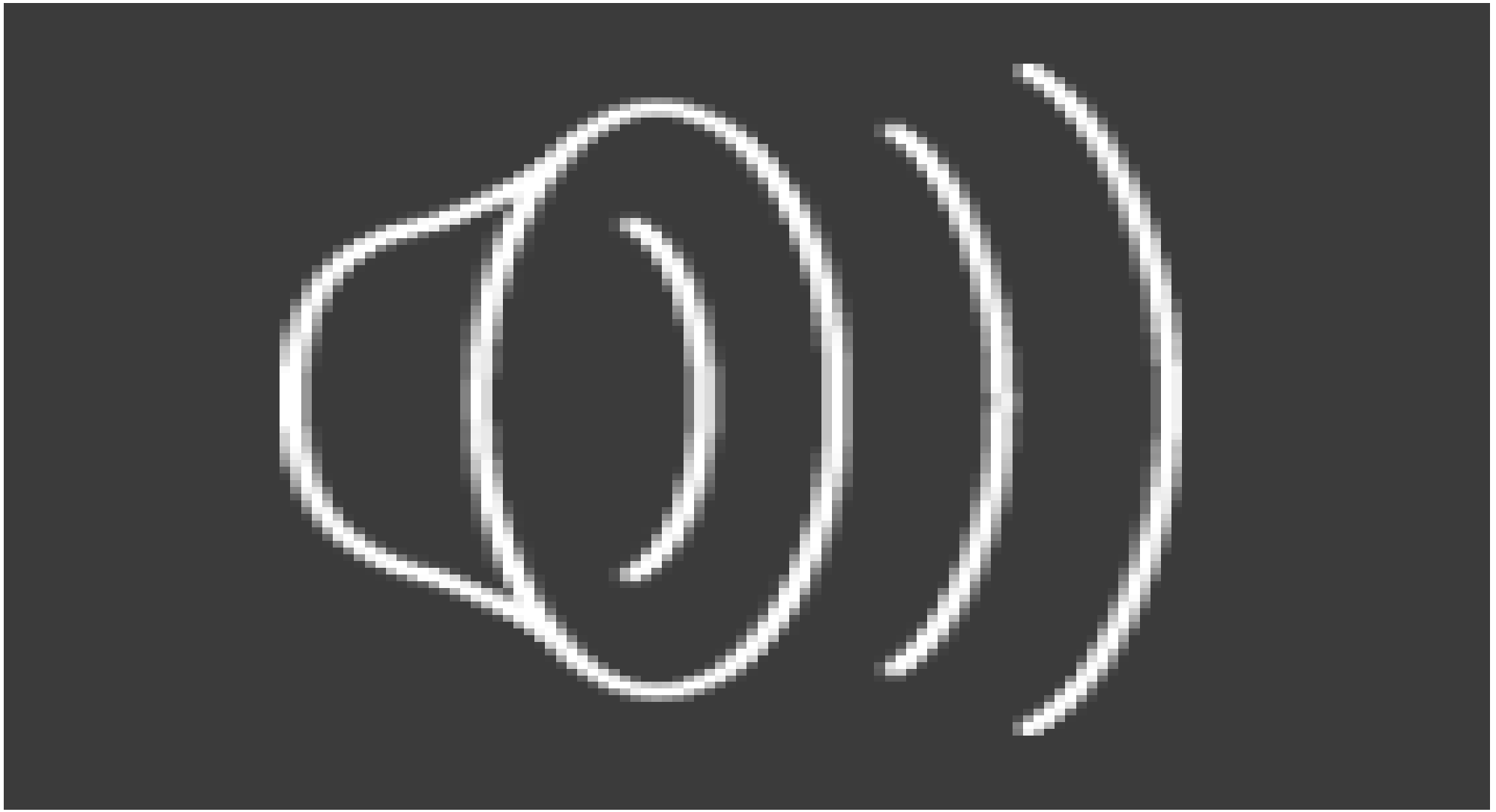


Controlling multiple behaviours

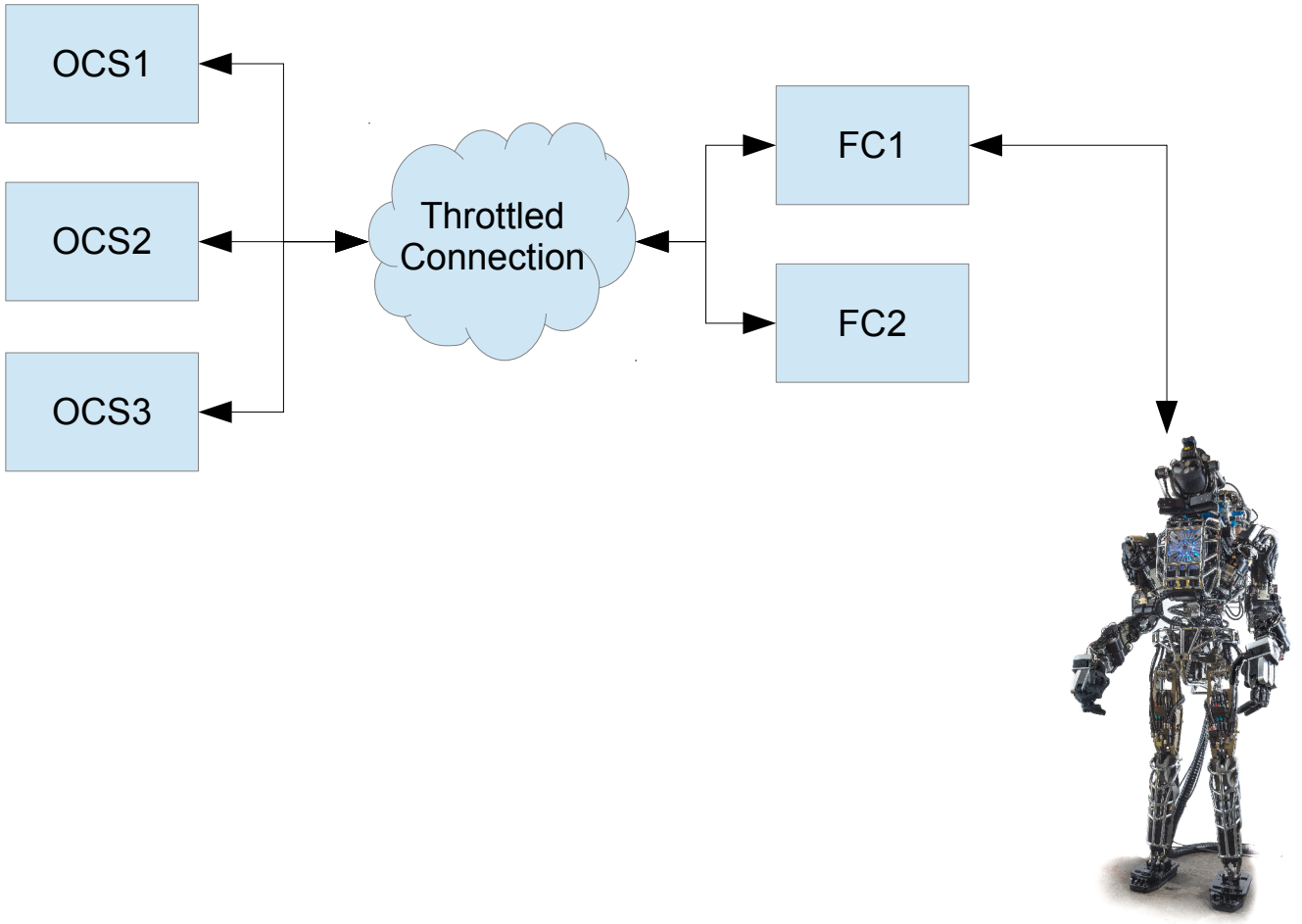




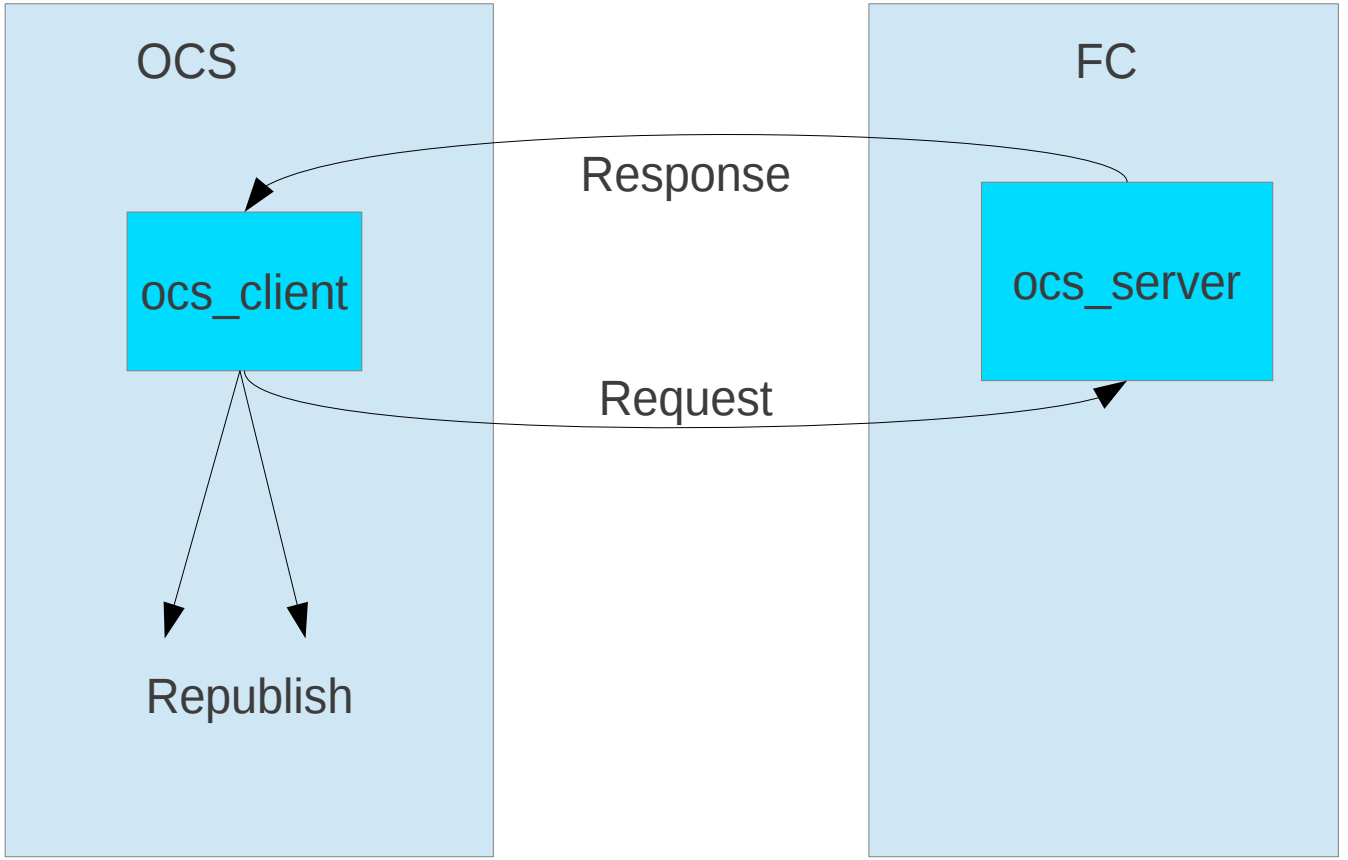
Egg Demo



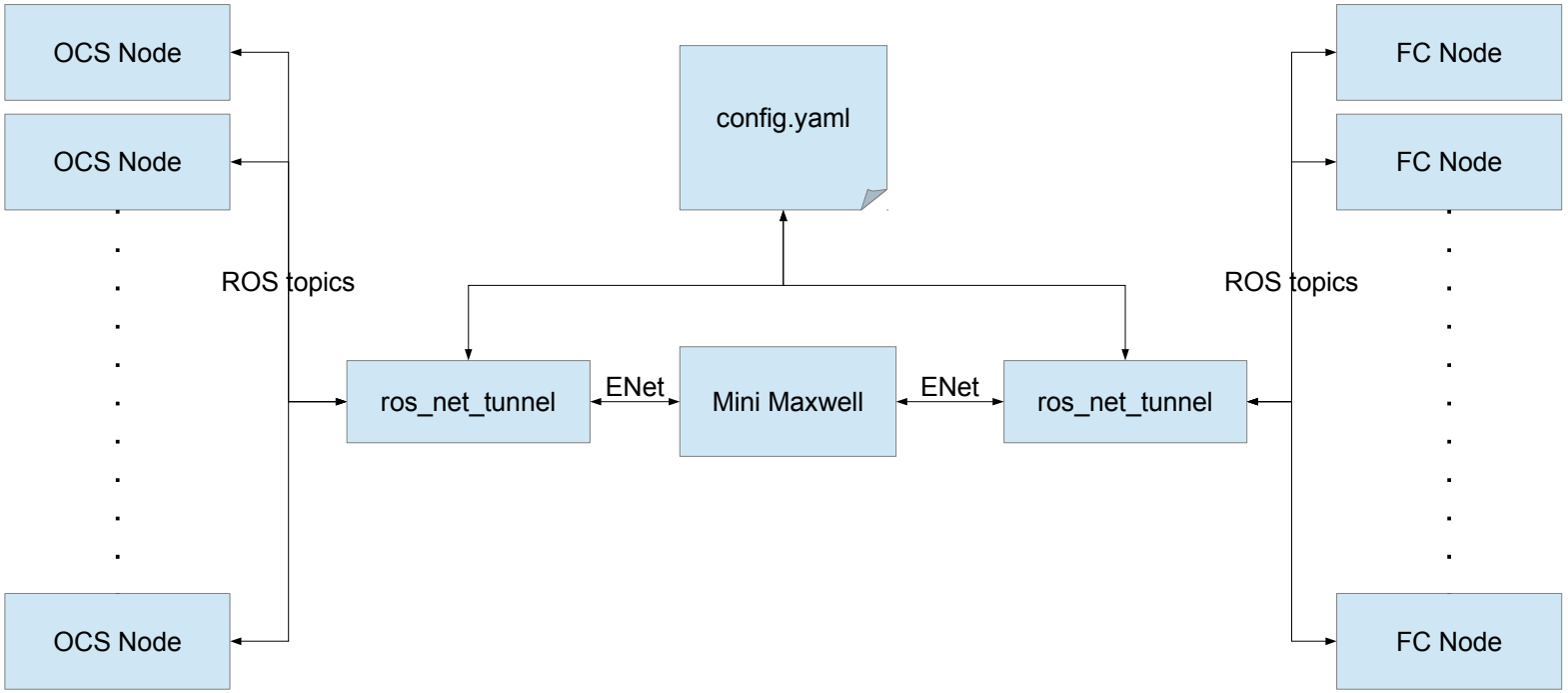
DARPA Challenge Networking



DARPA Challenge Networking

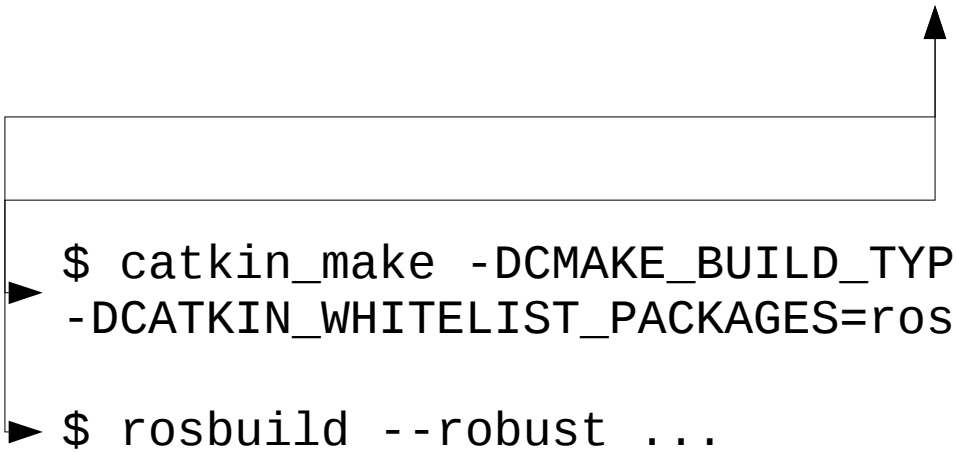


ros_net_tunnel



hku_make

```
$ hku_make atlas_robot_interface
```



```
$ catkin_make -DCMAKE_BUILD_TYPE=RelWithDebInfo
-DCATKIN_WHITELIST_PACKAGES=rosconsole;rosparam;rospack;...

$ rosbuild --robust ...
```

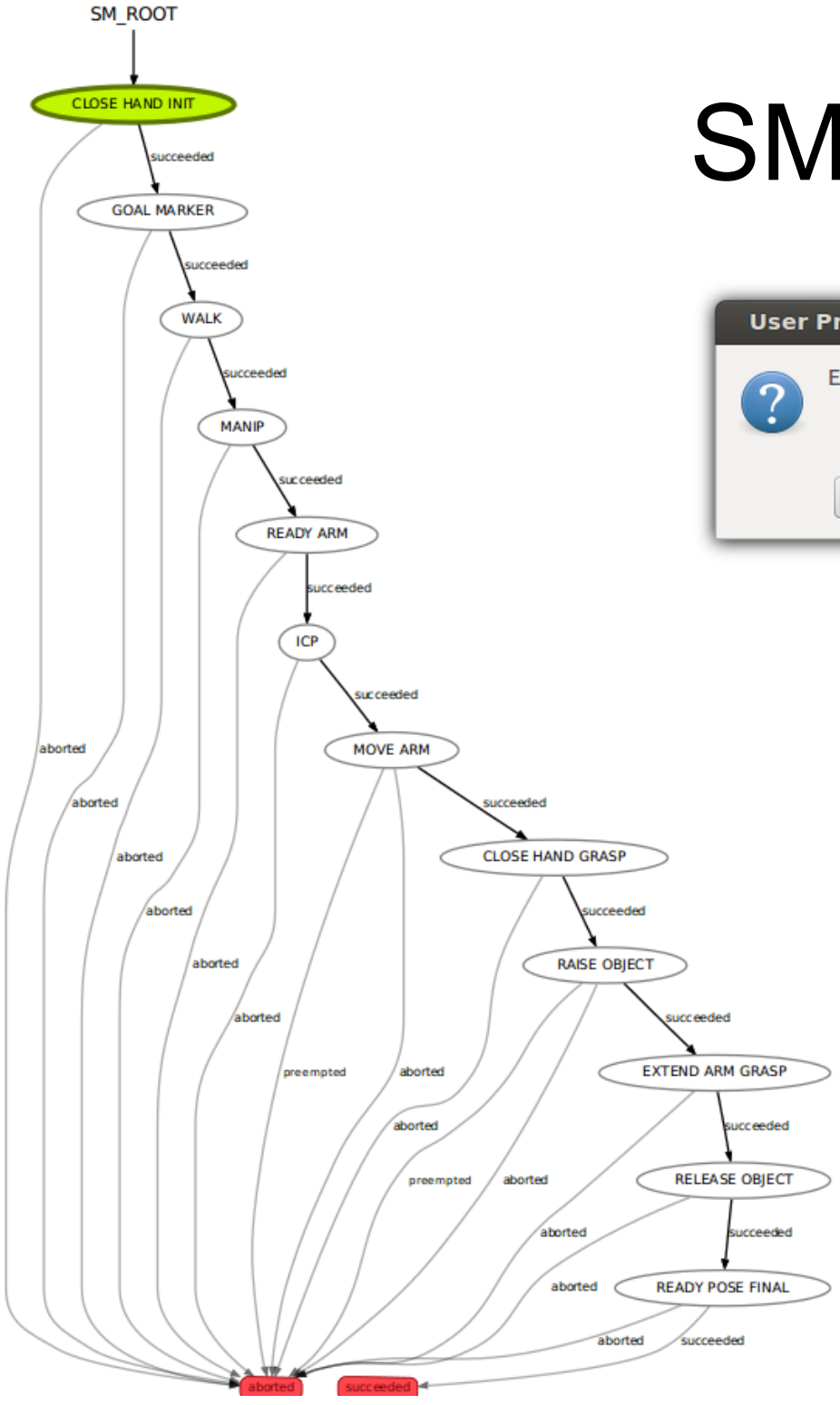
hku_make

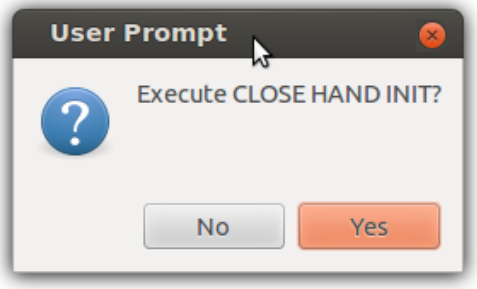
```
$ hku_make atlas_robot_interface
```

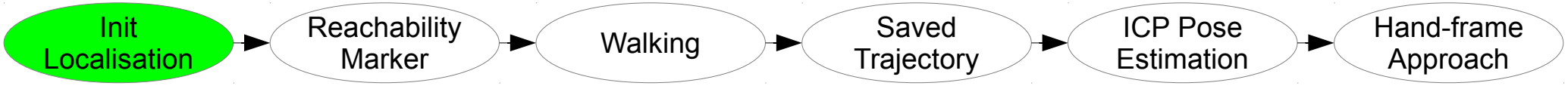
```
$ catkin_make -DCMAKE_BUILD_TYPE=RelWithDebInfo
-DCATKIN_WHITELIST_PACKAGES=rosconsole;rosparam;rospack;...

$ rosbuild --robust ...
```

```
 _____________
< Success! >
 -------------
        \   ^__^
         \  (oo)\_______
            (__)\       )\/\
                ||----w |
                ||     ||
```

SMACH

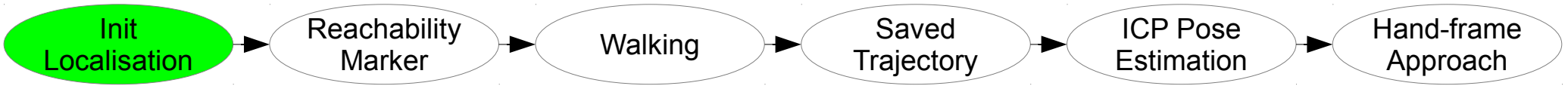

SM_ROOT
CLOSE HAND INIT
succeeded
GOAL MARKER
succeeded
WALK
succeeded
MANIP
succeeded
READY ARM
succeeded
ICP
succeeded
MOVE ARM
succeeded
CLOSE HAND GRASP
succeeded
RAISE OBJECT
succeeded
EXTEND ARM GRASP
succeeded
RELEASE OBJECT
succeeded
READY POSE FINAL
succeeded
aborted
preempted
aborted
succeeded


User Prompt
Execute CLOSE HAND INIT?
No
Yes



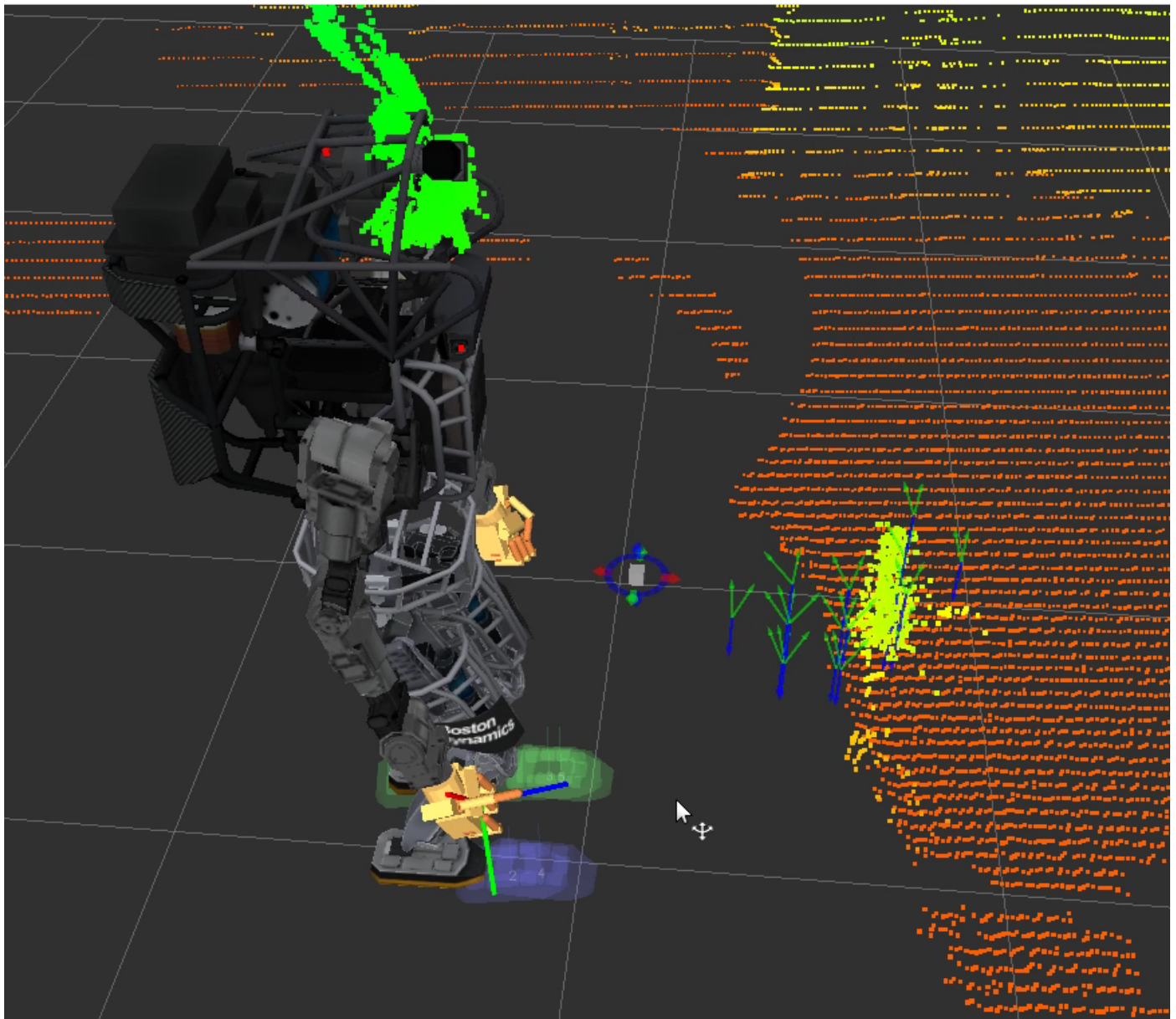
Localisation

(Video clip of patch selection)

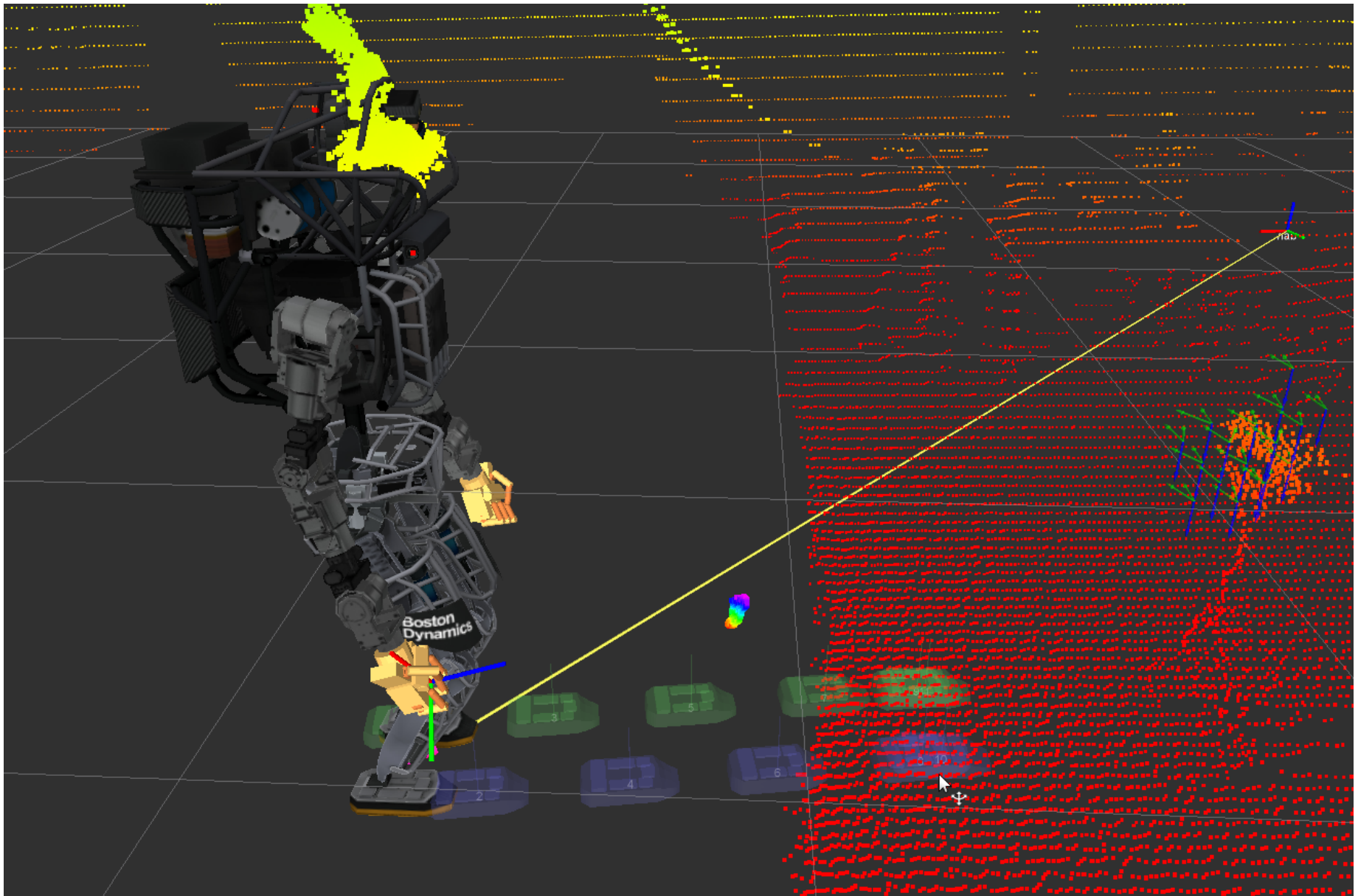


Localisation

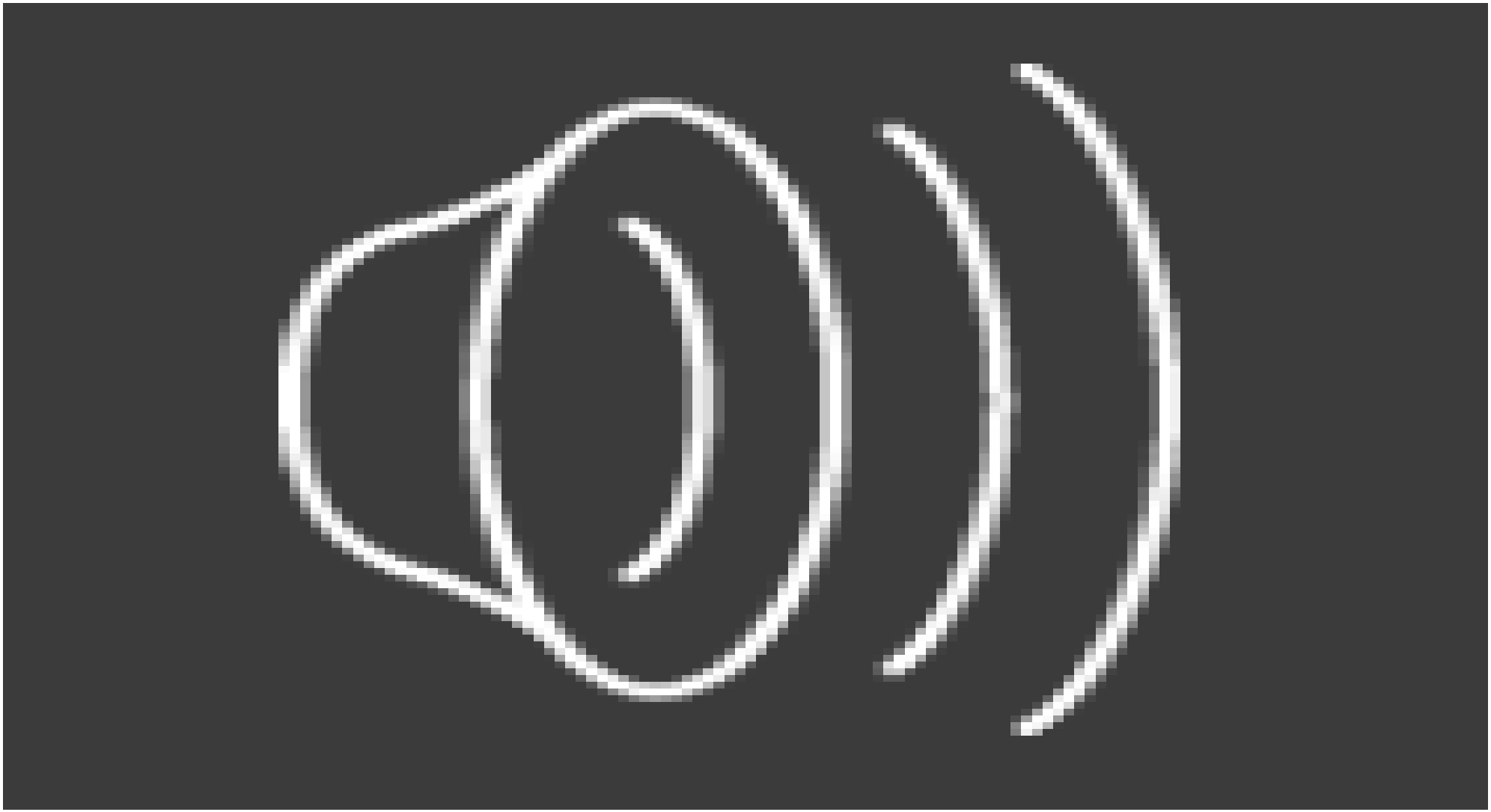
Reachability Marker

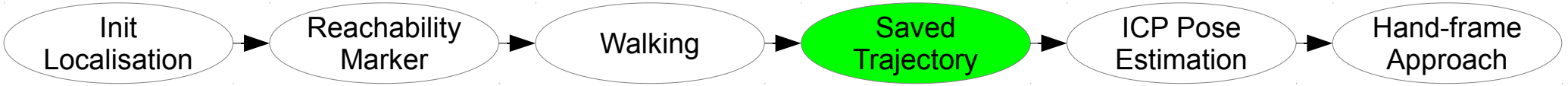


Walking



Walking Demo

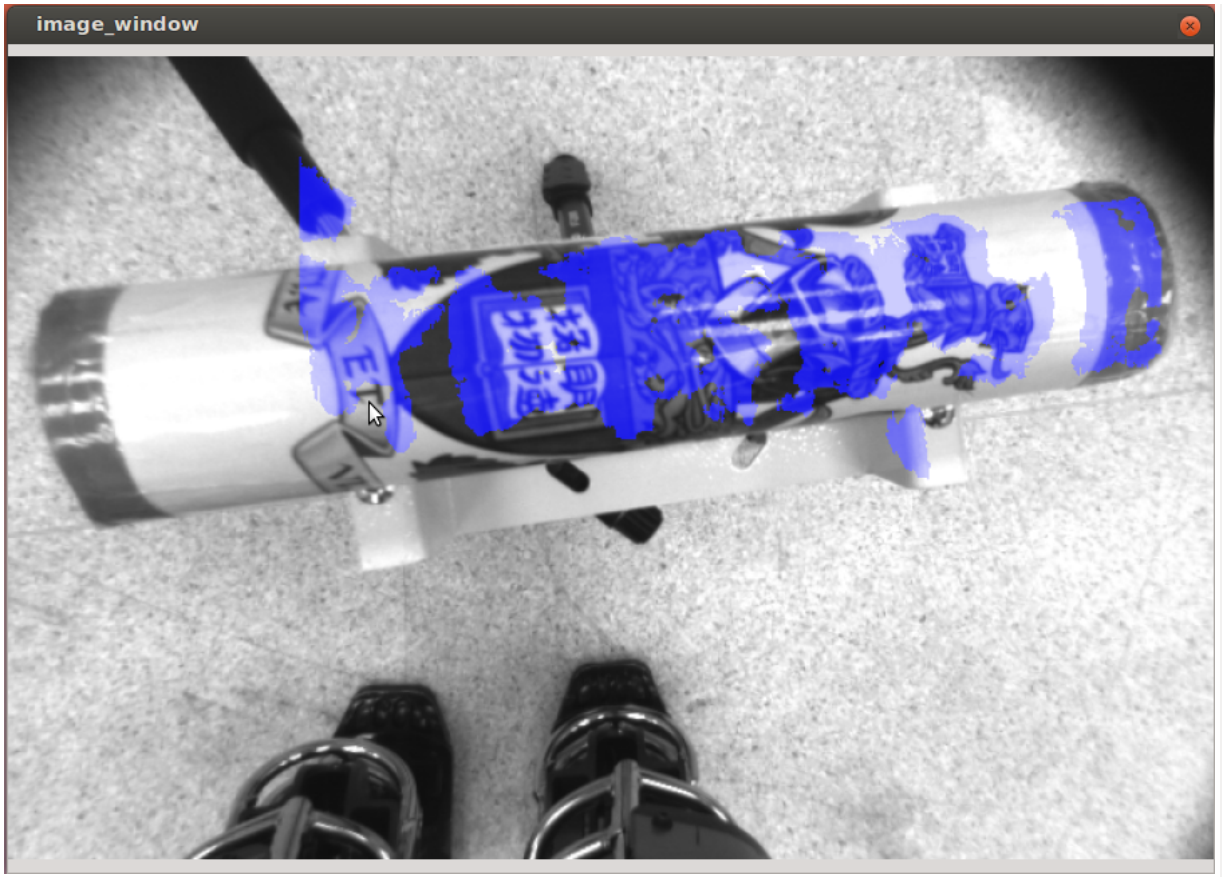


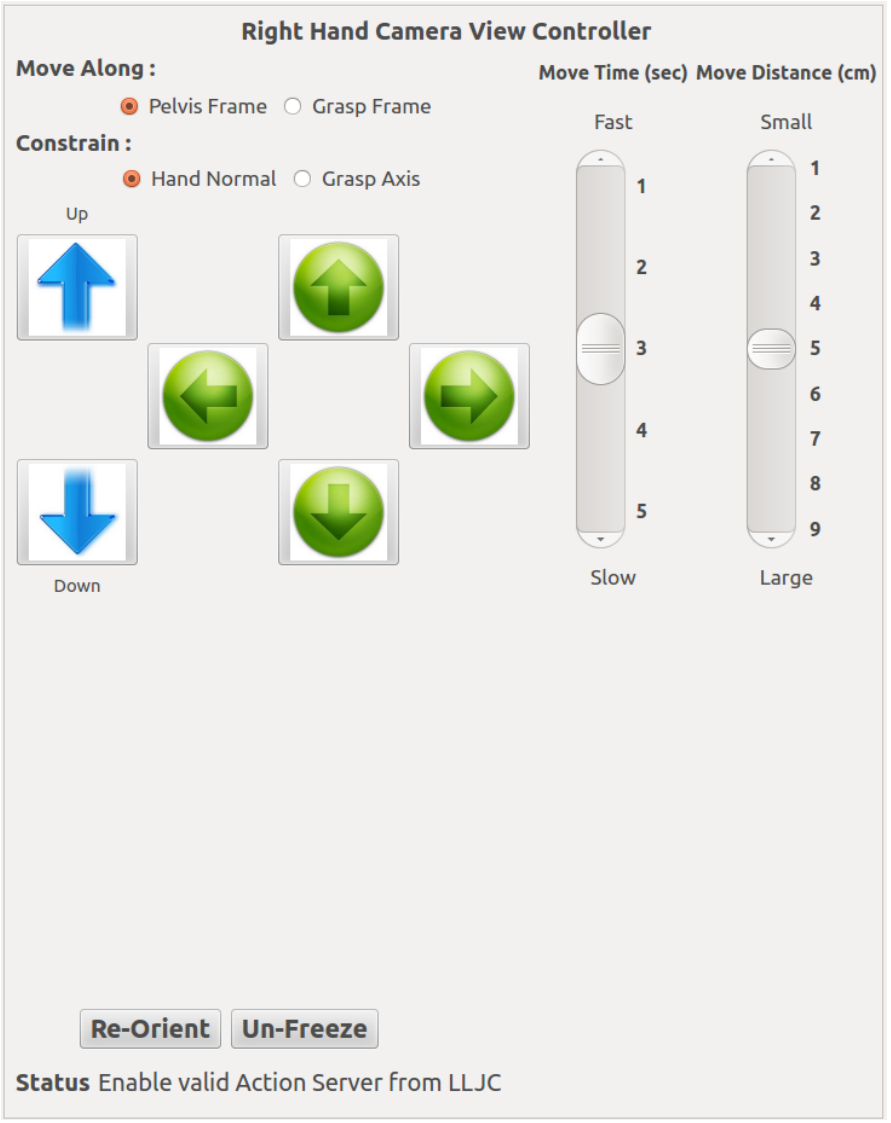


Saved YAML Trajectories

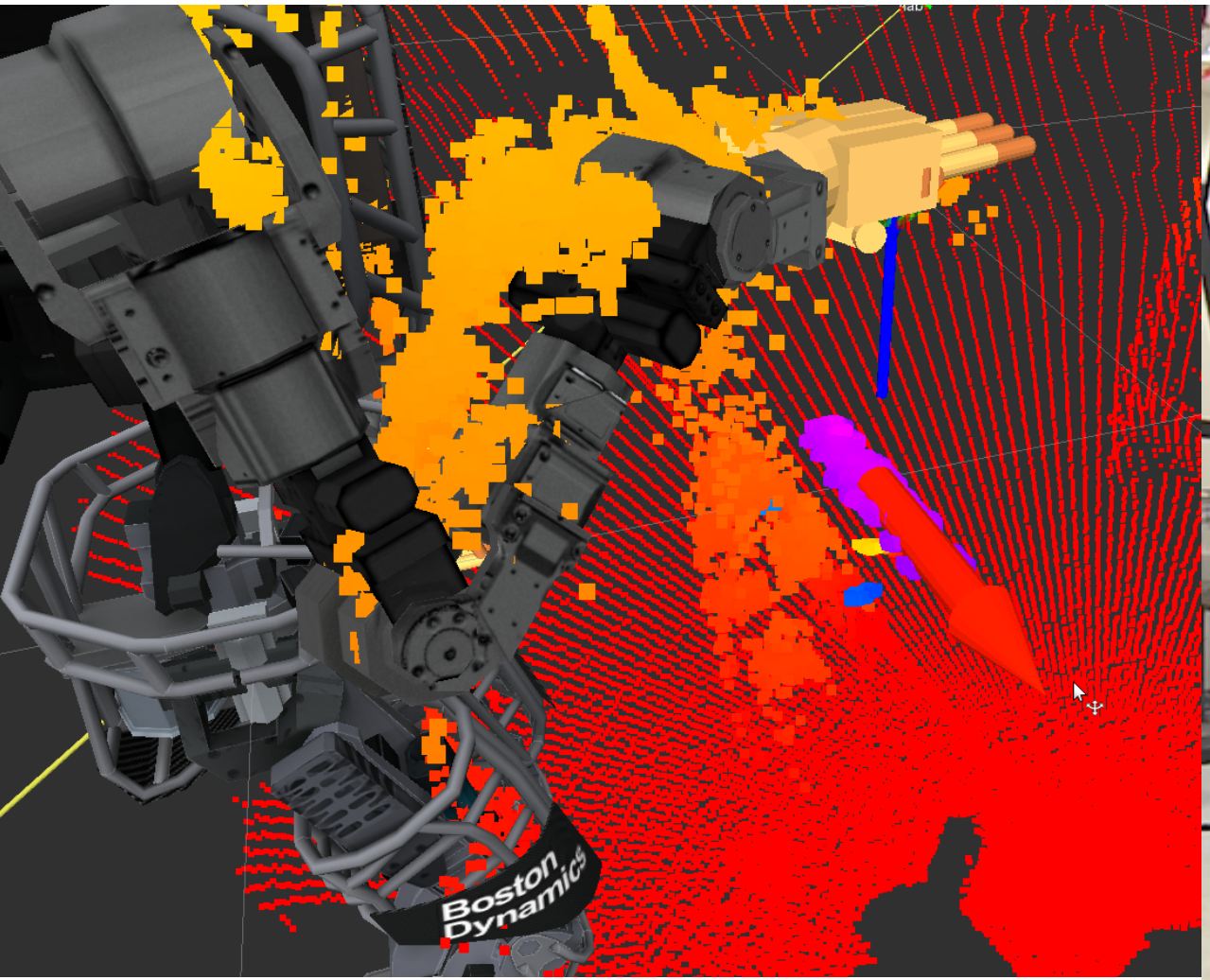
```
---

# Message name, preferably unique

- hmi_msgs: right_sandia_hand_close

  # actionType corresponds to the behavior type defined

  actionType:
            4

  # actionCode is used to set sub behavior types

  actionCode:
            1

  # 0: not selected, 1: position control, 2: compliant control - 28 joints to select

  selection: [
            1,   1,   1,   1,   1,   1,   1,   1,
            1,   1,   1,   1,   0,   0,   0,   0,
            0,   0,   0,   0,   0,   0,   0,   0,
            0,   0,   0,   0
          ]

  # Angle for each joint

  angle: [
           0.0, 1.5, 1.7, 0.0, 1.5, 1.7, 0.0, 1.5,
           1.7, 0.0, 0.8, 1.1, 0.0, 0.0, 0.0, 0.0,
           0.00, -70.0, 0.0, 0.0, 0.0, 0.0, 0.0, 80.0,
           0.0, 0.0, 0.0, 0.0
        ]

  # For backward compatibility with old format. 0: degree, 1: radian

  unit:
            1

  # Time to reach this pose

  duration:
            1.00
```

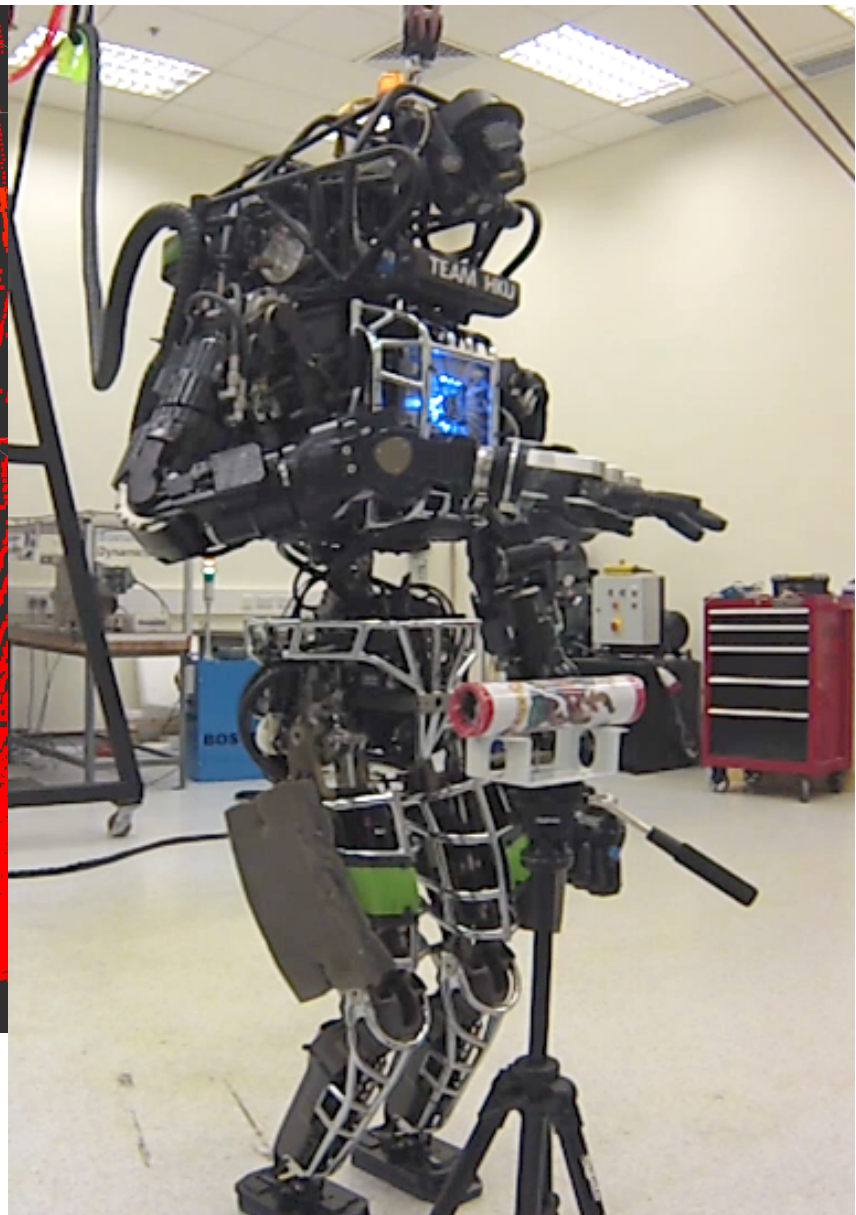
ICP Pose Estimation



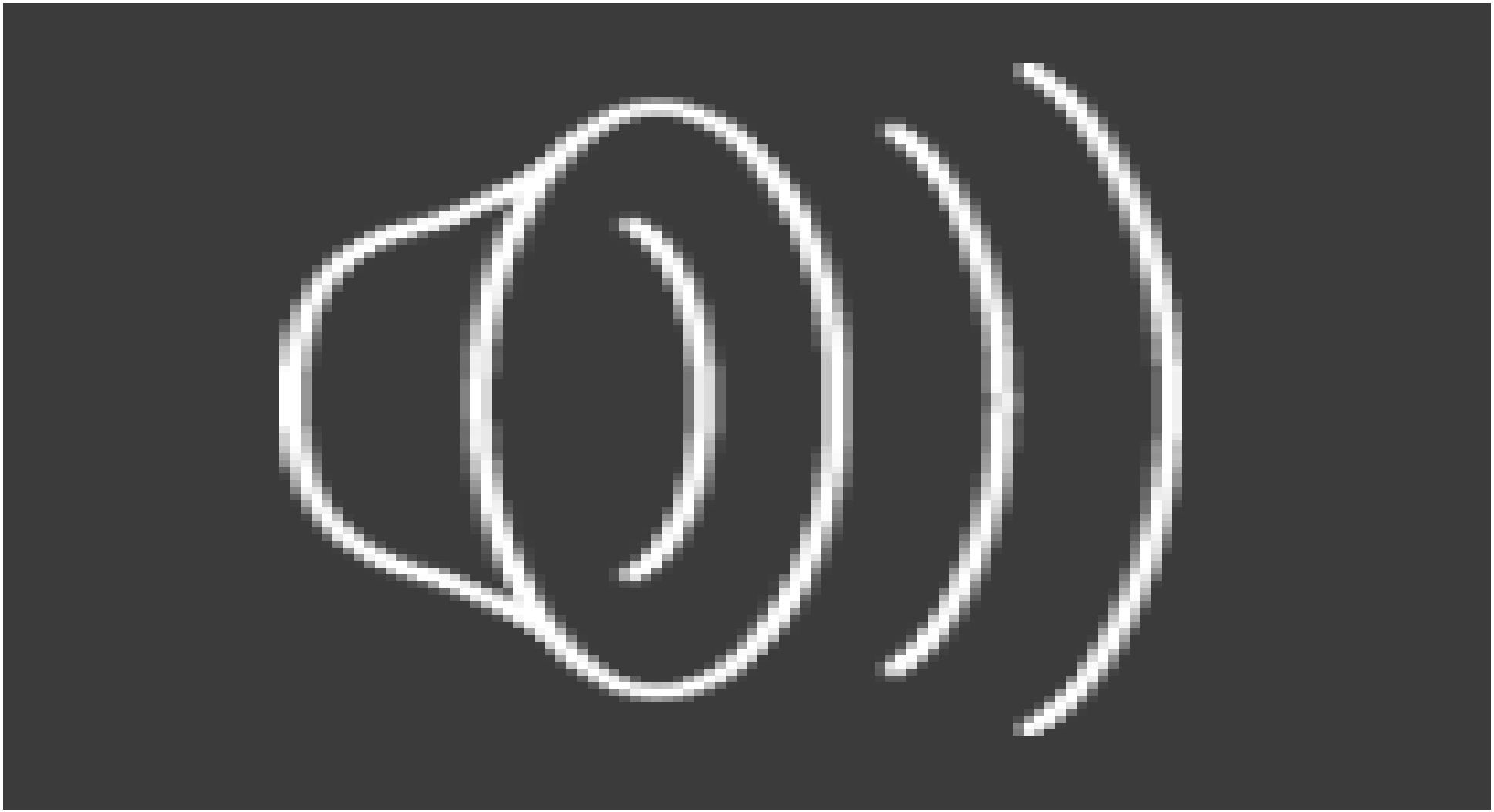


ICP Pose Estimation

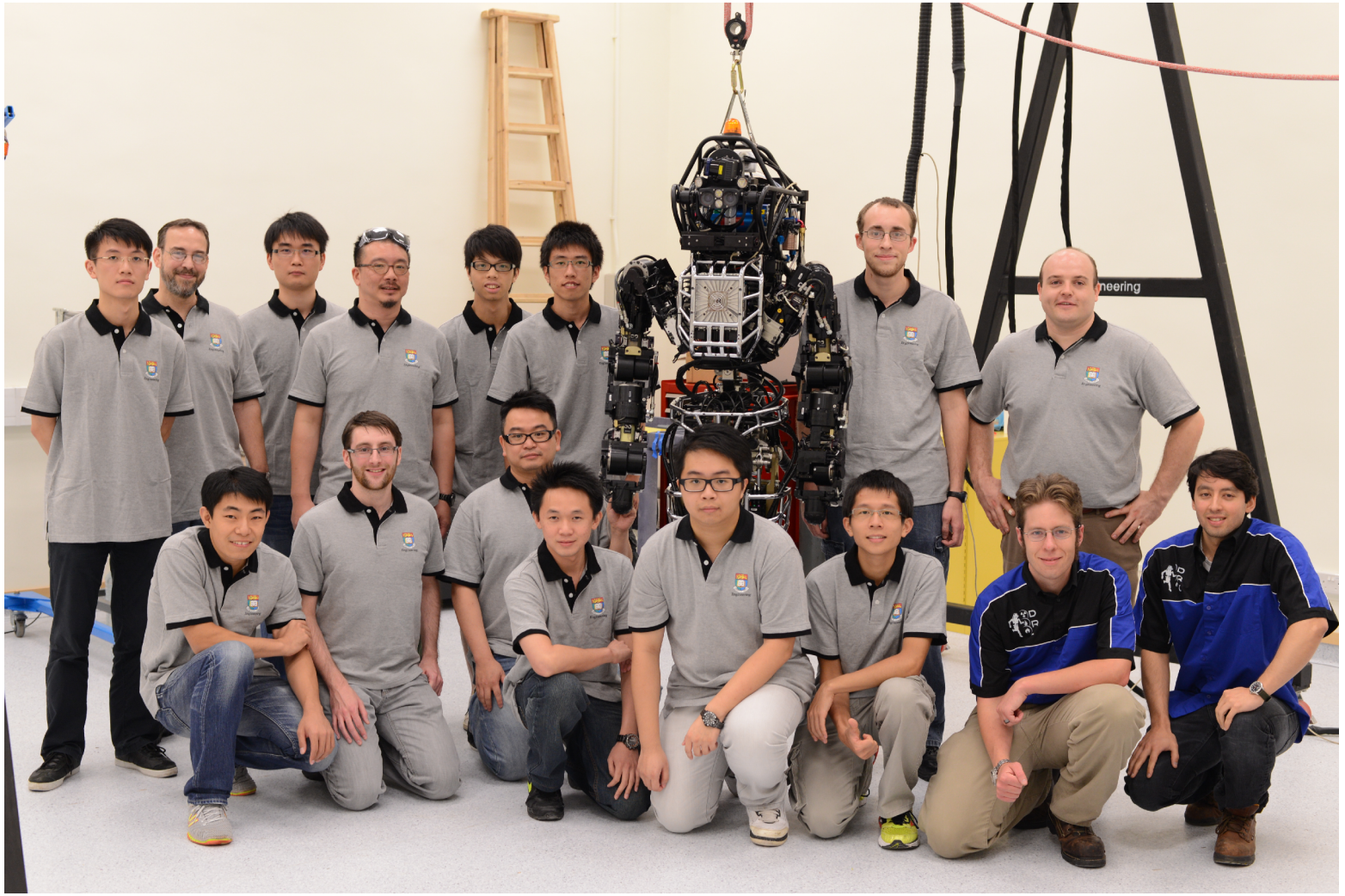




Hand-frame approach



Thanks!



MoveIt!