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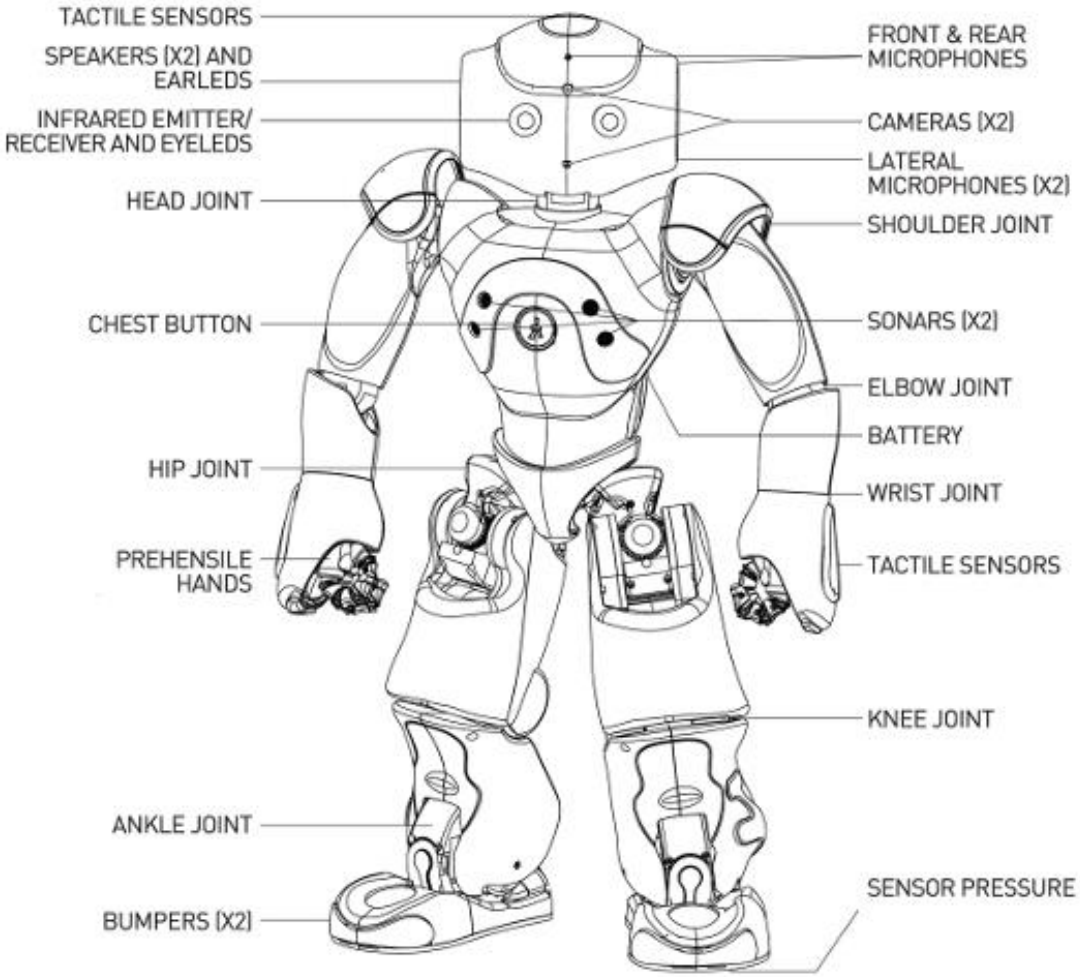
NAO Sensors and Actuators



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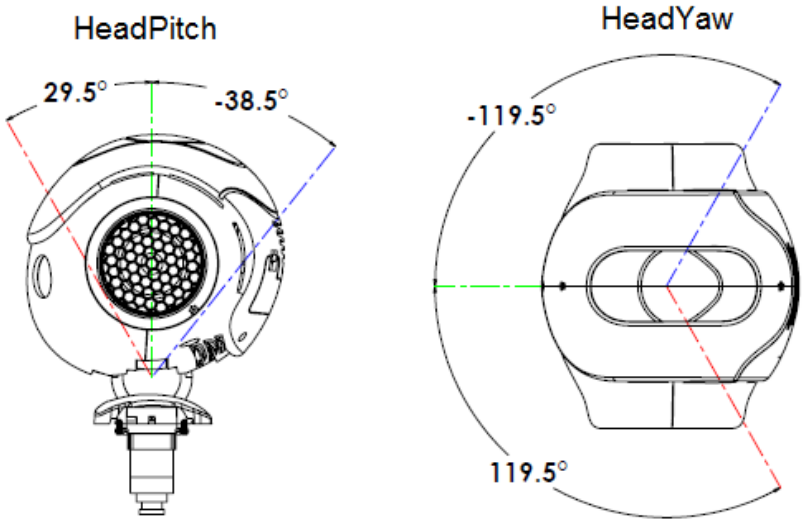
Head Joints

Never move the joints

beyond their limits!



Joint Limits

Joint Name	Range (degrees)	Range (radians)
HeadYaw	[-119.5; 119.5]	[-2.0857; 2.0857]
HeadPitch	[-38.5; 29.5]	[-0.6720; 0.5149]

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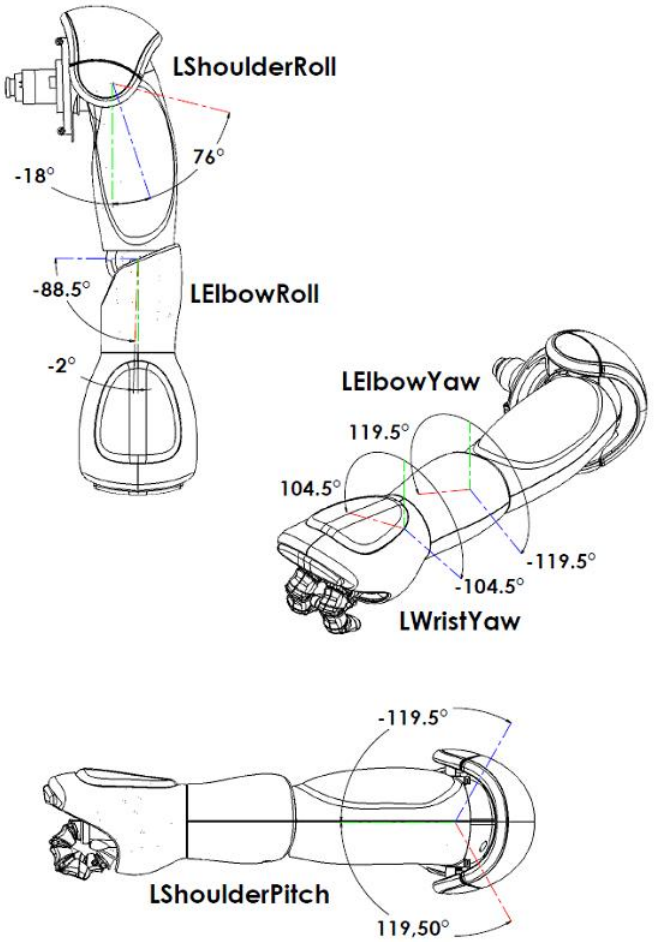
Left Arm Joints

Joint Limits

Joint Name	Range (degrees)	Range (radians)
LShoulderPitch	[-119.5; 119.5]	[-2.0857; 2.0857]
LShoulderRoll	[-18; 76]	[-0.3142; 1.3265]
LElbowYaw	[-119.5; 119.5]	[-2.0857; 2.0857]
LElbowRoll	[-88.5; -2]	[-1.5446; -0.0349]
LWristYaw	[-104.5; 104.5]	[-1.8238; 1.8238]
LHand	{0,1}	{0,1}



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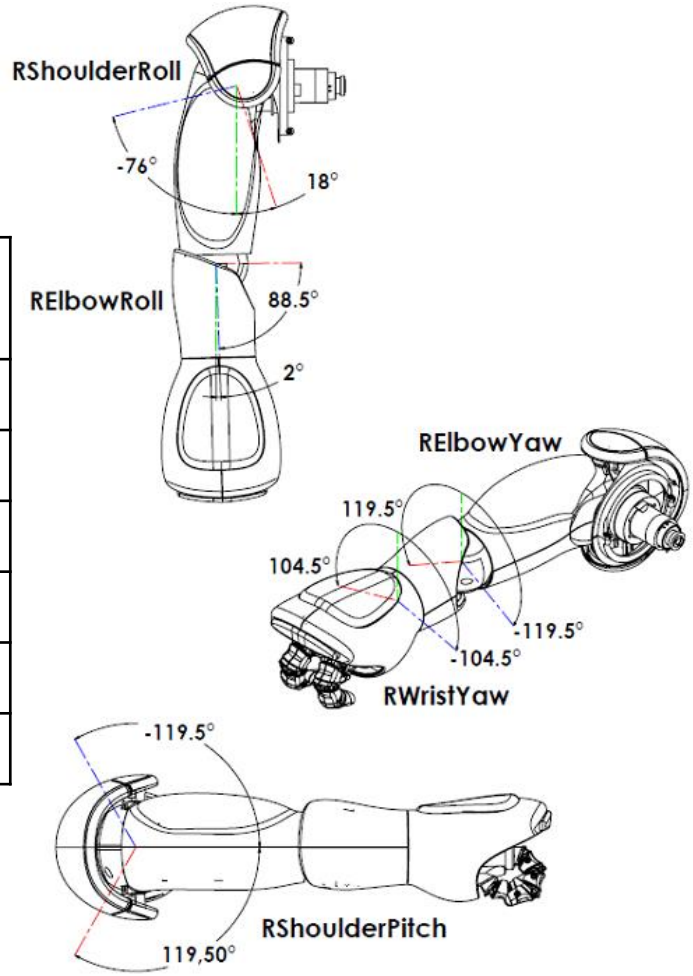
Right Arm Joints

Joint Limits

Joint Name	Range (degrees)	Range (radians)
RShoulderPitch	[-119.5; 119.5]	[-2.0857; 2.0857]
RShoulderRoll	[-76; 18]	[-1.3265; 0.3142]
RElbowYaw	[-119.5; 119.5]	[-2.0857; 2.0857]
RElbowRoll	[2; 88.5]	[0.0349; 1.5446]
RWristYaw	[-104.5; 104.5]	[-1.8238; 1.8238]
RHand	{0,1}	{0,1}



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NAO Startup in ROS

- Start roscore on your computer
- In a separate terminal, execute the following: roslaunch nao_bringup nao_full_py.launch

  to connect to the robot

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NAO Topics

The important topics of NAO are:

- /joint_states -> provides current joint angle values
- /image_raw -> provides the camera image in bgr8 format
- /bumper -> provides the bumper states
- /tactile_touch -> provides the head touch sensor states
- /joint_angles -> *accepts* motion commands to control NAO

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Enable Motors

To control the robot, you first have to enable the motor stiffness. In a terminal, execute:

rosservice call /body_stiffness/enable “{}”

To disable the stiffness after you are done execute:

rosservice call /body_stiffness/disable “{}”

This fully enables, disables the stiffness for all joints of the robot. You can also specify single joints in the brackets and select stiffness values in the range of [0,1]. For now, these two commands are enough.

Remember that disabling the stiffness causes the robot to collapse, so hold it before disabling the joints, to prevent damage!

Also don’t let the stiffness be enabled for too long, the robot will overheat.

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Reminder

When sending commands, always honor the joint limits!

Also check that the robot won’t collide with itself or the environment!