2. MoveIt Configuration Tutorial for MyCobot 630 Pro

Objectives

- Configure MoveIt for the MyCobot 630 Pro robotic arm
- Set up planning groups and controllers
- Prepare for motion planning and control

Prerequisites

- ROS2 Jazzy Jalisco installed
- Completed mycobot630pro_description package
- MoveIt 2 installed
- MoveIt Setup Assistant

Step 1: Launch MoveIt Setup Assistant

- The MoveIt Setup Assistant is a graphical user interface for configuring any robot for use with MoveIt. Its primary function is generating a *Semantic Robot Description Format (SRDF)* file for your robot, which specifies additional information required by MoveIt such as *planning groups*, *end effectors*, and various *kinematic* parameters. Additionally, it generates other necessary configuration files for use with the MoveIt pipeline.

```
# Launch MoveIt Setup Assistant
ros2 launch moveit_setup_assistant setup_assistant.launch.py
```

- Follow this guide of how to use moveit Setup Assistant GUI to generate the moveit configuration package and ***SRDF*** file from the ***URDF*** file of *mycobot630pro_description* package:

  MoveIt Setup Assistant Guide

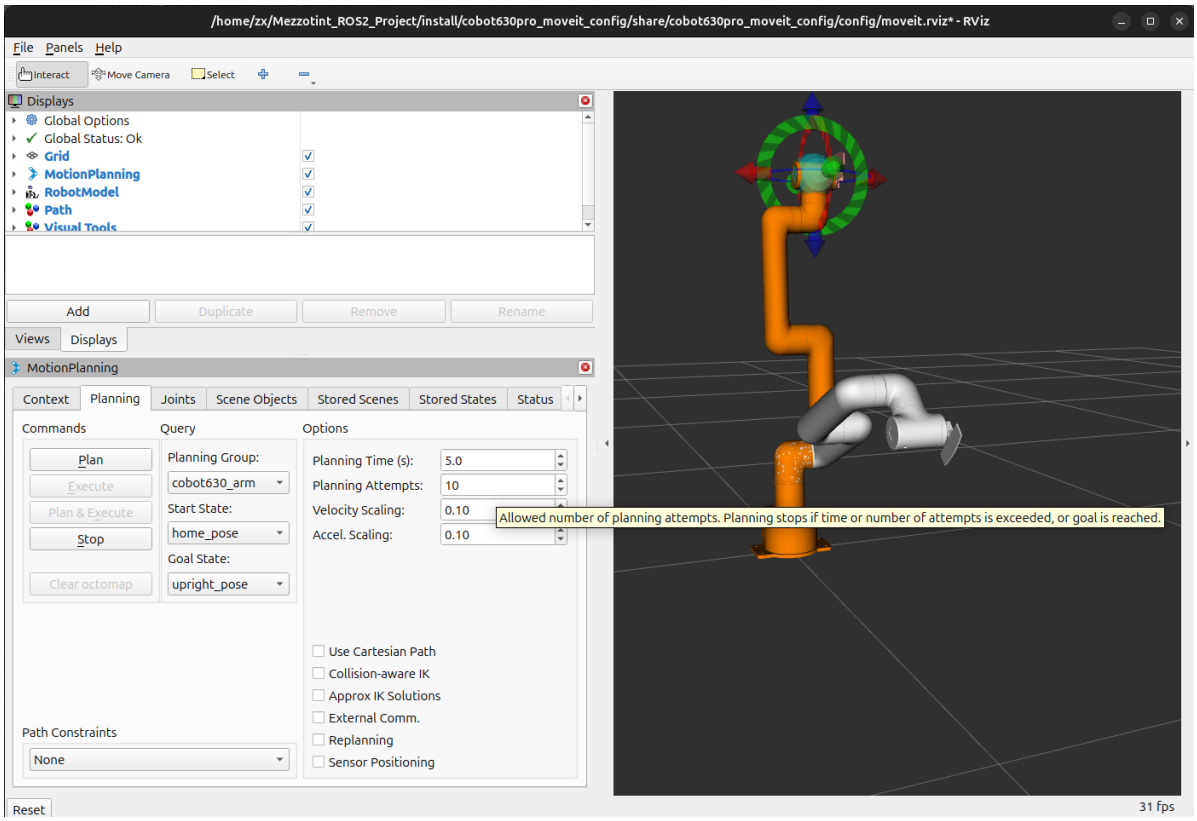
Step 2: Building the package

```
# Navigate to workspace directory
cd ~/colcon_ws/
# build the package
colcon build --symlink-install --packages-select cobot630pro_mov
# Source workspace
source install/setup.bash
```

Step 3: Test Moveit Pipeline

```
# Launch demo.launch
ros2 launch cobot630pro_moveit_config demo.launch.py
```

- Rviz should launch with the Robot model spawned and you can test the control and planning by executing different pre-defined positions or a custom goal you can set by moving the end-point of the planning group to other location in the workspace of the arm, then `plan&execute`



Planning Groups Configuration

Main Arm Planning Group: `cobot630_arm`

- **Joints**:
  1. joint0
  2. joint1
  3. joint2
  4. joint3
  5. joint4

Tool Planning Group: `cobot_tool`

- **Joint**:
  1. joint5

Kinematics Configuration

Solver Details

- **Kinematics Solver**: KDL (Kinematics and Dynamics Library)
- **Plugin**: `kdl_kinematics_plugin/KDLKinematicsPlugin`
- **Search Resolution**: 0.005
- **Solver Timeout**: 0.005 seconds

Controller Configuration

Controller Manager

- Type: `moveit_simple_controller_manager/MoveItSimpleControllerManager`

Arm Controller

- Name: `cobot630_arm_controller`
- Type: `FollowJointTrajectory`
- Controlled Joints:
  - joint0
  - joint1
  - joint2
  - joint3
  - joint4

Tool Controller

- Name: `cobot_tool_controller`
- Type: `FollowJointTrajectory`
- Controlled Joint:
  - joint5

ROS2 Controllers Configuration

Controller Manager Parameters

- **Update Rate**: 100 Hz
- **Controller Types**: `joint_trajectory_controller/JointTrajectoryController`

Joint Interface Configuration

- **Command Interfaces**: position
- **State Interfaces**: position, velocity
- **Allow Non-Zero Velocity at Trajectory End**: Yes

Key Configuration Files

kinematics.yaml

```
cobot630_arm:
  kinematics_solver: kdl_kinematics_plugin/KDLKinematicsPlugi
n
  kinematics_solver_search_resolution: 0.005
  kinematics_solver_timeout: 0.005
```

moveit_controllers.yaml

```
# MoveIt uses this configuration for controller management

moveit_controller_manager: moveit_simple_controller_manager/M
oveItSimpleControllerManager

moveit_simple_controller_manager:
  controller_names:
    - cobot630_arm_controller
    - cobot_tool_controller
```

```
  cobot630_arm_controller:
    type: FollowJointTrajectory
    joints:
      - joint0
      - joint1
      - joint2
      - joint3
      - joint4
    action_ns: follow_joint_trajectory
    default: true

  cobot_tool_controller:
    type: FollowJointTrajectory
    joints:
      - joint5
    action_ns: follow_joint_trajectory
```

ros2_controllers.yaml

```
# This config file is used by ros2_control
controller_manager:
  ros__parameters:
    update_rate: 100  # Hz

    cobot630_arm_controller:
      type: joint_trajectory_controller/JointTrajectoryContro
ller



    cobot_tool_controller:
      type: joint_trajectory_controller/JointTrajectoryContro
ller



    joint_state_broadcaster:
```

```
      type: joint_state_broadcaster/JointStateBroadcaster

cobot630_arm_controller:
  ros__parameters:
    joints:
      - joint0
      - joint1
      - joint2
      - joint3
      - joint4
    command_interfaces:
      - position
    state_interfaces:
      - position
      - velocity
    allow_nonzero_velocity_at_trajectory_end: true

cobot_tool_controller:
  ros__parameters:
    joints:
      - joint5
    command_interfaces:
      - position
    state_interfaces:
      - position
      - velocity
    allow_nonzero_velocity_at_trajectory_end: true
```

References

- MoveIt 2 Documentation
- ROS2 Control Overview
- URDF & SRDF
- Other Inverse Kinematics Solvers:

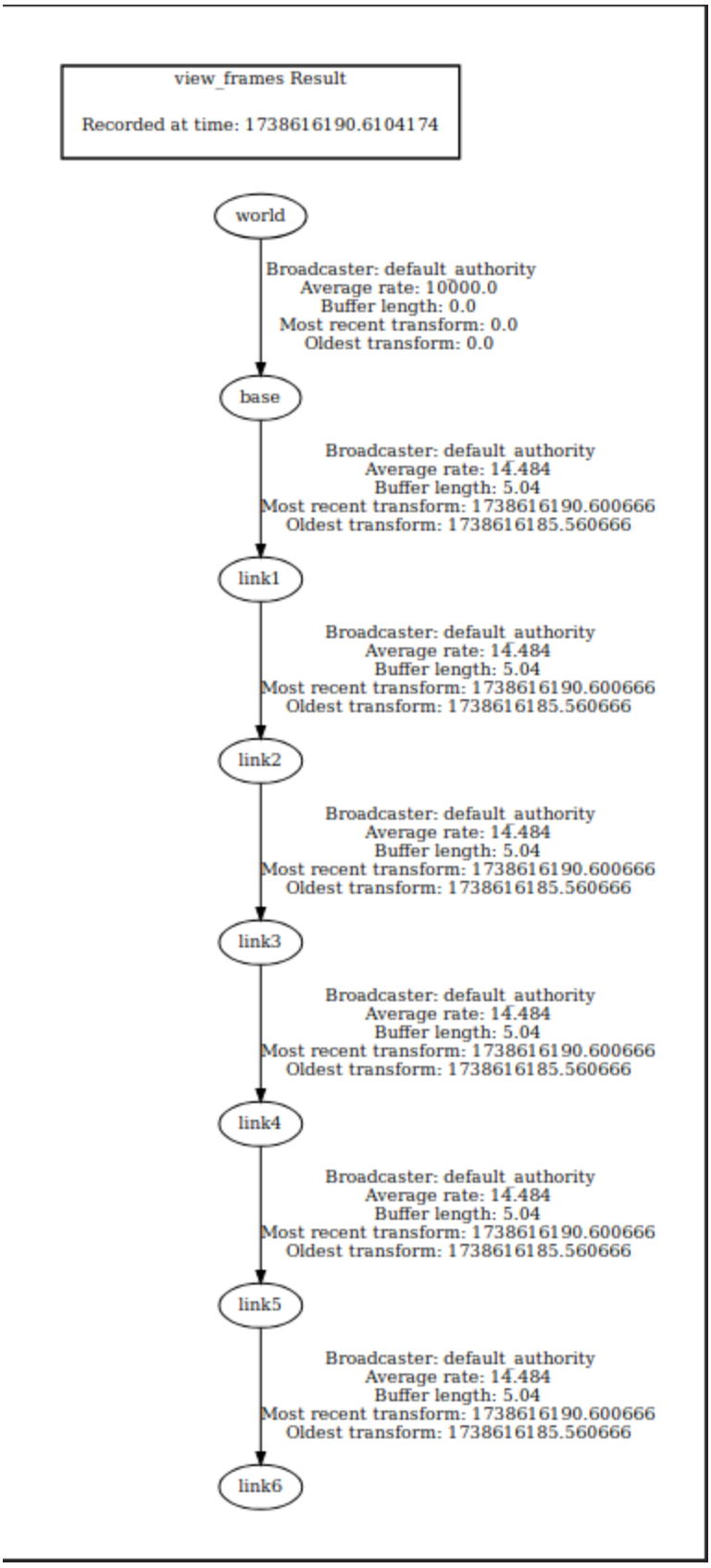
- Pick IK
- IKFast

Troubleshooting

- Verify URDF compatibility
- Check joint limits and workspace
- Validate controller configurations
- Verify Correct TF tree using `tf2_tools` package, `view_frames` node

```
# Launch the demo of moveit config package
ros2 launch cobot630pro_moveit_config demo.launch.py
# Run tf2_tools view_frames node to listen to transforms bei
# and create the tf tree
ros2 run tf2_tools view_frames
```

This will create a .gv and .pdf files that has the frames tree to check. The tf tree should be all connected from ***/world*** frame to ***/link6*** frame like this:


view_frames Result
Recorded at time: 1738616190.6104174
world
Broadcaster: default_authority
Average rate: 10000.0
Buffer length: 0.0
Most recent transform: 0.0
Oldest transform: 0.0
base
Broadcaster: default_authority
Average rate: 14.484
Buffer length: 5.04
Most recent transform: 1738616190.600666
Oldest transform: 1738616185.560666
link1
Broadcaster: default_authority
Average rate: 14.484
Buffer length: 5.04
Most recent transform: 1738616190.600666
Oldest transform: 1738616185.560666
link2
Broadcaster: default_authority
Average rate: 14.484
Buffer length: 5.04
Most recent transform: 1738616190.600666
Oldest transform: 1738616185.560666
link3
Broadcaster: default_authority
Average rate: 14.484
Buffer length: 5.04
Most recent transform: 1738616190.600666
Oldest transform: 1738616185.560666
link4
Broadcaster: default_authority
Average rate: 14.484
Buffer length: 5.04
Most recent transform: 1738616190.600666
Oldest transform: 1738616185.560666
link5
Broadcaster: default_authority
Average rate: 14.484
Buffer length: 5.04
Most recent transform: 1738616190.600666
Oldest transform: 1738616185.560666
link6