1.MoveIt configuration

Note: The environment has already been configured in the virtual machine file provided by Yahboom. The first, second, and third steps of the configuration process can be skipped

1. Start the configuration program

Start roscore

```
roscore
```

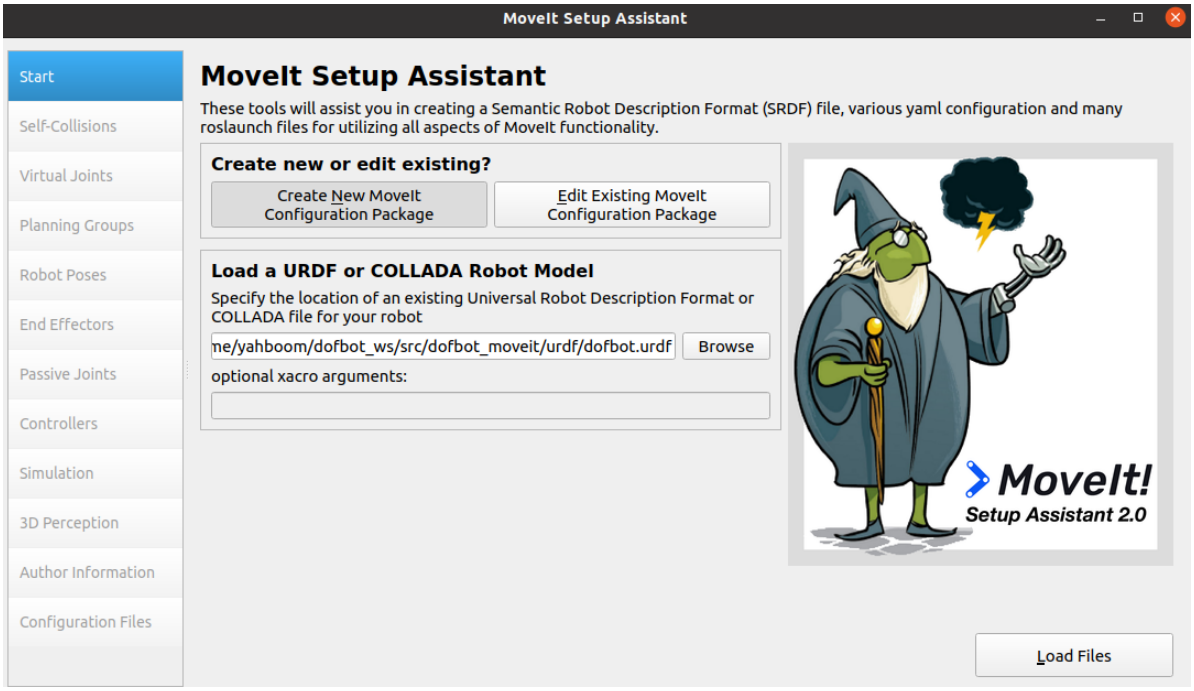
Open another terminal and start MoveIt

```
rosrun moveit_setup_assistant moveit_setup_assistant
```

2.Configuration process

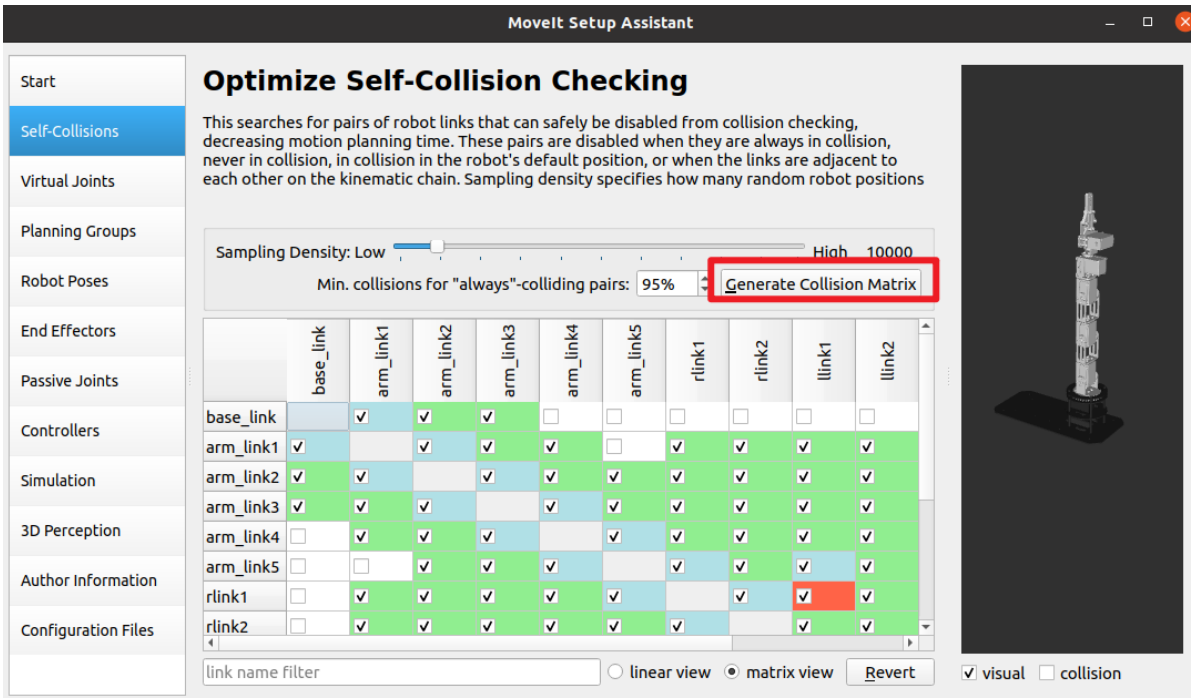
- Load URDF model
  If an error is reported [Model not found] when loading the model, exit MoveIt ->enter the workspace ->update the environment (source dev/setup. bash) ->and restart the MoveIt configuration. If loading the model for the first time to generate a configuration, select the left side. If modifying the generated configuration file, select the right side.

Click the Browse button, locate the URDF model file, and click on the bottom right corner to load it.



- Avoid Collision Matrix， ACM

After loading the model, select 'Self Collections' and click on the' Generate Collision Matrix 'button.

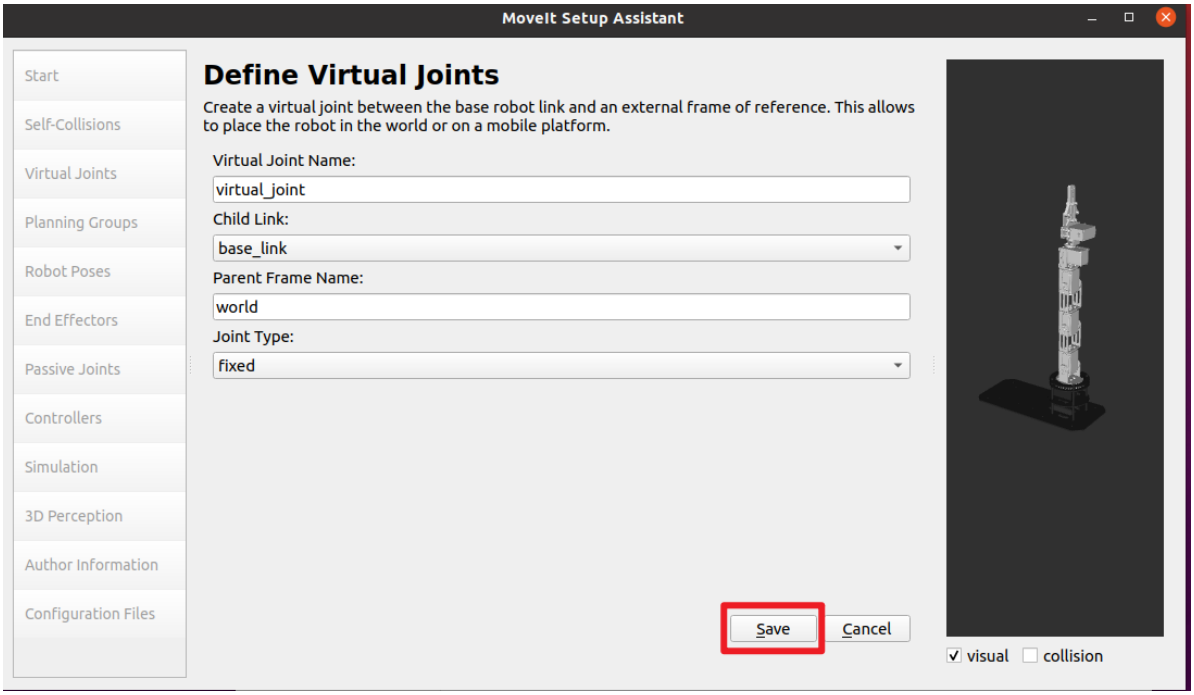


- Adding virtual joints can be understood as a joint that connects a robot to the world. Virtual Joint Name We named it virtual_ Joint.

  Child Link refers to the part where we want to connect the 'world' with the robot, and we choose the base_ Link.

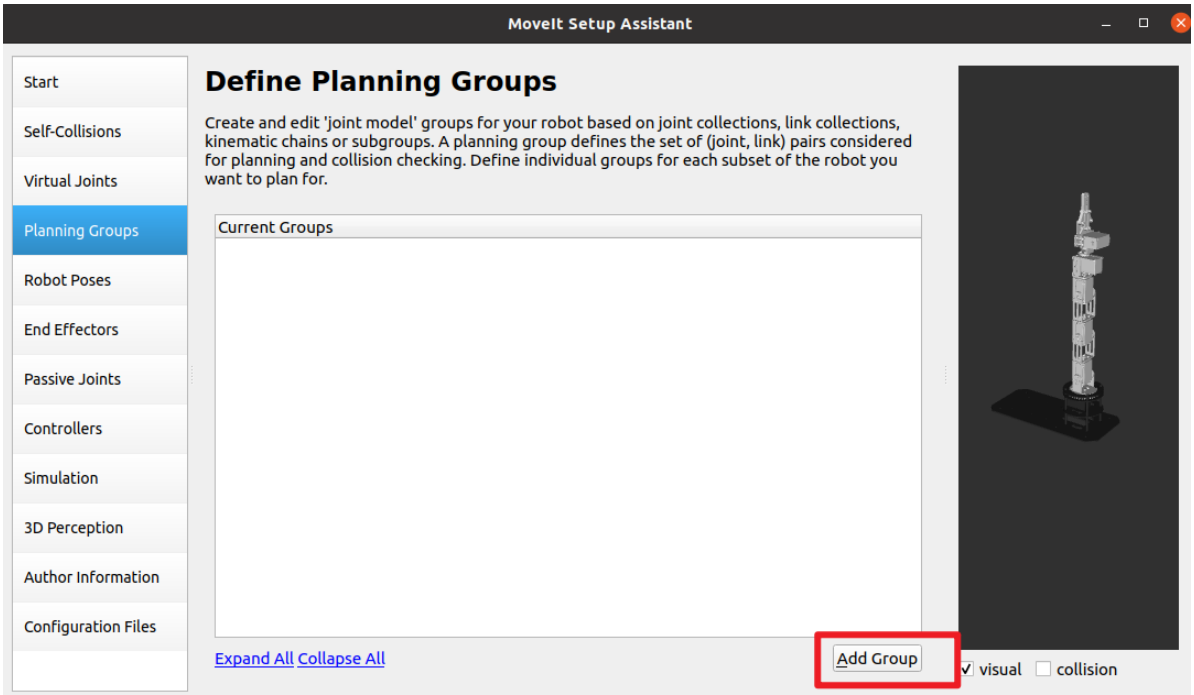
  Parent Frame Name is the name of the world coordinate system, commonly referred to as world in ROS.

  Joint Type, select Fixed. Represents that robots are fixed relative to the world. And the other two, Planar refers to a planar mobile base (xyplane+angle), used for mobile robots such as PR2; There is also a type of Floating, which refers to a floating base (xyz position+orientation), such as a humanoid robot.



- Create a motion planning group

  Planning Group is one of the core components of MoveIt. Click on [Add Group] to add a planning group



- Add robotic arm planning group

  If there is no 'trac ik' in the system, execute the following command to install.

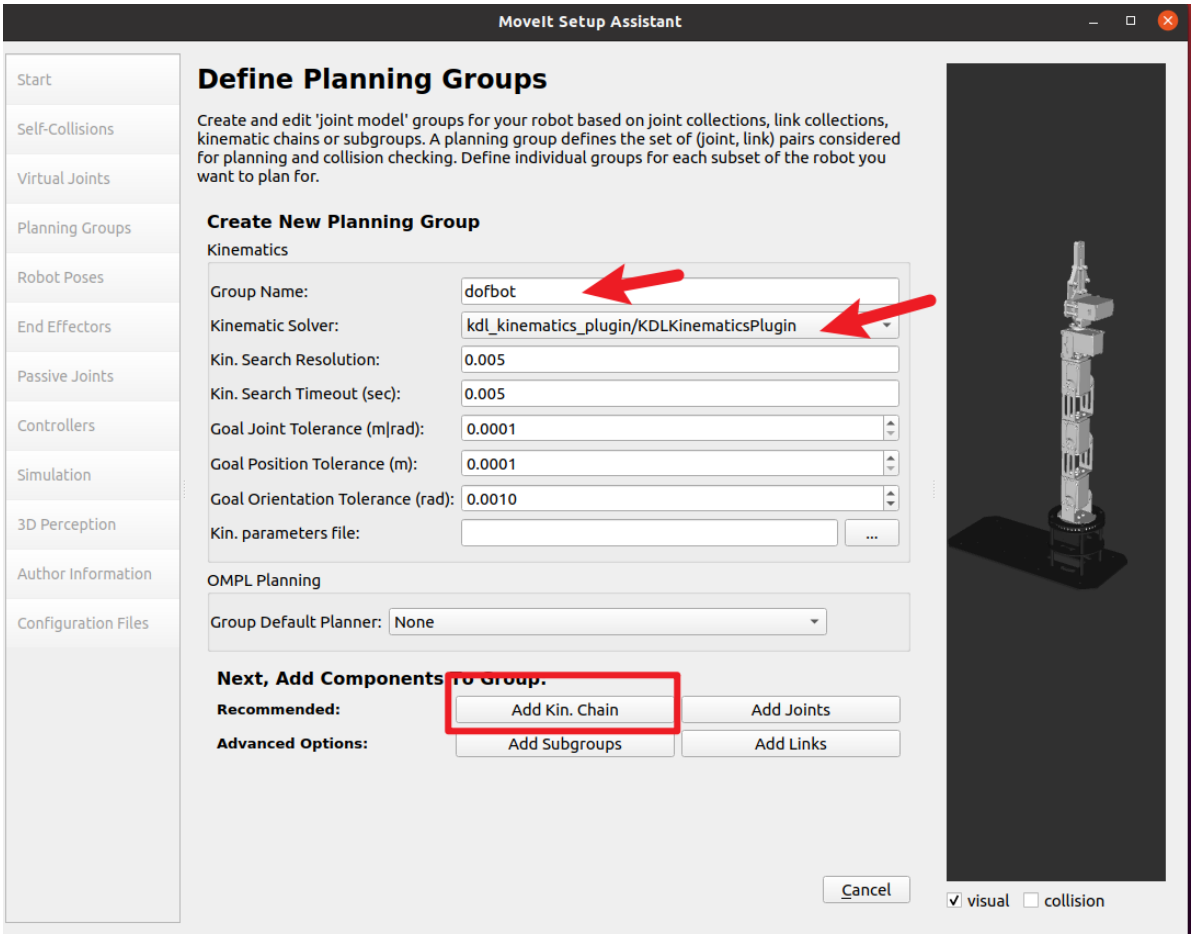
- Group Name: Create a group name and set it to [dofbot].
- Kinematic Solver: Here we choose 【 KDL 】

  Kinematic solving tool, which is responsible for solving forward kinematics and inverse kinematics (IK). Generally, we choose KDL, The Kinematics and Dynamics Library. This is a library of kinematics and dynamics that can effectively solve the forward and inverse kinematics problems of single chain mechanical structures with more than 6 degrees of freedom.

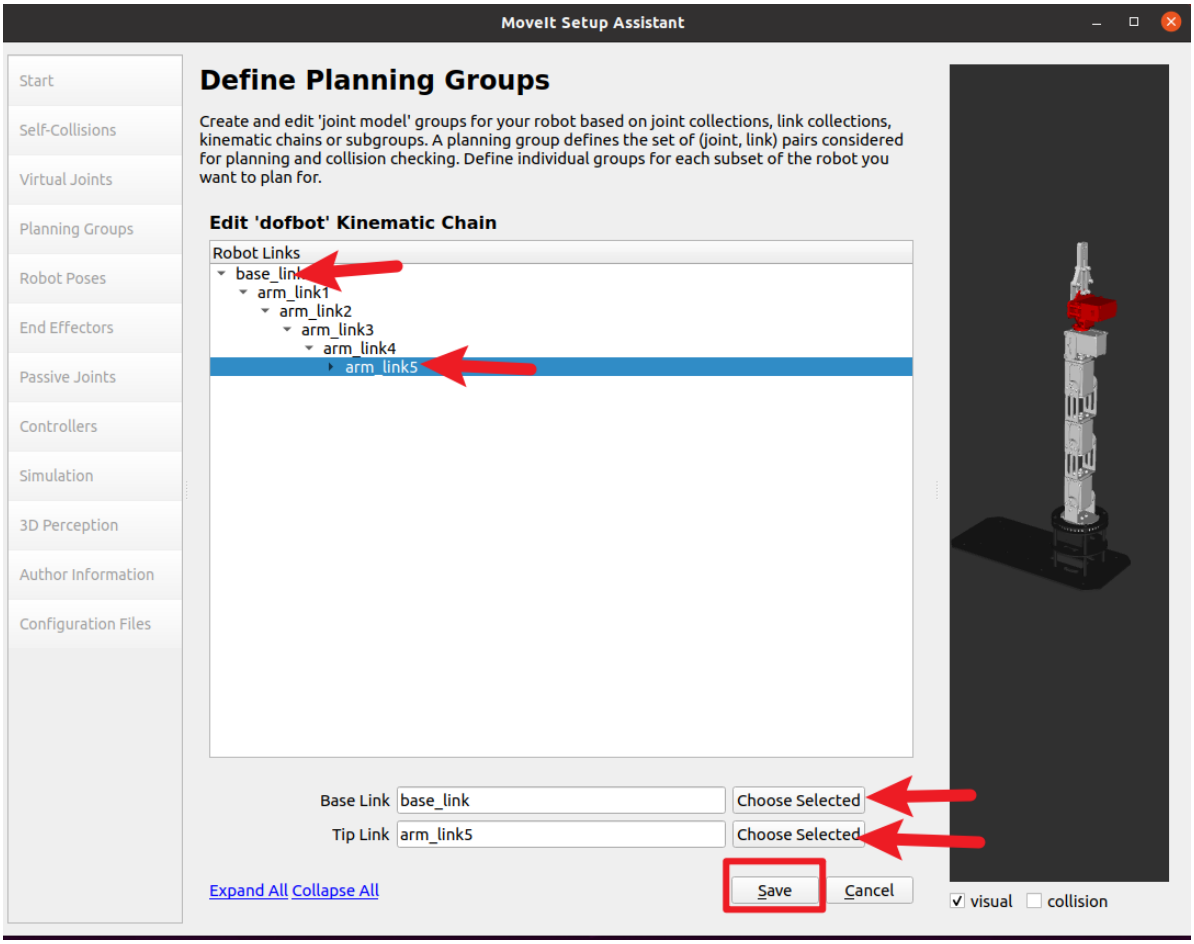
Of course, you can also use other IK Solvers, such as SRV or IK_ FAST, you can even develop new Solvers yourself and plug them in.

- Kin. Search Resolution: Sampling density of joint space
- Kin. Search TImeout: Solution time, if the equipment performance is insufficient or there is no solution within the specified time in the actual application process, the time can be increased; For example, set to [0.1], [0.01].

Click on [Add Kin. Chain] to add a joint chain.



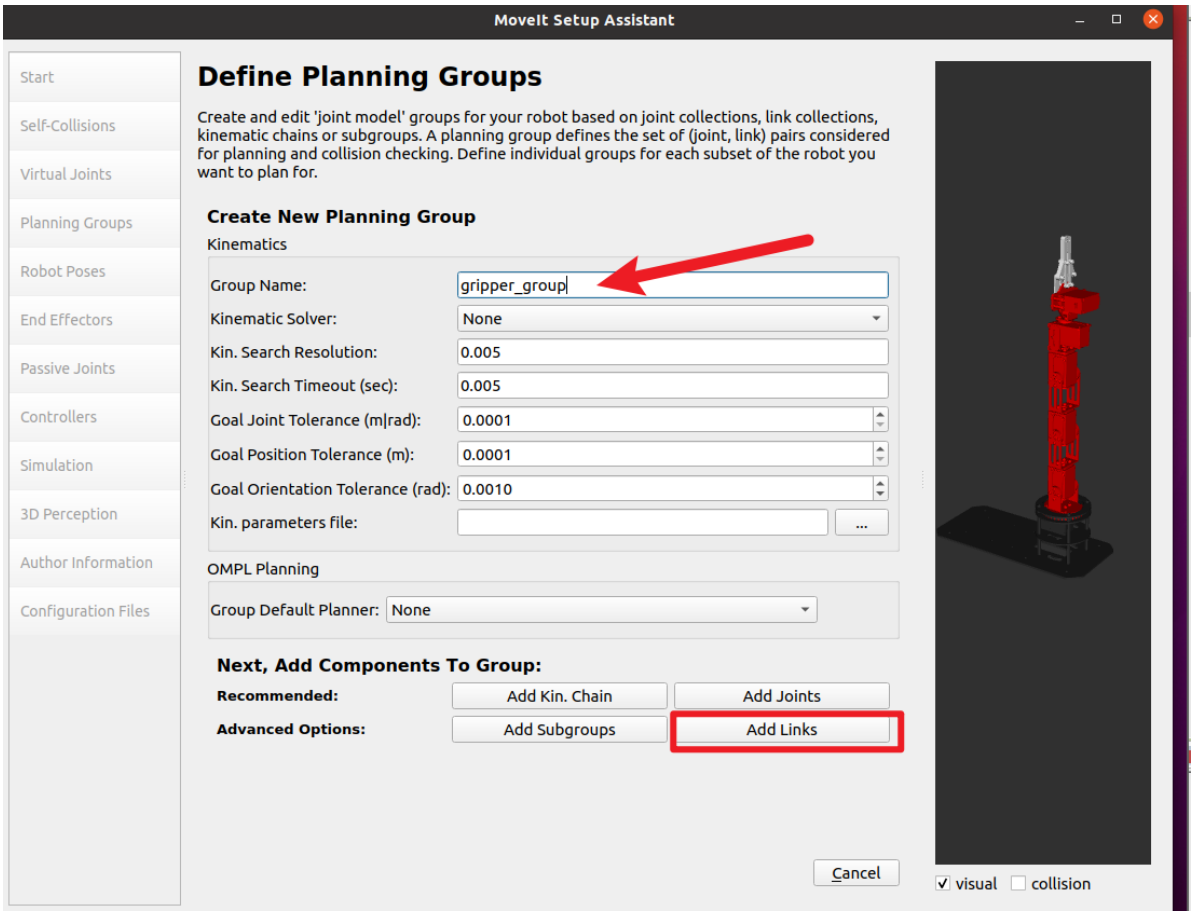
Click on [Expand All], select Base Link as [base_footprint], and select Tip Link as [arm_link5]; Click [save] to save.



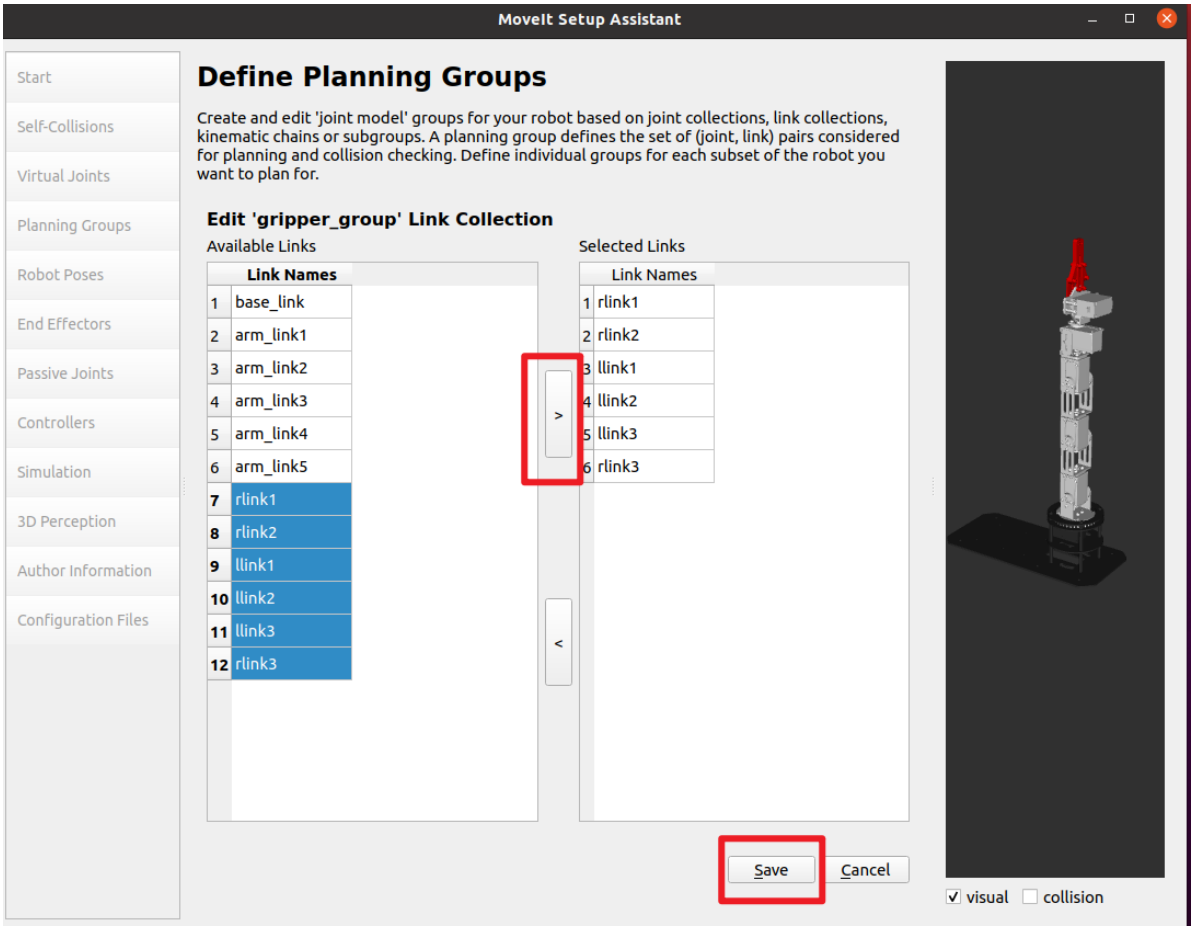
- Add Claw Planning Group

Click on [Add Group] to add a claw planning group.

Set the group name to "gripper_group'" and there is no need to set a kinematic solver; Click on [Add Links] to add the gripper link.



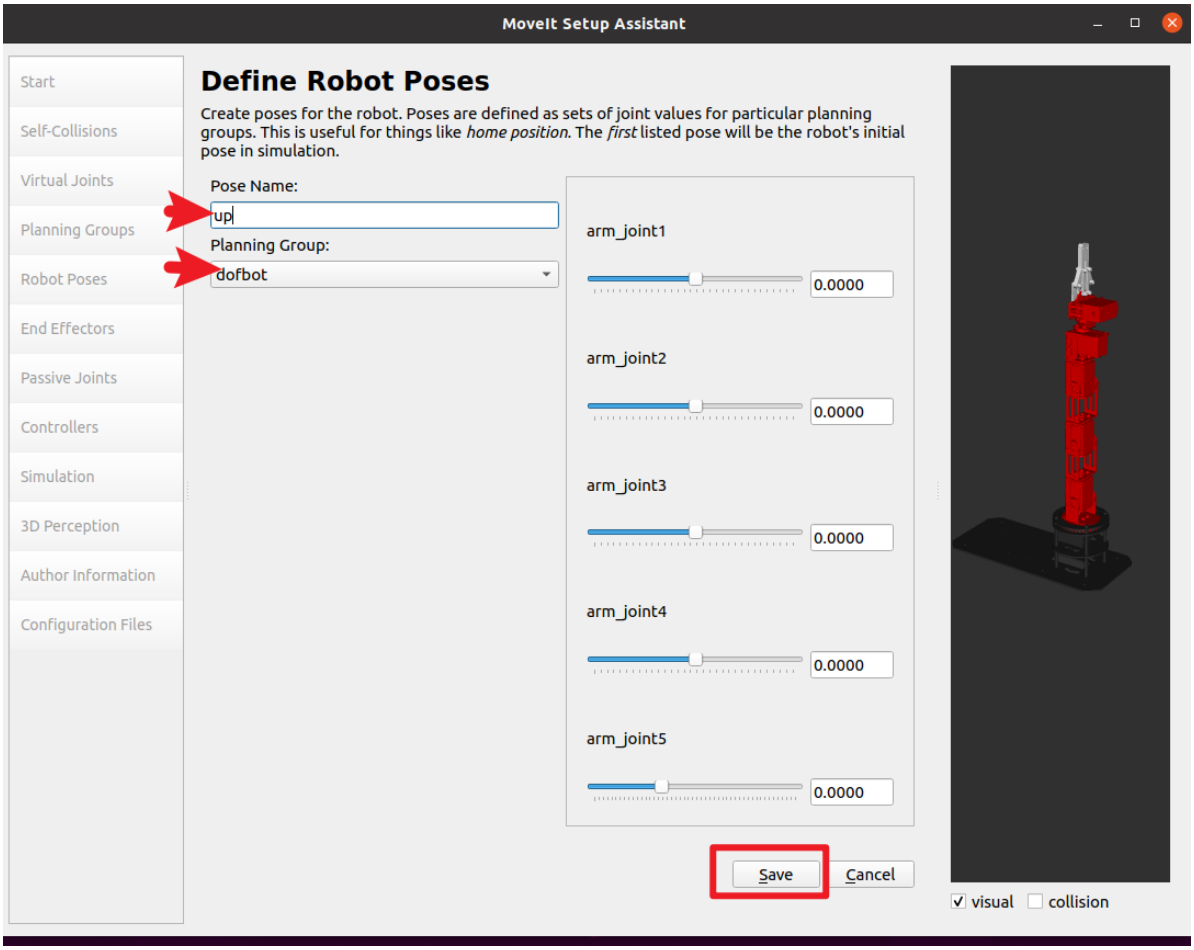
Select the connecting rod of the gripper part, click [>], automatically add the right side, and click [Save] to save.



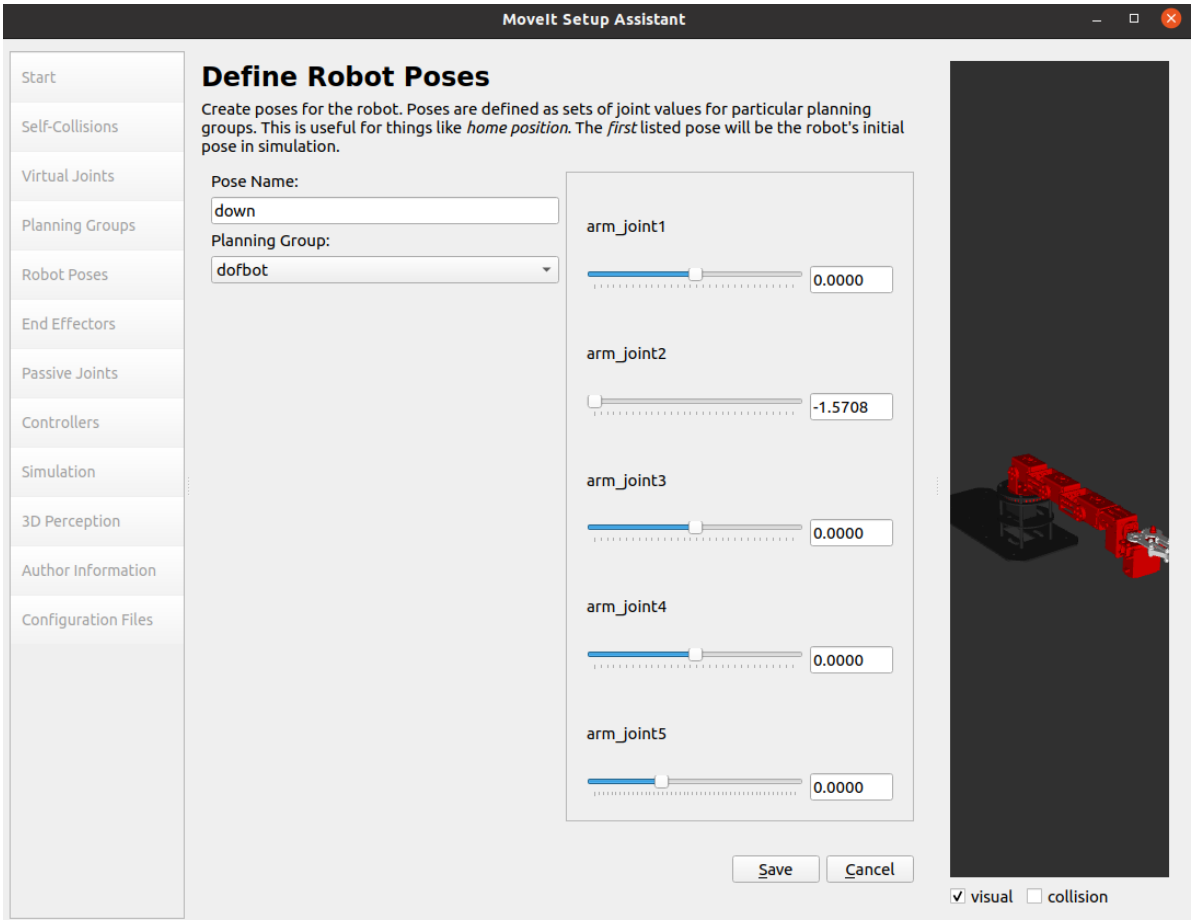
- Create a preset pose

Select [Robot Poses] and click [Add pose] to add a pose.

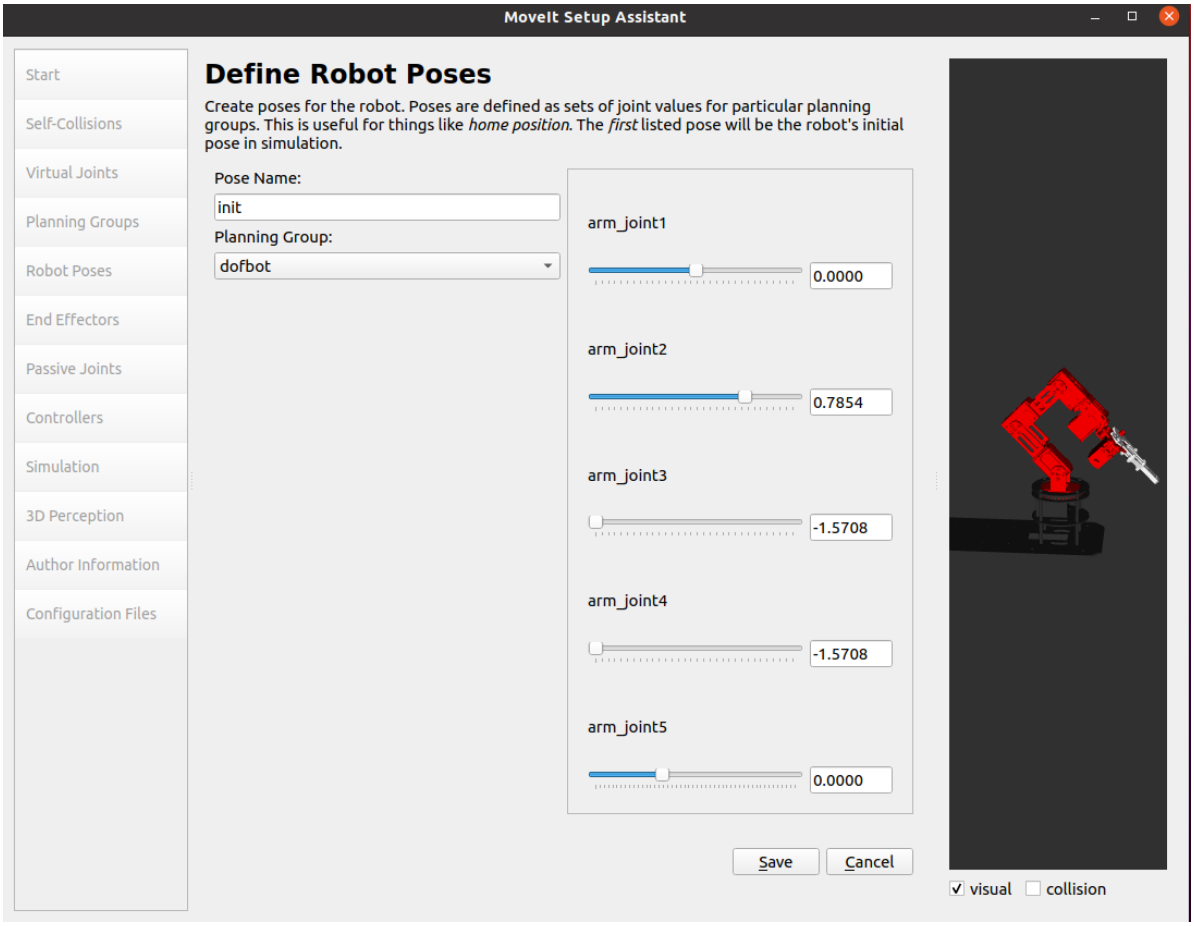
Add a robotic arm pose, with the pose name Pose Name set to [up].



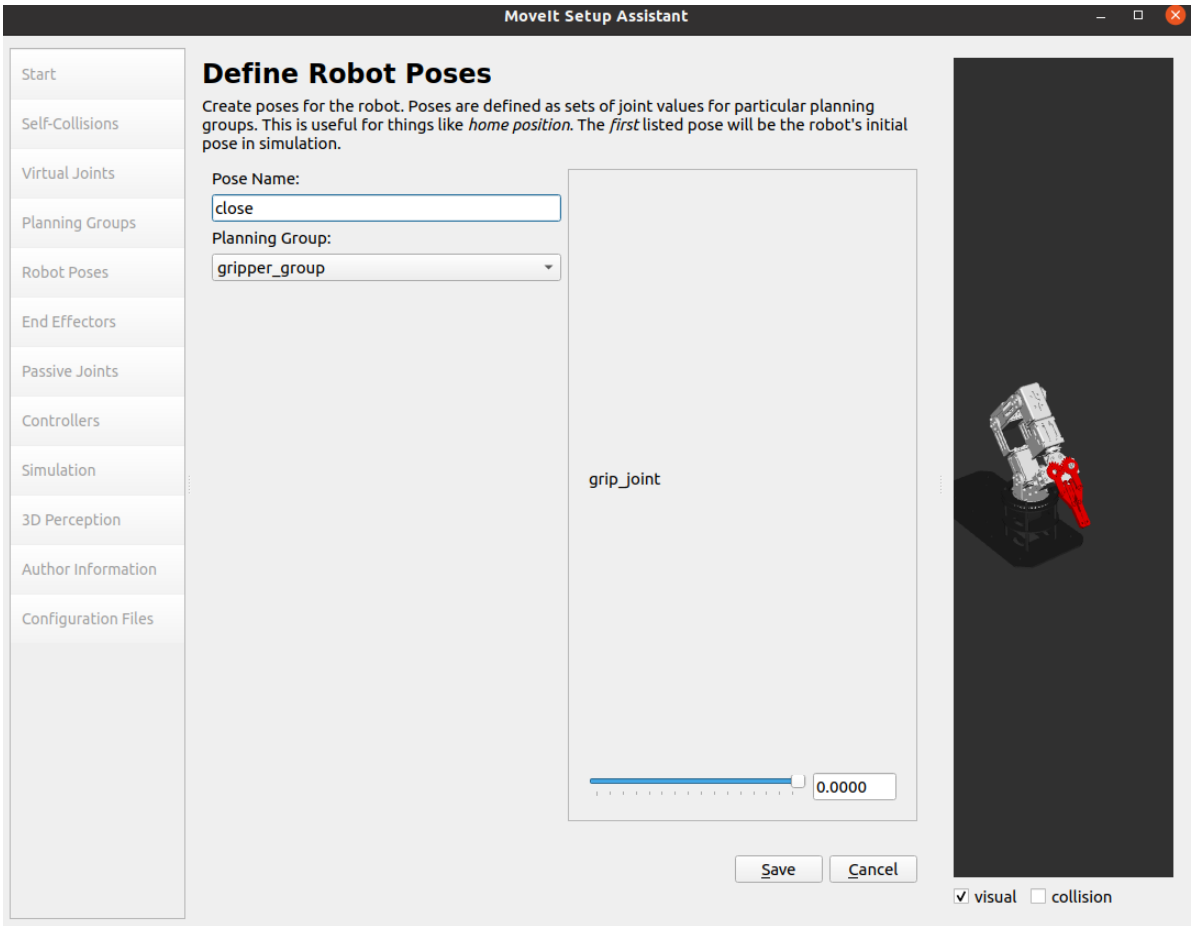
Add a [down] posture



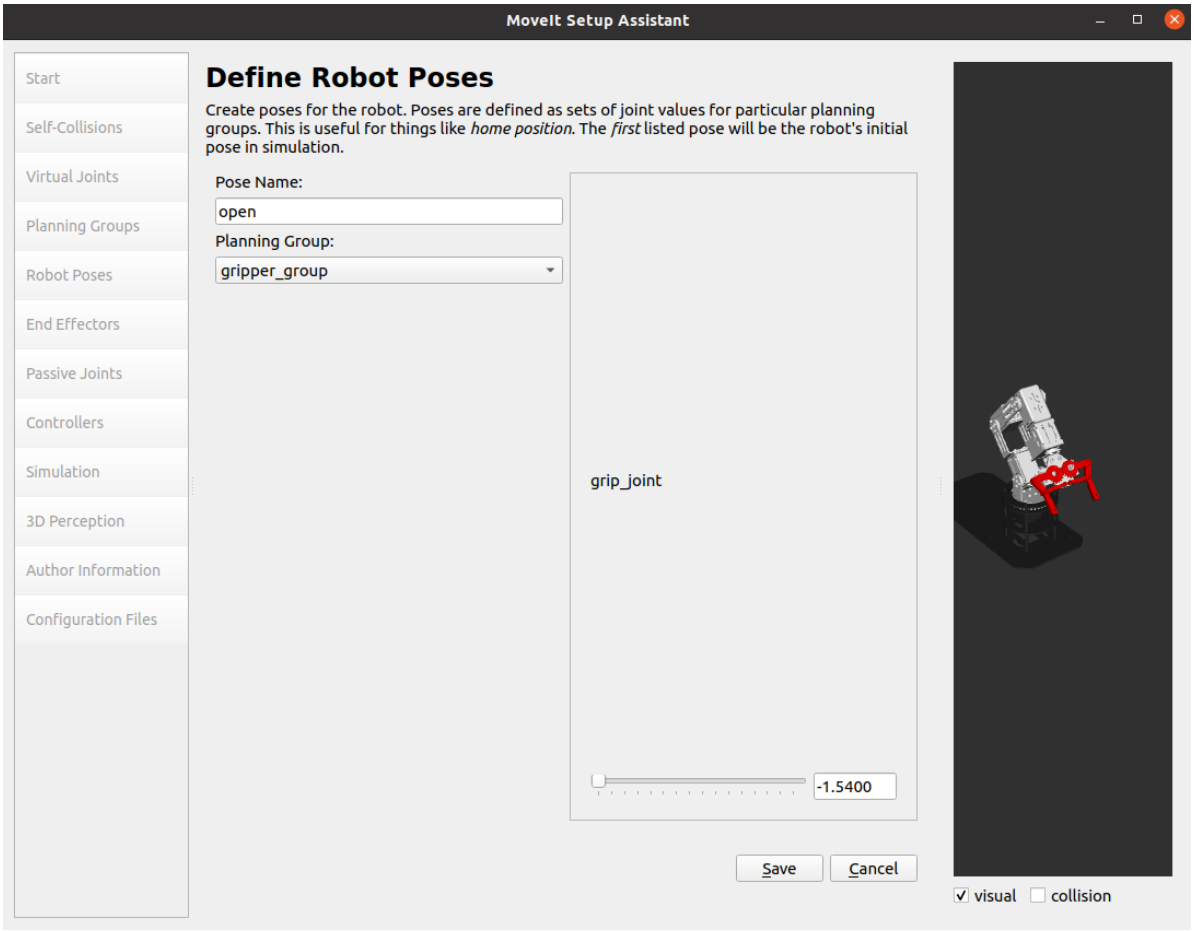
Add [init] posture



Add Claw [close] Pose

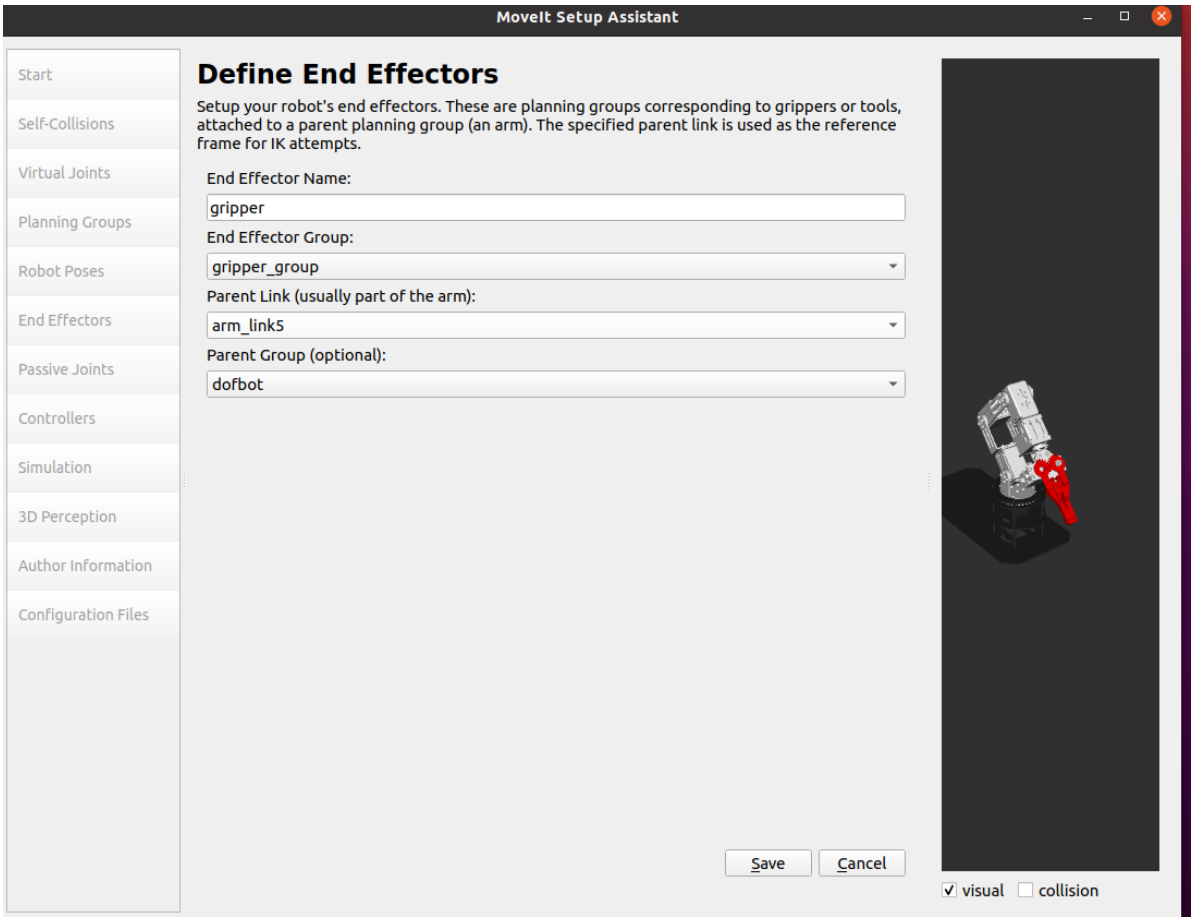


Add Claw [Open] Pose



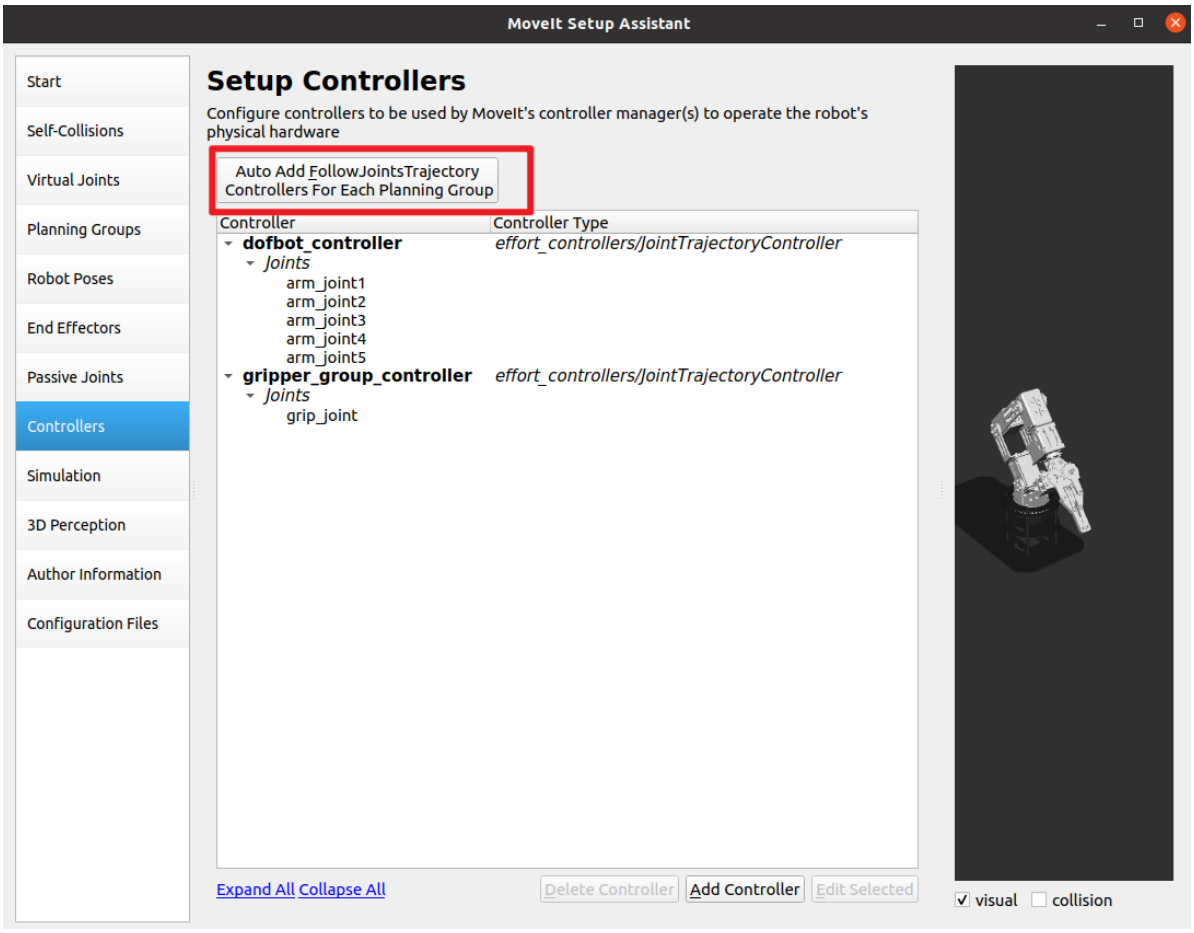
- Set end effector joints

Select [End Effectors] and set it as shown in the following figure

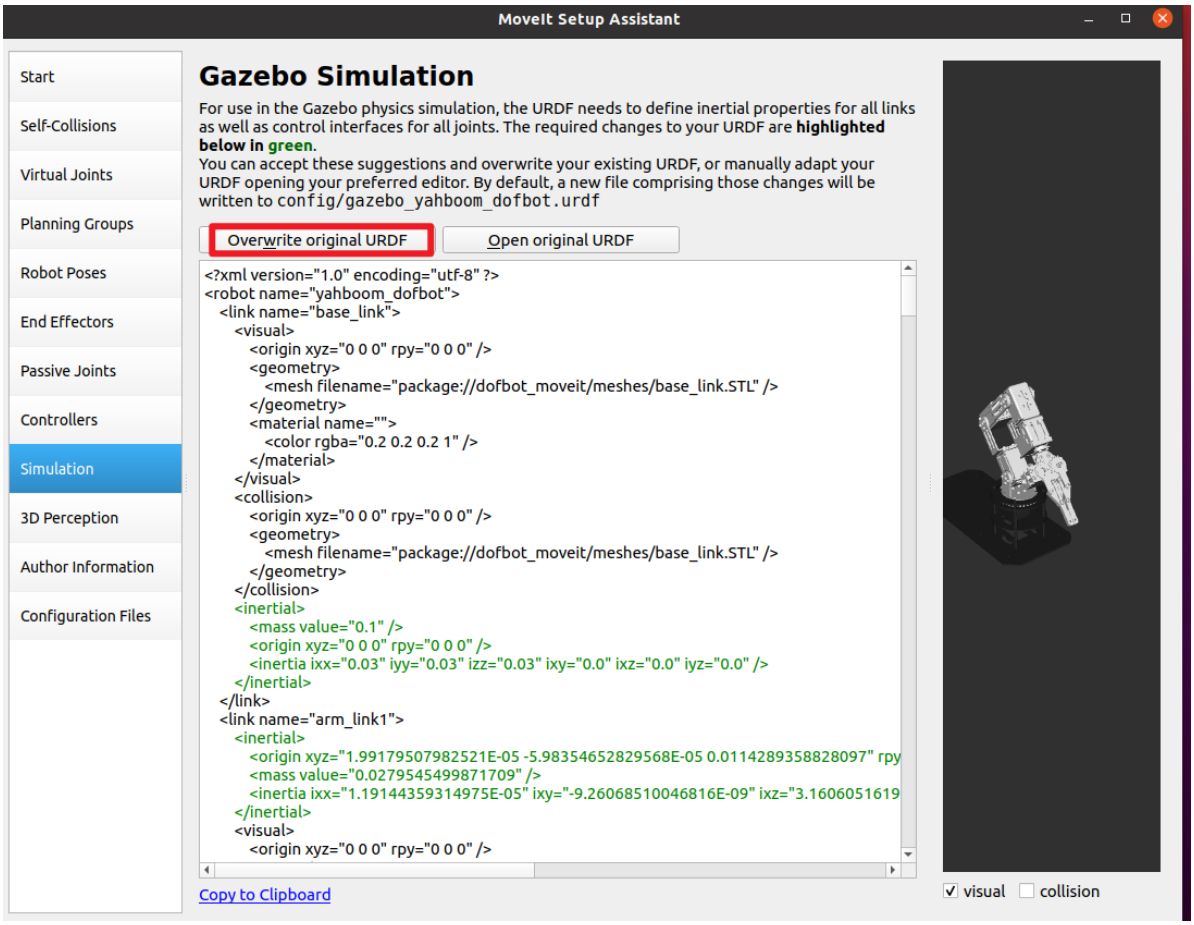


- Create ROS controller

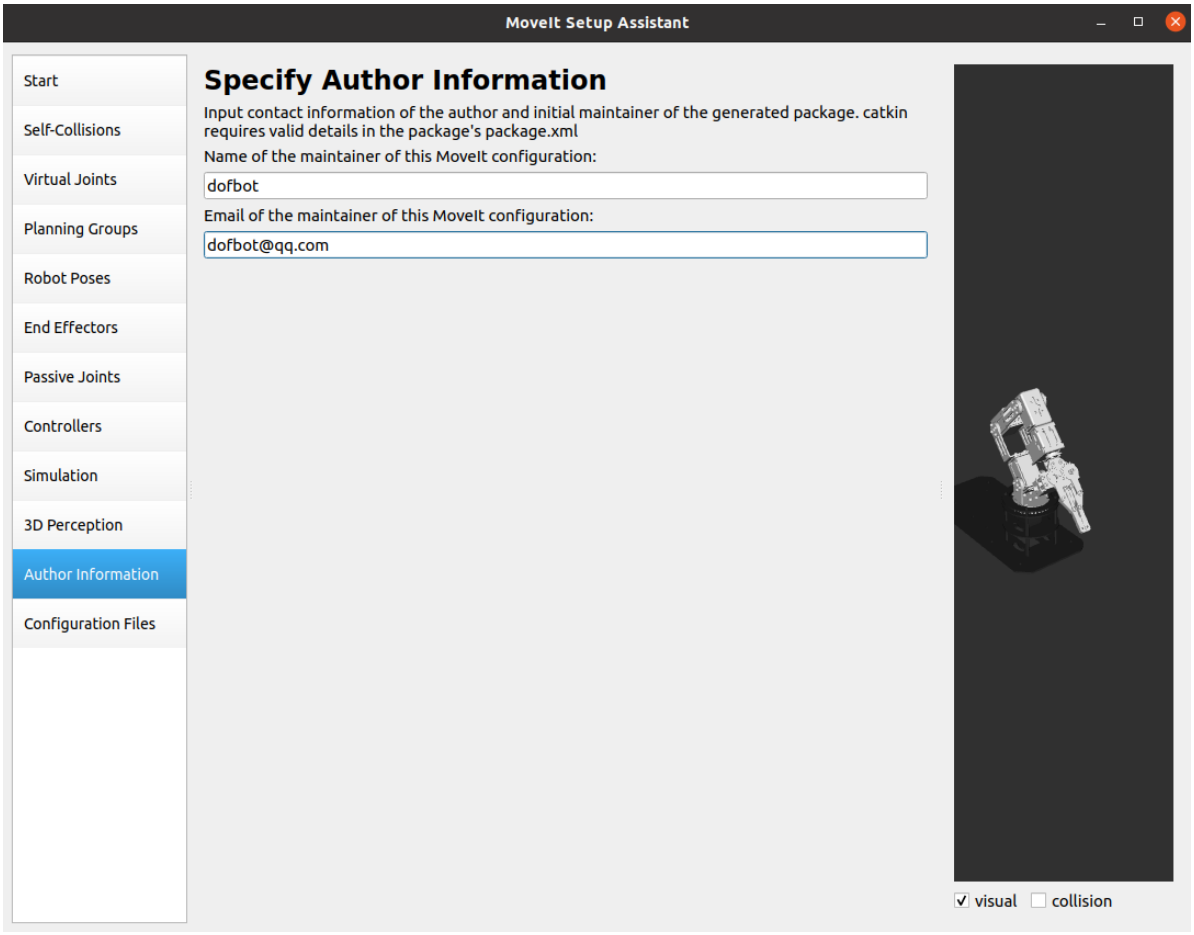
Select ROS Control and click to automatically add following joint trajectory



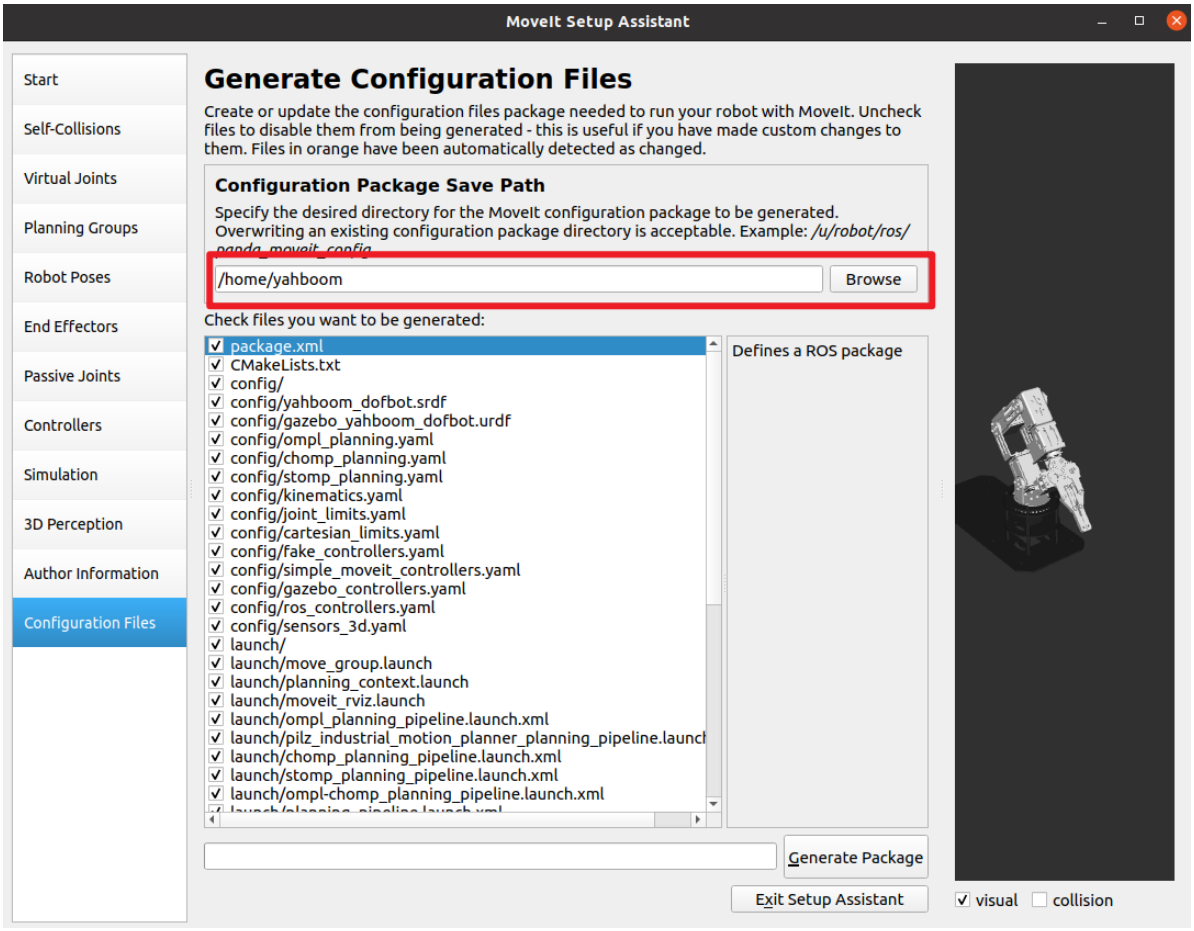
- Add simulation
  Select 【 Simulation 】 and click 【 Generate URDF 】



- Add author information. If not added, it cannot be generated
  Select 'Author Information' and add the following content.



- Generate Configuration File
  Select [Configuration Files], click [Browse], select the folder you want to prevent (the folder must be empty), click the [Generate Package] button, and generate the configuration file. After completing, click on [Exit Setup Assistant]



3.MoveIt Configuration Package Details

Opening the just created [dofbot_config] folder, we found that there are two folders: config and launch.

config folder

- Fake_ Controllers. yaml: This is the virtual controller configuration file, which allows us to run MoveIt without physical robots or even any emulators (such as gazebo) turned on.
- Joint_ Limits. yaml: This records the limits of the position, velocity, and acceleration of each joint of the robot, which will be used for future planning.
- Kinematics. yaml: something set up by the motion planning group to initialize the kinematic solution library
- Dofbot.srdf: This is an important MoveIt configuration file.
- Ompl_ Planning. yaml: Here are various parameters for configuring various OMPL algorithms.
- SR file: SR is a configuration file for moveit, used in conjunction with URDF. We can see that this is a configuration file in XML format, with the root being a robot and an attribute named 'yahboomcar'_ Dofbot '. The following is what was just set up in the Setup Assistant, including the definition of group formation, pose, terminal controller, virtual joints, and collision avoidance matrix ACM. In theory, as long as we have SRDF and URDF, we can fully define a robot's moveit information.

launch folder

- Demo. launch: demo is the summary point of the run, and when opened, we can see that it includes other launch files.
- Move_ Group. launch: As the name suggests, the function of a move group is to activate a planning group. The default is to use the ompl motion planning library. The rest are all about setting some basic parameters, which can be skipped temporarily.
- Planning_ Context. launch: Here we can see that the urdf and srdf files used, as well as the kinematic solution library, are defined. It is not recommended to manually change these, but if you need to use a different URDF or SRDF, you can make the changes here.
- Setup_ Assistant. launch: If you need to make some configuration changes, you can run it directly.

4.Configuration verification

Enter the workspace where the configuration file is located and execute the following command

```
cd ~/dofbot_ws/                                  # Entering the workspace
catkin_make                                      # Compile
source devel/setup.bash                          # Update system
environment
roslaunch dofbot_config demo.launch
# Start moveIT
```

As shown below.