## 7. ROS arm controllers grip and pick results:

The below image displays the plan generated by PlanSys2, outlining the sequence of actions for the robotic arm:

The workspace was divided into 9 parts, each part having its own coordinates and being treated as a location. The object in question was named as “beer” at the time of the trial run as it had been downloaded from open source models just a few minutes prior. The name has been changed for it now.

The command given was: “Amigos: move beer from position1 to position 5”

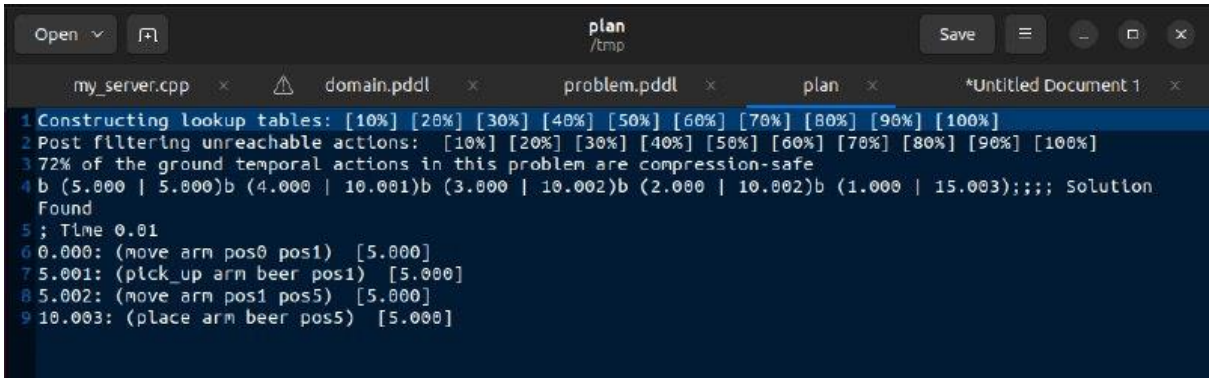


**Fig 7.2.1 Plan Generated by PlanSys2**

Fig 7.2.2 depicts the initial position of the robotic arm before executing any actions.

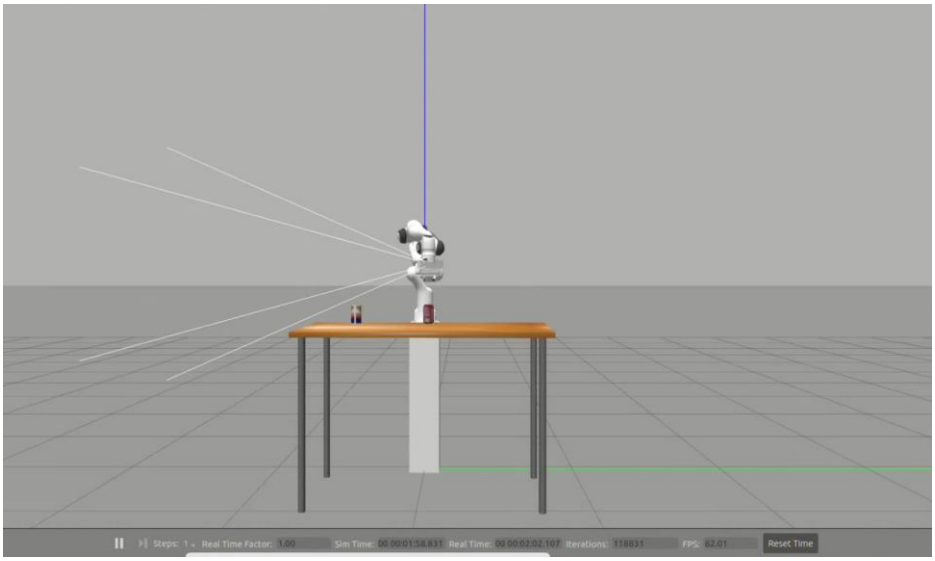

**Fig 7.2.2 Initial Position of the Arm**

The arm after generating the plan, starts executing it. First step was to Move to pick the object, then the second step was to Pick the object. To Pick the object, the object must be attached to the robot in the simulator as the gazebo virtual world has no concept of friction and hence the object would slip away or get knocked away,

treating the contact with the arm as a forbidden collision.

The below image illustrates the process of attaching an object to the end-effector of the robotic arm.

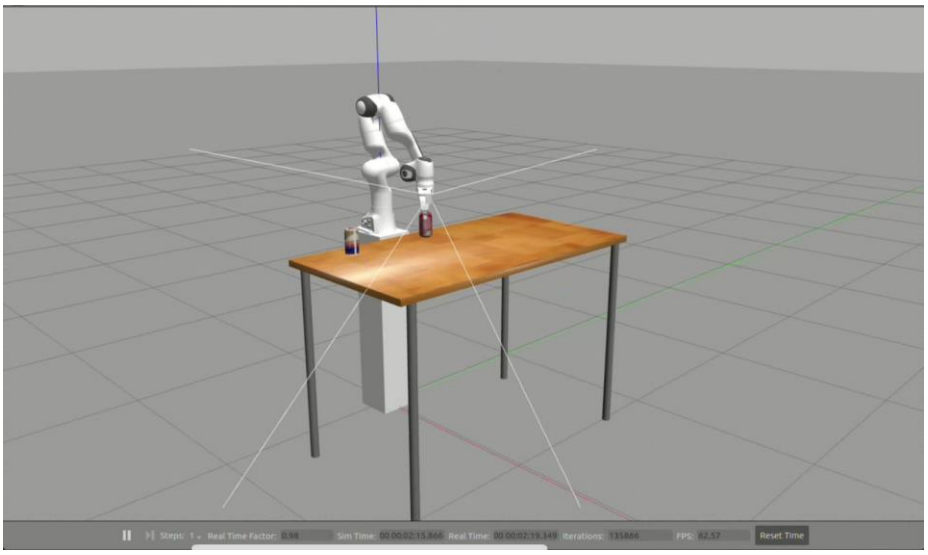

**Fig 7.2.3 Attaching Object**

Once the object is attached to the robot, the next step in the Pick action is to lift it off the table.

Fig 7.2.4 showcases the robotic arm picking up an object from a specified position.

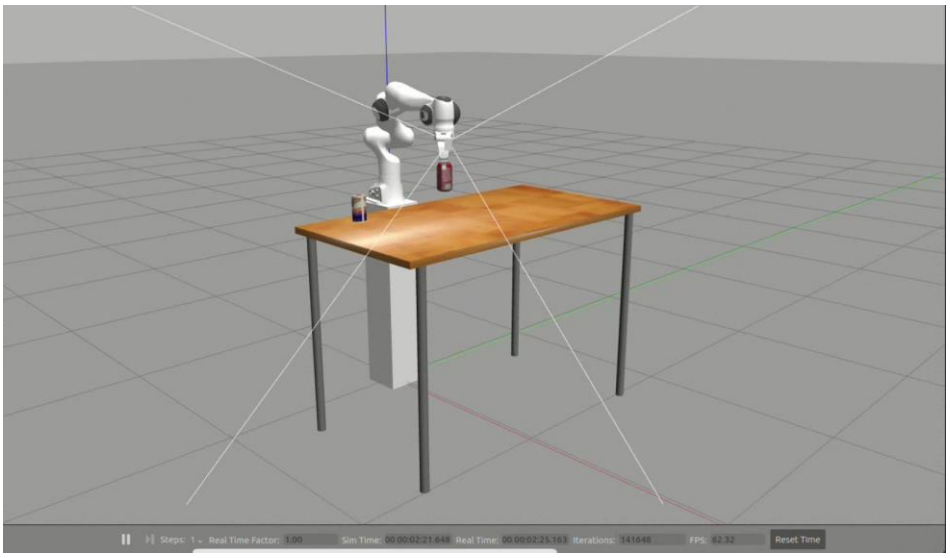

**Fig 7.2.4 Picking Object from Position**

The third step is to then Move it to the desired location. We keep move operations at a height, so as to avoid colliding with other objects on the table that might come in the way. Once the arm is hovering above the desired location, the last step – Place action starts. Here, the object is gently placed on the table, then detached from the arm and the arm lifts itself back up, leaving the object behind.

Fig 7.2.5 exhibits the robotic arm placing the object it picked up to the designated position.

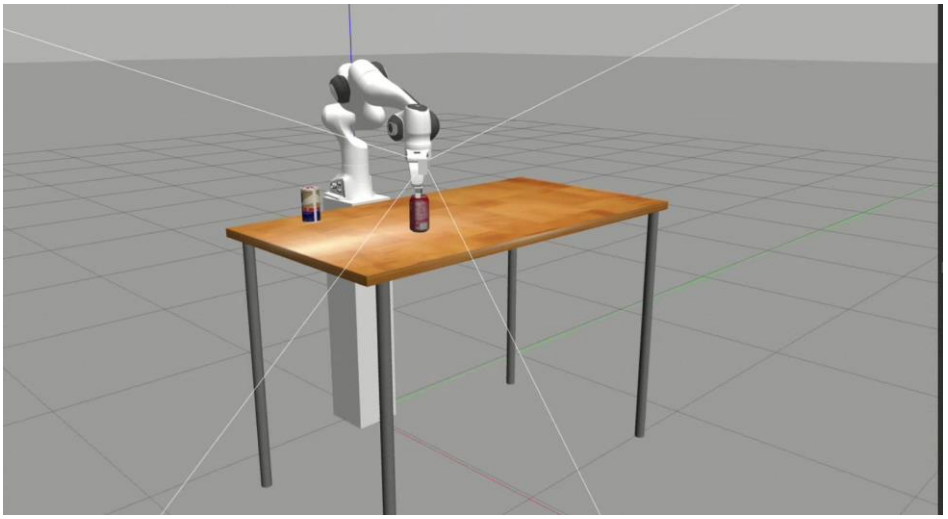

**Fig 7.2.5 Placing Object to Position**