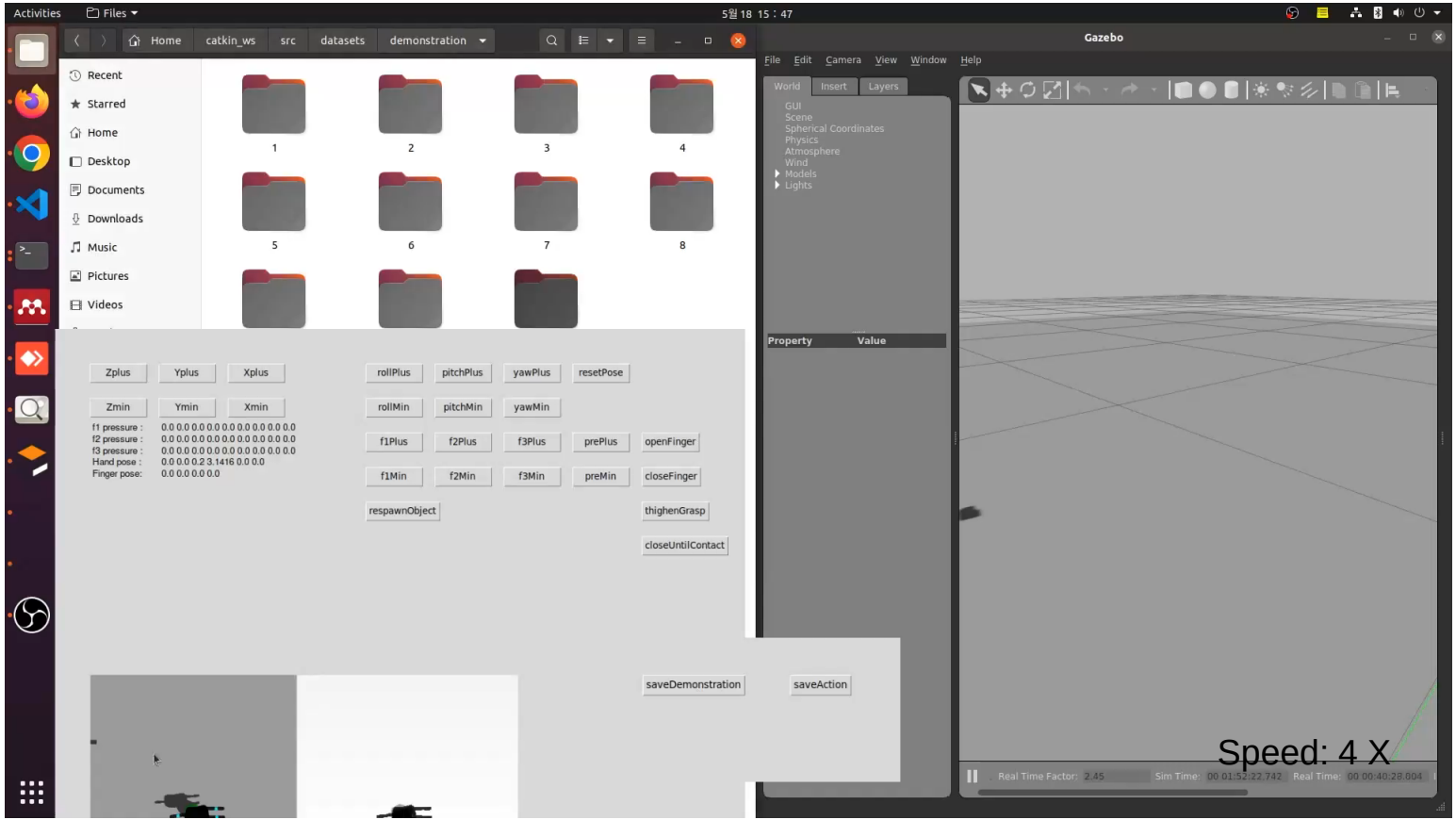
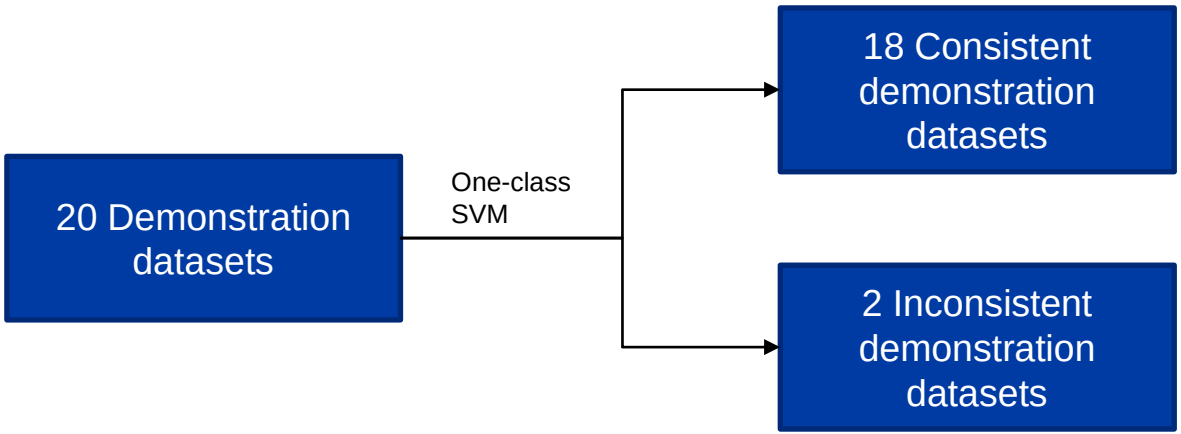
Autonomous Grasp with LfD in Gazebo

Kurnianto Irfan Rahadi

Demonstration Example

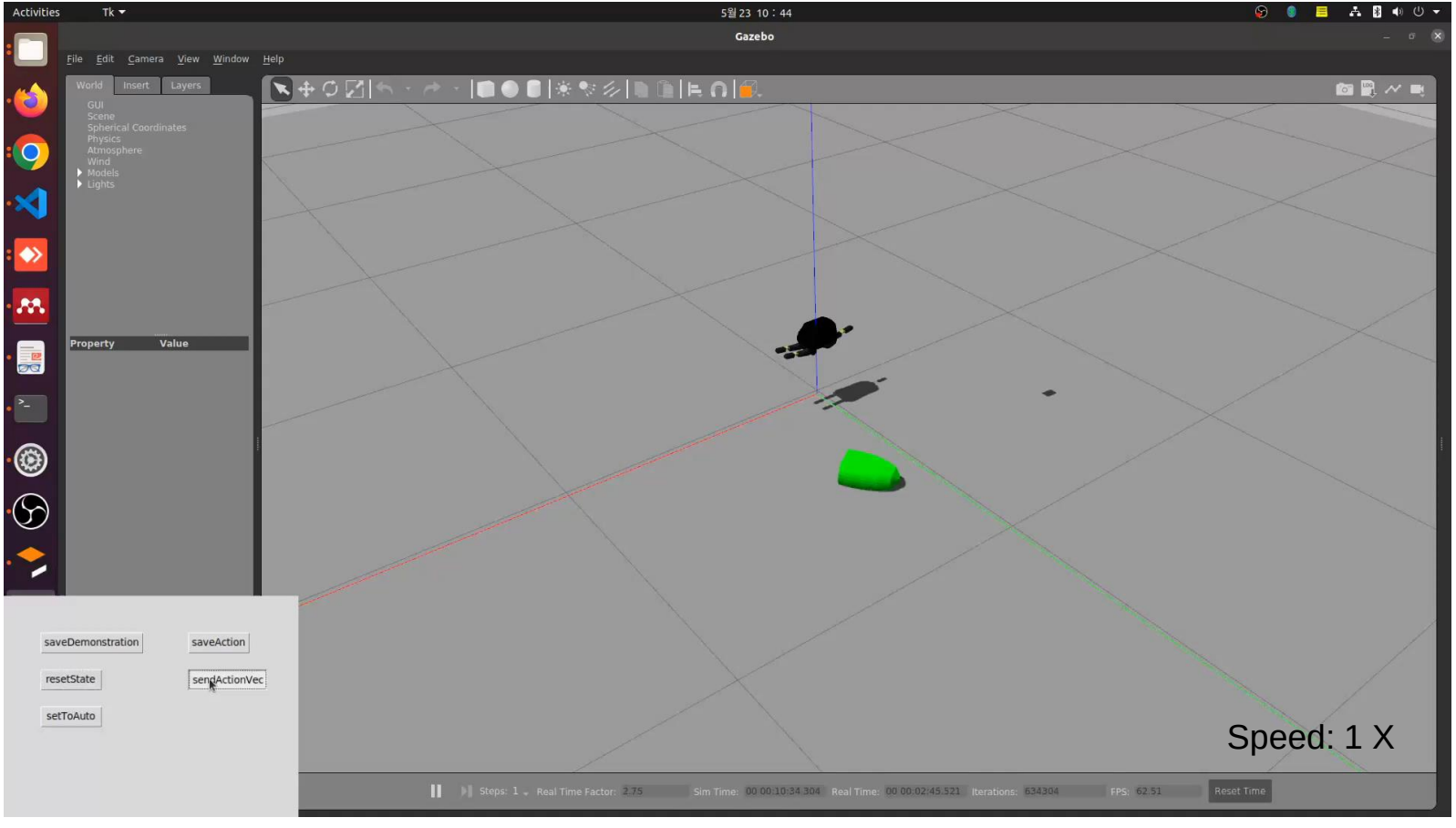


Inconsistent Filter

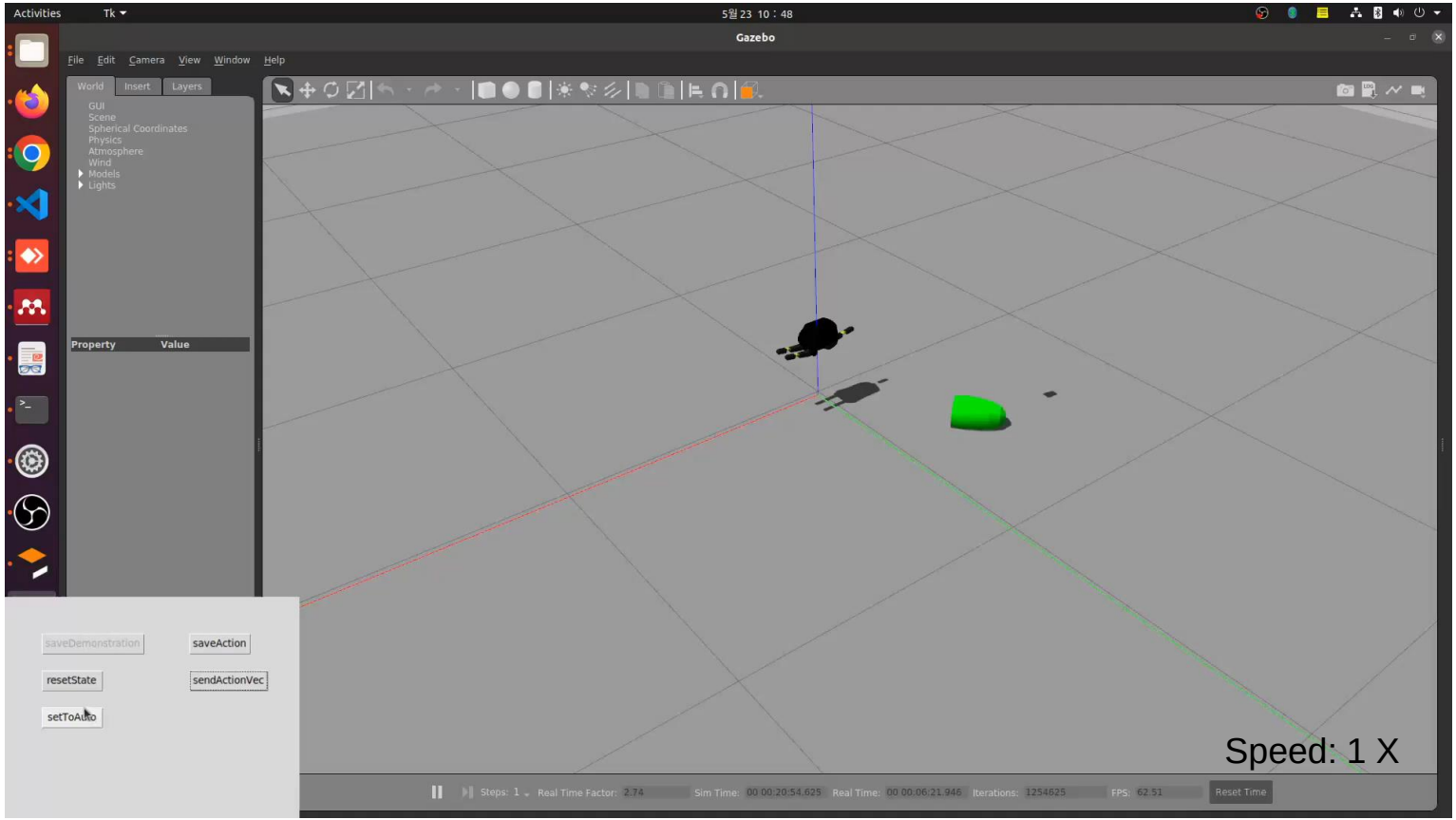


Example when we use 20 demonstration

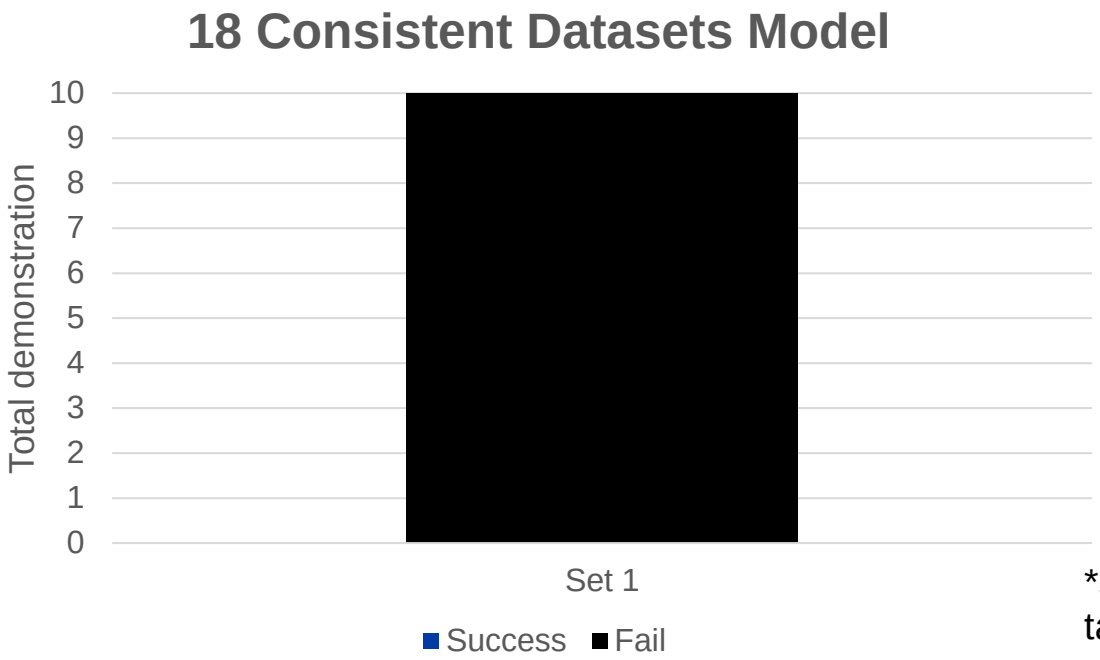
Good Autonomous Grasping Example



Bad Autonomous Grasping Example



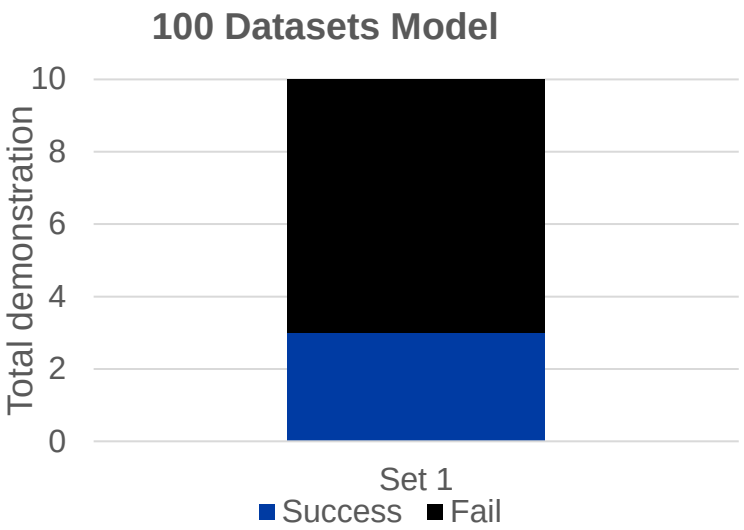
Autonomous Grasp for 20 Datasets Model



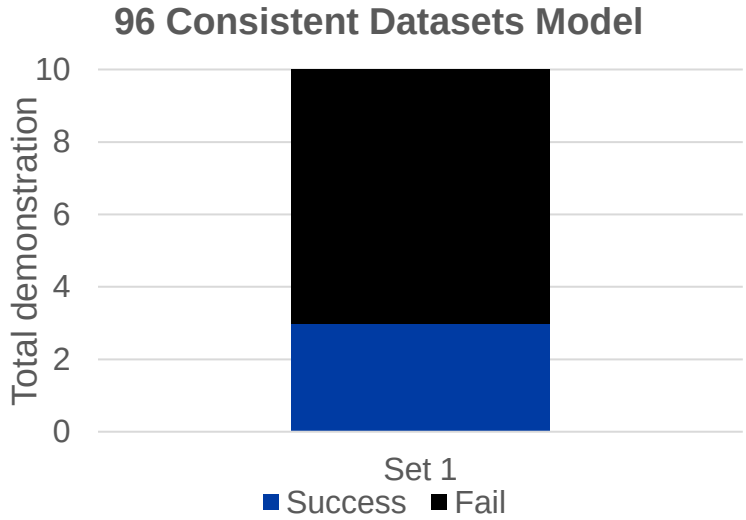
Success rates: 0 %

*set : perform autonomous task consecutively

Autonomous Grasp Model for 100 Datasets

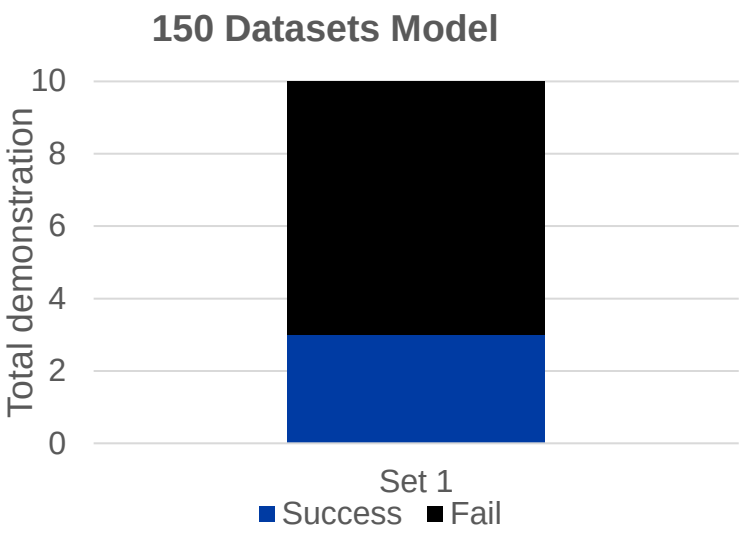


Success rates: 30 %

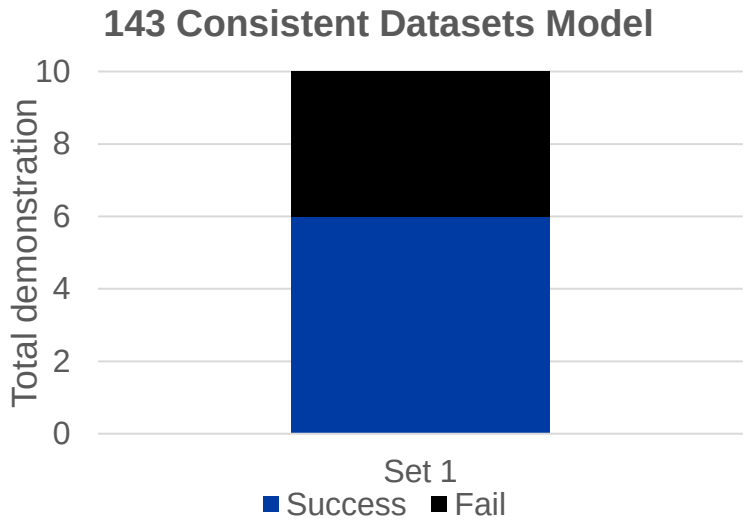


Success rates: 30 %

Autonomous Grasp Model for 150 Datasets



Success rates: 30 %



Success rates: 60 %

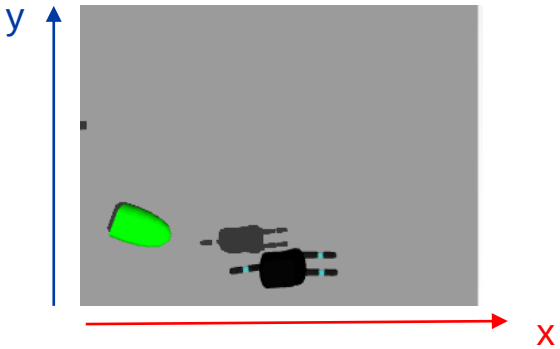
Conclusion

- To improve grasp success rates, we need more demonstration
- The demonstrator is not expert demonstrant

Additional Materials

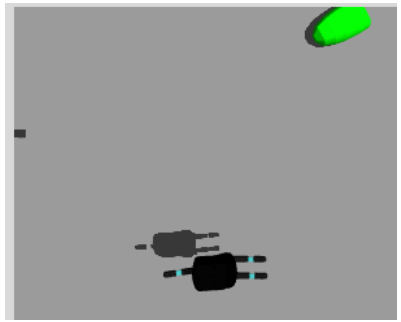
Kurnianto Irfan Rahadi

Configuration of Object Spawnmer



Lower bound

Object pose and orientation
x : -0.5
y : 0.1
yaw: -2



Upper bound

Object pose and orientation
x : 0.5
y : 0.8
yaw: 2

Robot Operating System

Control System

- PID Controller
- Reinforcement Learning

Actuator

Things that move

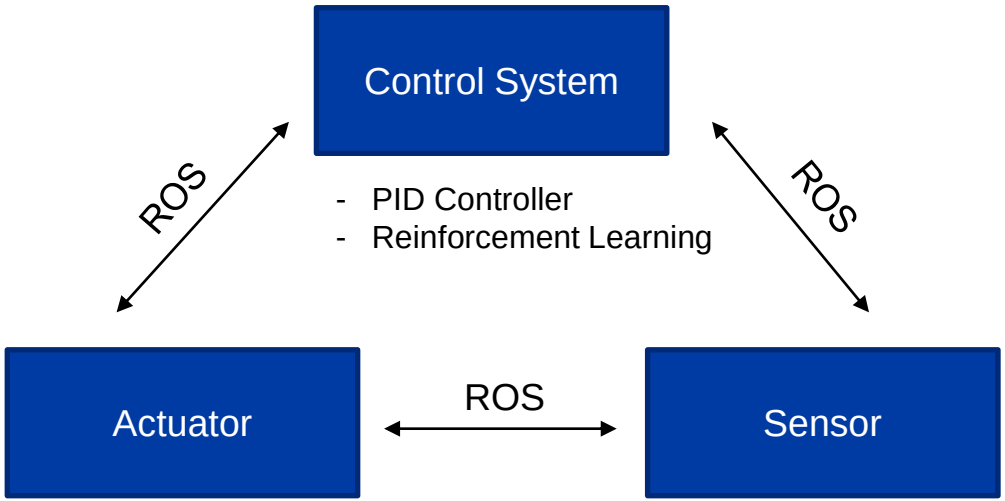
- Motor
- Robot Arm

Sensor

Things that read the world

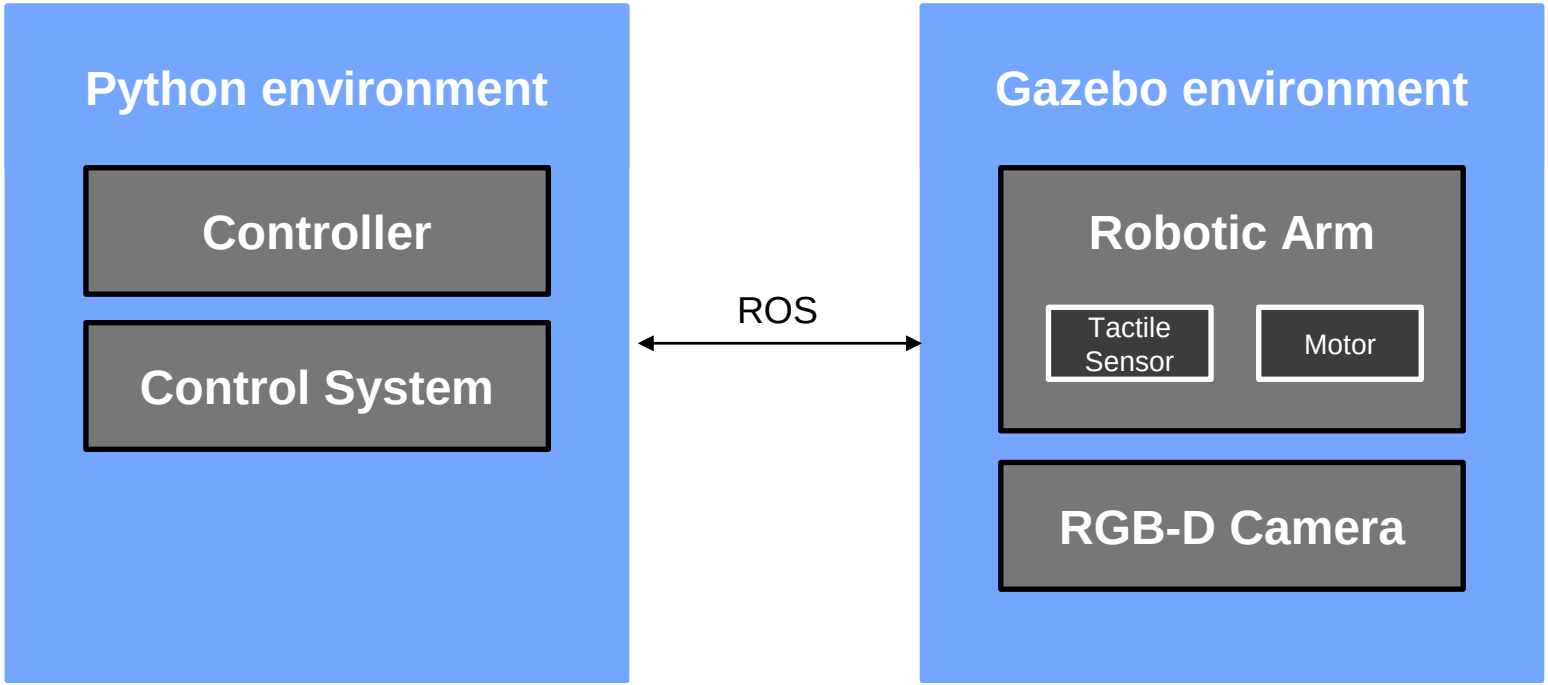
- RGB-D Camera
- Tactile Sensor

Robot Operating System (2)

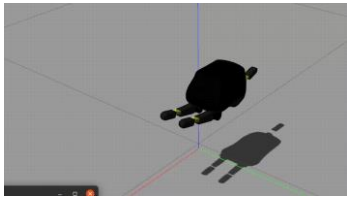


ROS :
A program that publishes or subscribes a message

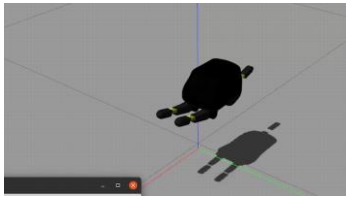
Python, ROS, and Gazebo Communication



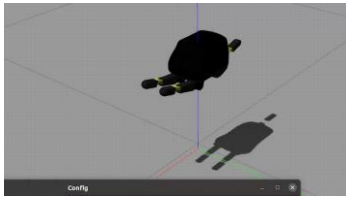
Gazebo Pose Axis



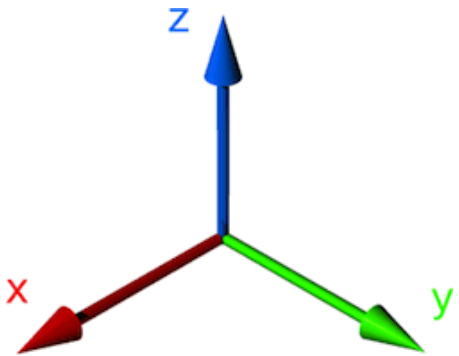
X+

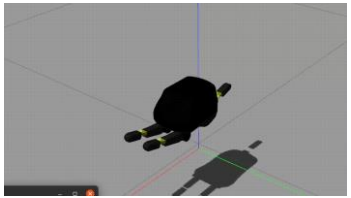


Y+

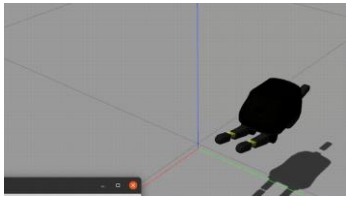


Z+





X-



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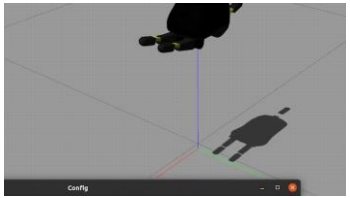
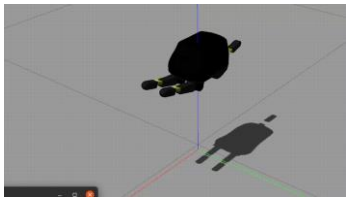
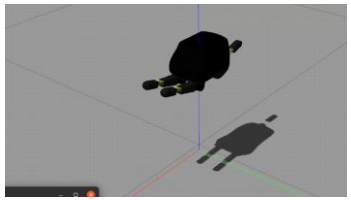


Z-

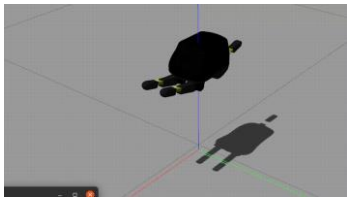
Gazebo Orientation Axis



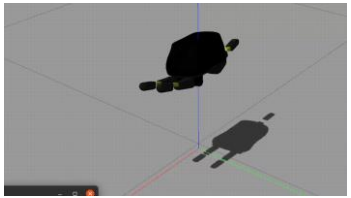
Roll+



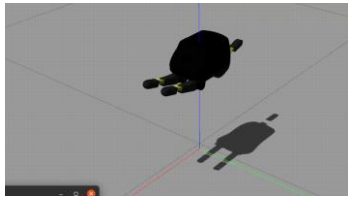
Pitch+



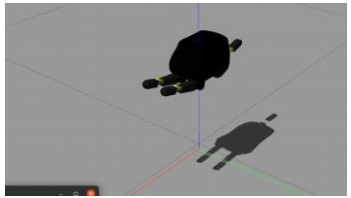
Yaw+



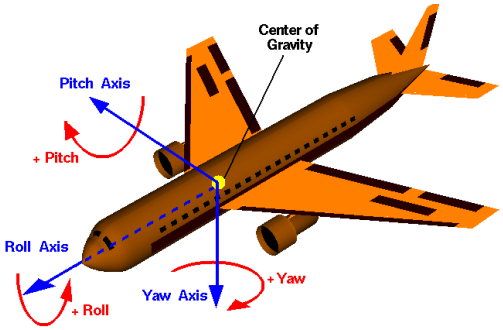
Roll-



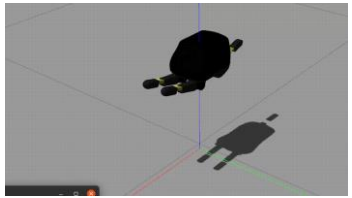
Pitch-



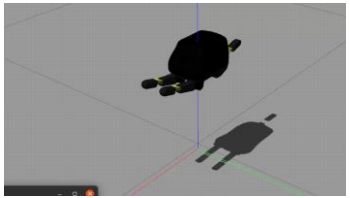
Yaw-



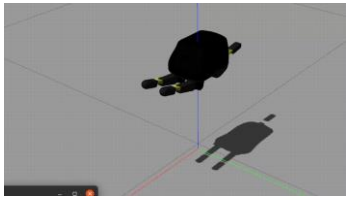
Gazebo Finger Movement



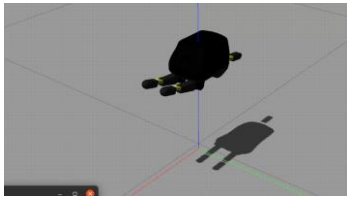
f1+



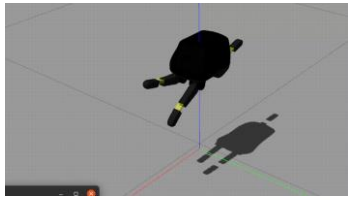
f2+



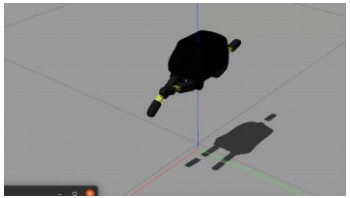
f3+



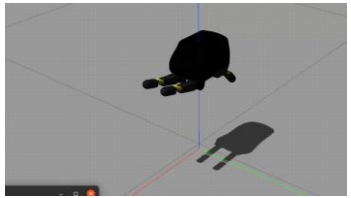
preshape+



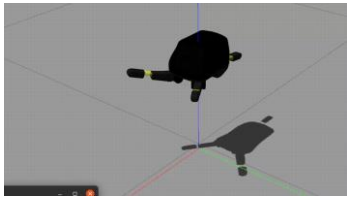
f1-



f2-

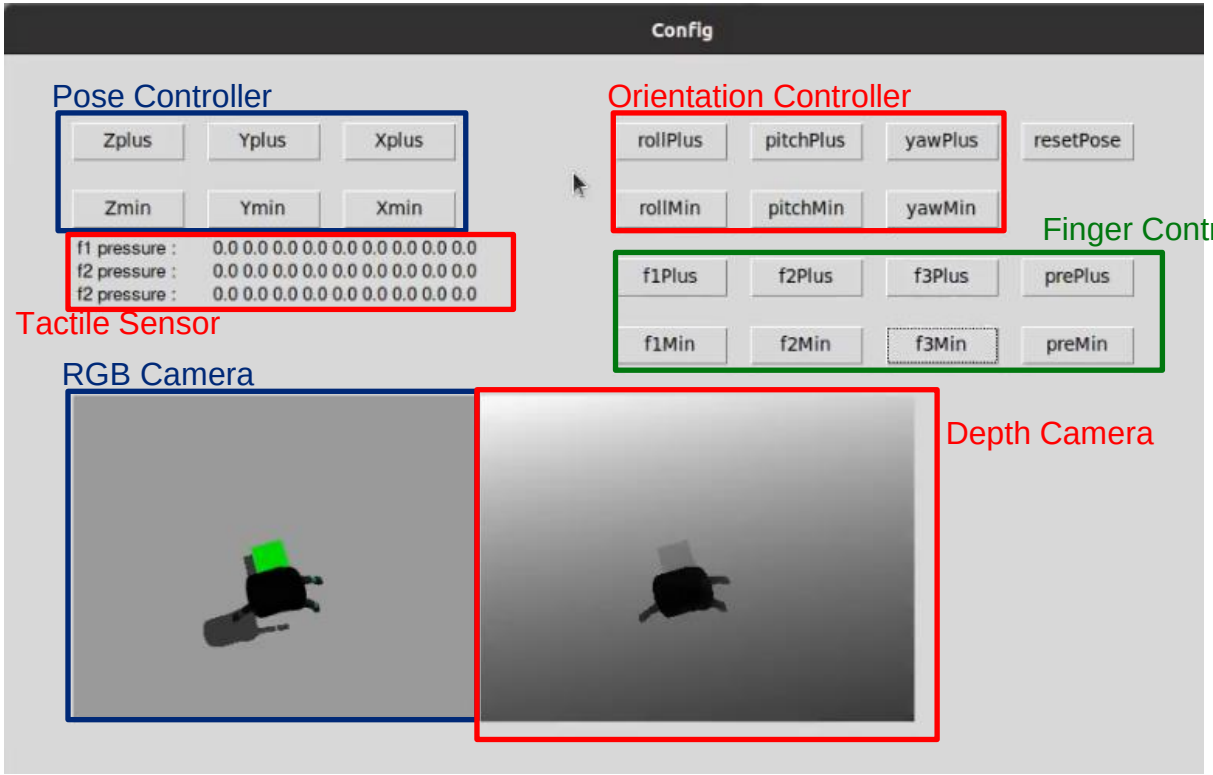


f3-

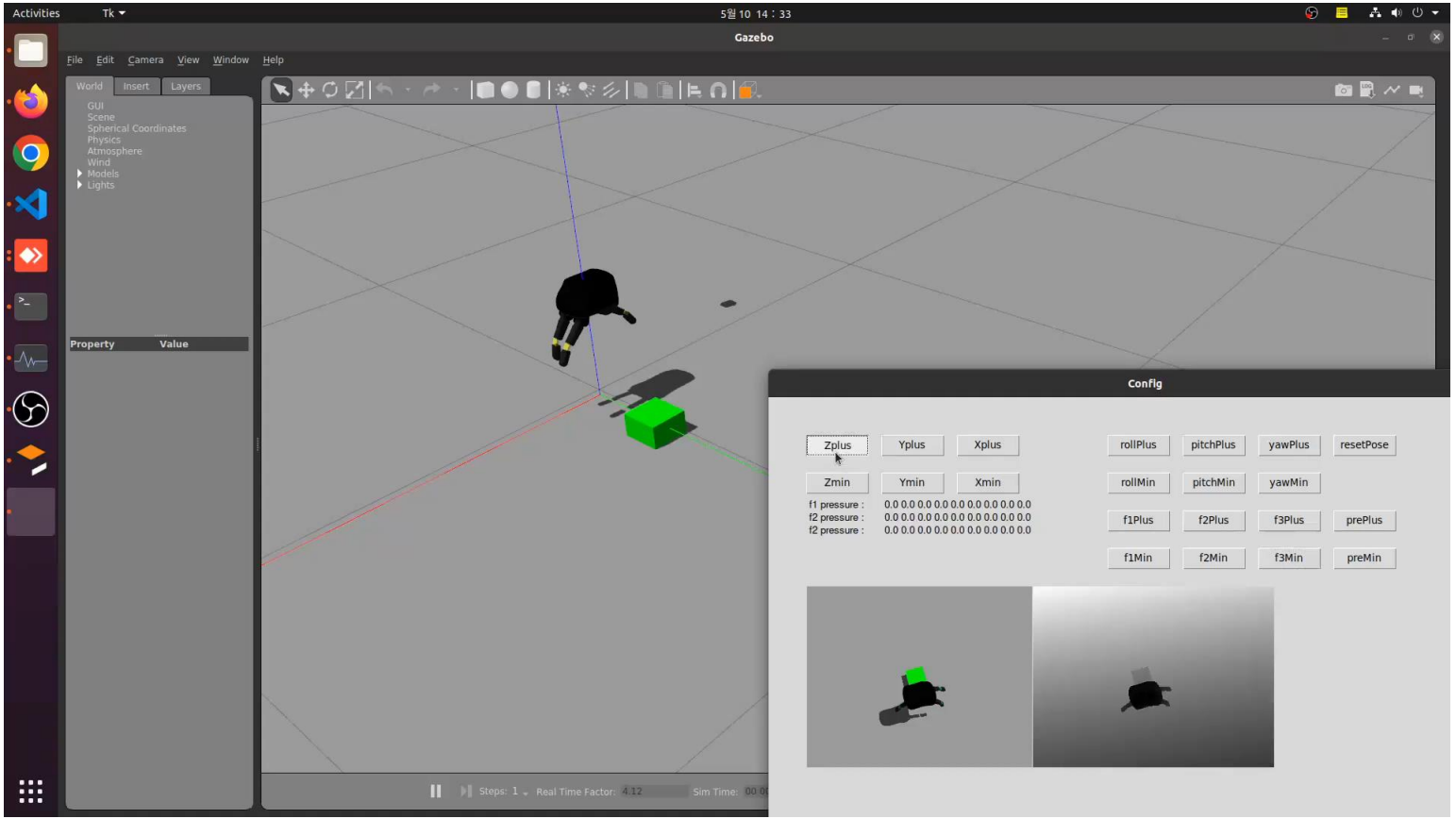


preshape-

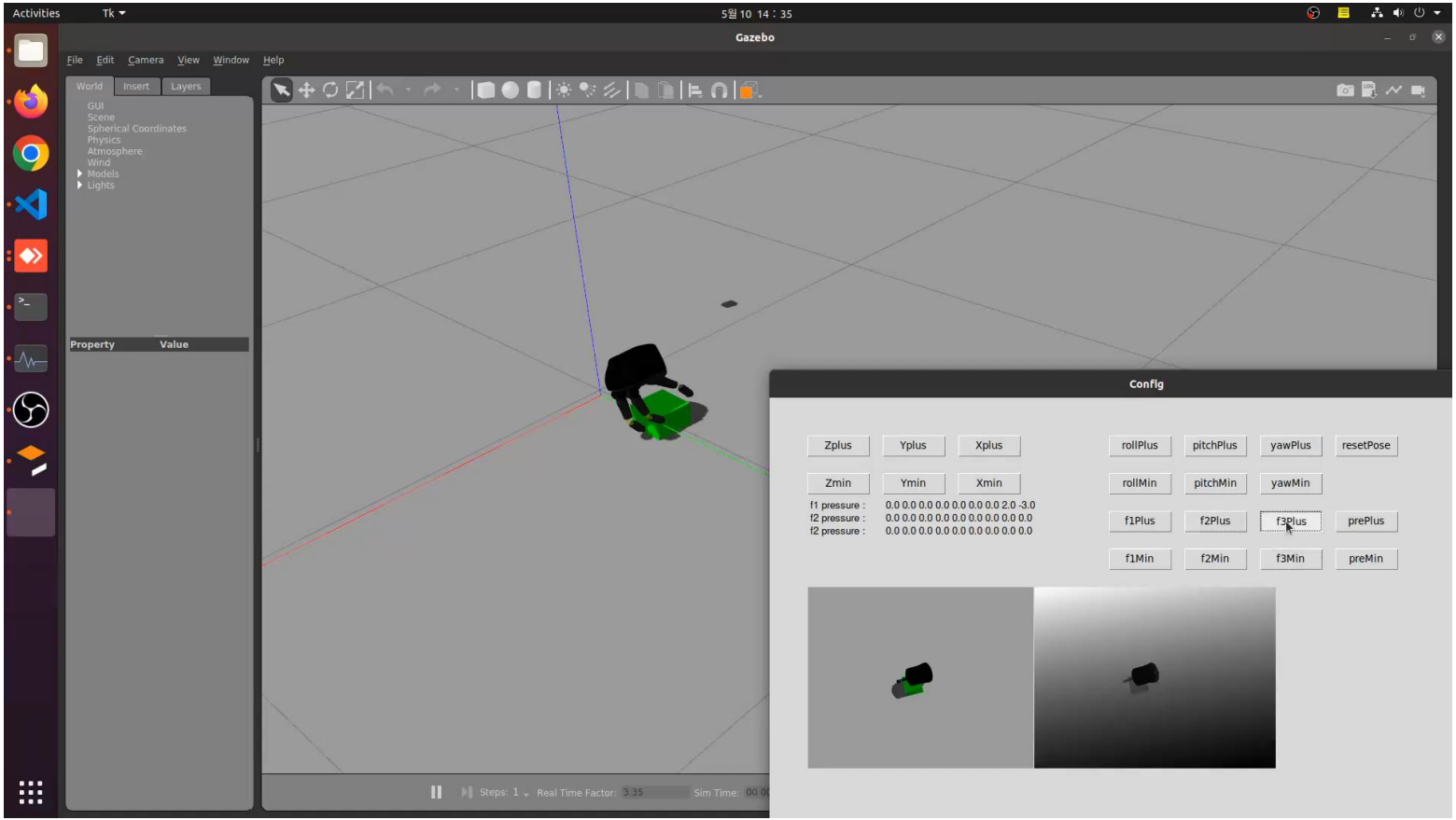
GUI Python Tkinter Controller



GUI Python Tkinter Controller (2)



GUI Python Tkinter Controller (3)



Data Shape

Data	Shape
Pose Controller	(3,1)
Orientation Controller	(3,1)
Finger Controller	(4,1)
Tactile sensor for each finger	(9,1)
RGB Camera*	(320,240,3)
Depth Camera*	(320,240,1)

* Width and height can be change