



PC649: MSc (IT) Summer Internship

Study of Robotics Simulator

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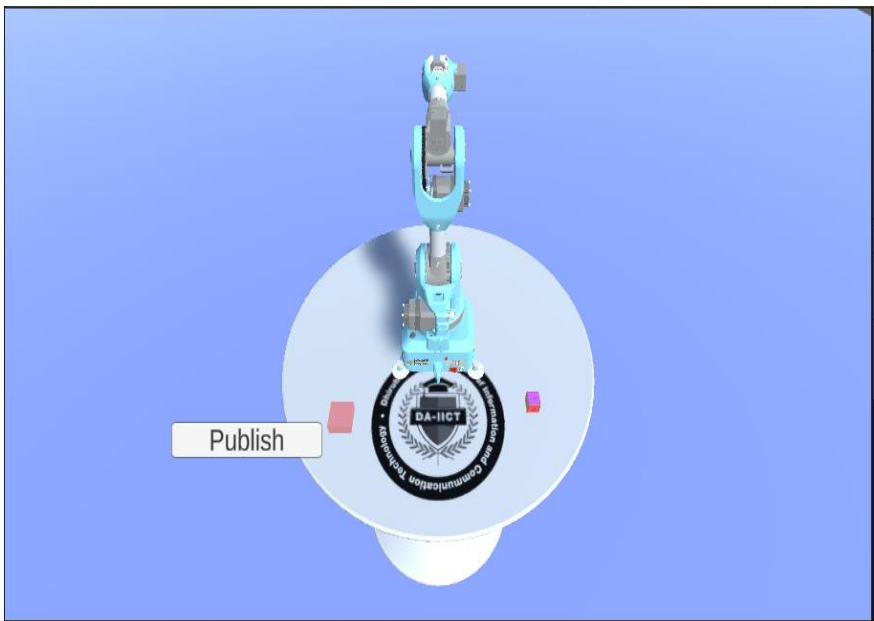
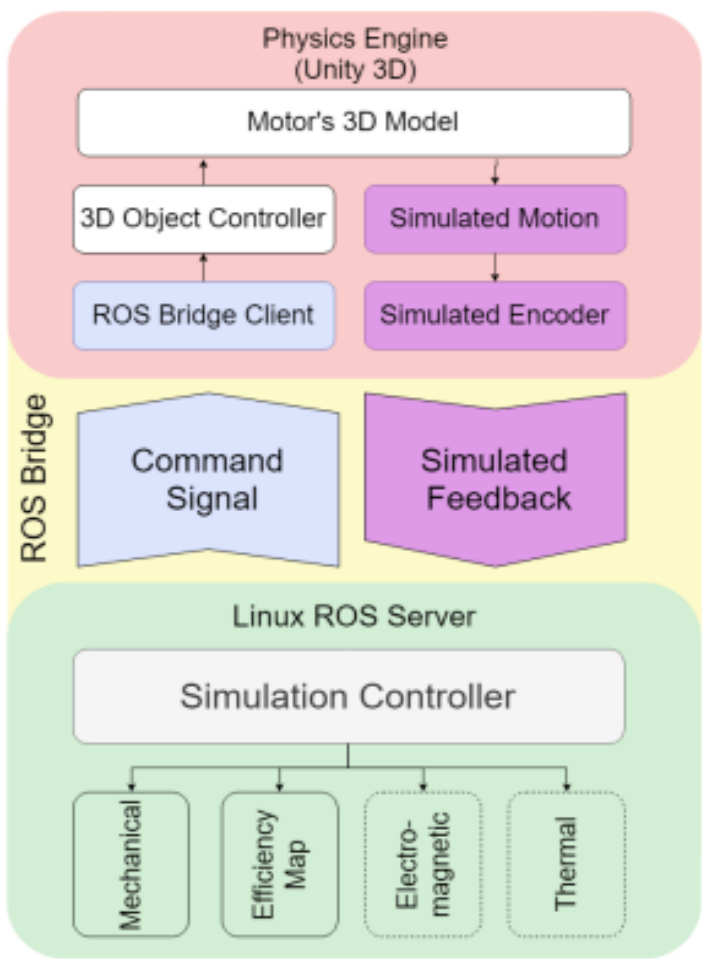
About Project

In recent years, mobile robots are becoming more and more common in industry and private households. This thesis aims to examine the simulation of mobile robots with Unity and ROS. Unity is a popular game-engine and widely used for the development of video games. The usage of Unity as a robotic simulator with learning environments could be useful for training learning algorithms. Data can easily be produced by automatically creating environments and acquiring data through simulations. A commonly used middleware in robotics with increasing usage and importance is ROS (Robot Operating System). Unity and ROS should be connected for this thesis work to ensure the usage of the same robot control software for the robot in reality and the simulated robots in Unity and ROS. The performance of Unity as a simulator in the ROS environment should be tested in this thesis work. While testing the performance of the simulator, its ability to adapt to different scenarios and applications should be rated.

Software Design

Underlying Architecture

Robot Model



Our Niryo robot (robotic arm) is used for our specific case study. We are going to control it. Then we will study latency between ROS sub-system and Unity sub system. There are many kinds of operations that can cause delay, for example delay between keyboard input and robot movement in the software, delay between data gathering from unity to writing data to a file, passing the data over ROS bridge, reading data and writing it to a file on ROS side. However, our guess is that the delay which is in milli seconds in our case study is majorly causing due to network transportation. Niryo robot has multiple joints namely shoulder link, arm link, elbow link, forearm link, wrist link and hand link. We will control this robot links through keyboard and will study latency through graph. For the scope of this report, we will study single way latency. Here, we have used virtual network over a real network for our study. Below are the data plots of various links. Given data is a unidirectional latency.

Snapshot

One critical aspect of simulation with Unity and ROS was the bridge that was needed between the two underlying operating systems. Problems that occurred here were for example related to timing aspects. When developing the experiments and setting up the environment in Unity and ROS, several problems appeared. One of them was a fundamental timing problem. The time in ROS is stated in two integers of time in seconds and time in nanoseconds. Following is some examples of data gathering of simulation from Both operating system over time delay.

