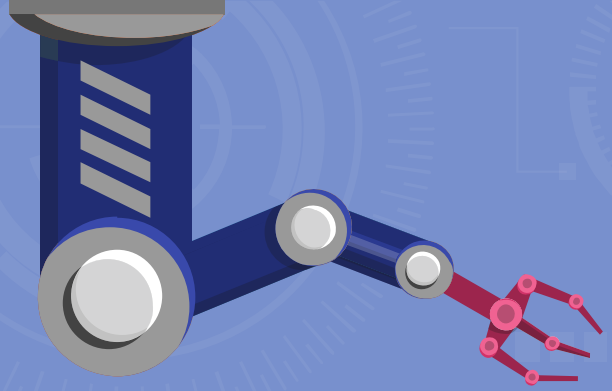
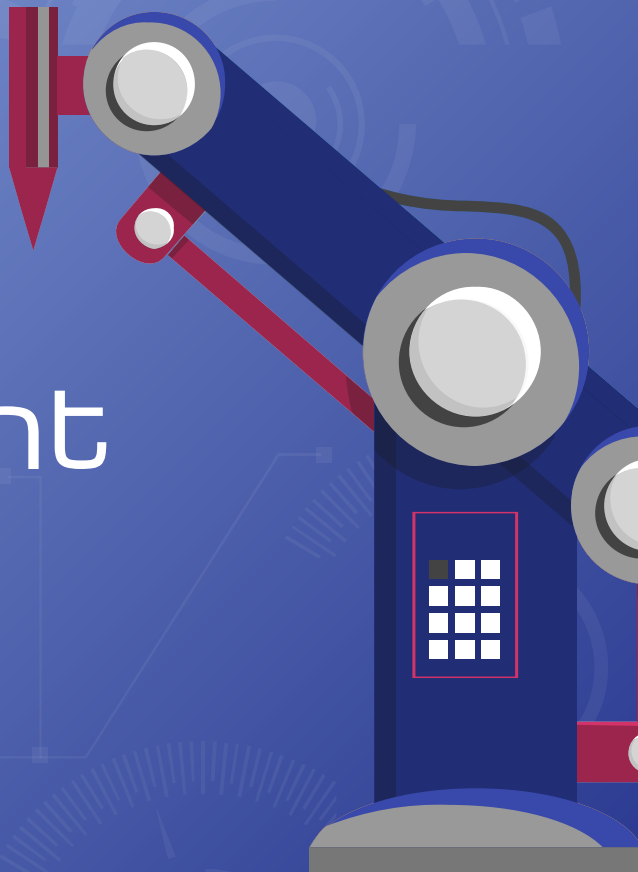




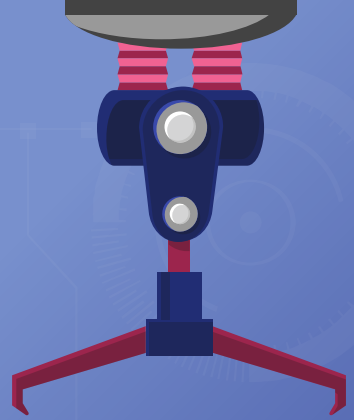
WM-3 Intelligent Robot Arm

CS4850 - Sections 03 & 04

Prototype Presentation

By Zhiwen Zheng and Ellie Ireland

Objectives & Overview



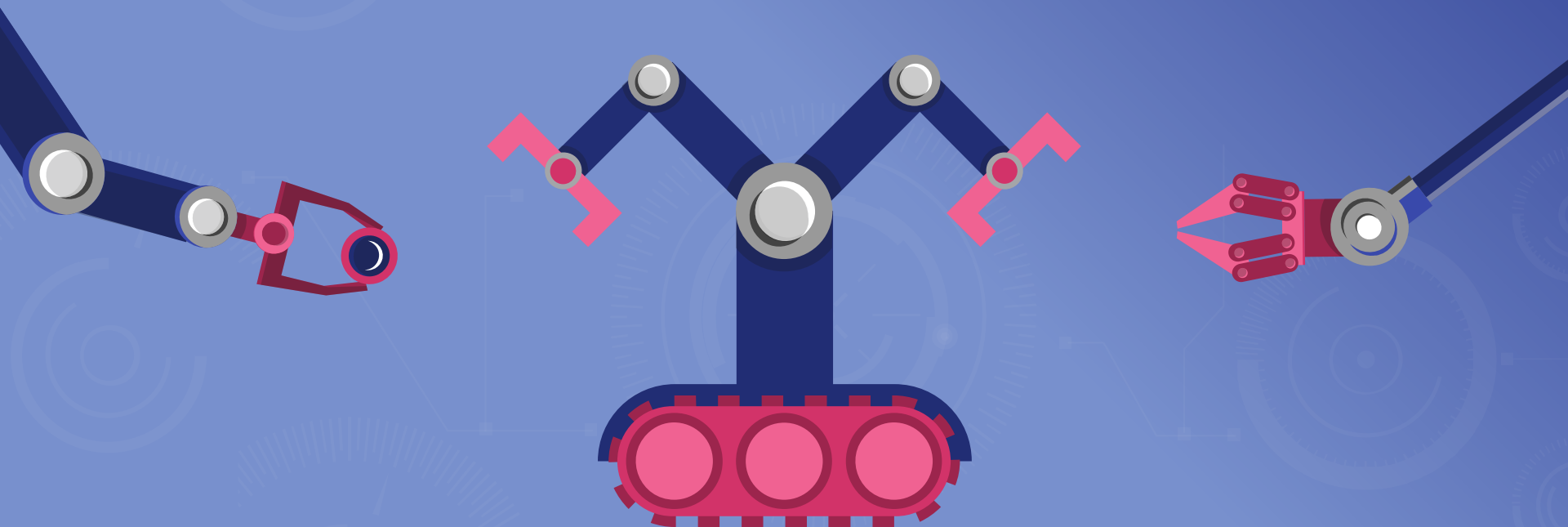
Our aim

- Implement a robotic manipulator and mobile robot together
- Achieve autonomous navigation
- Pick and place system

The goal

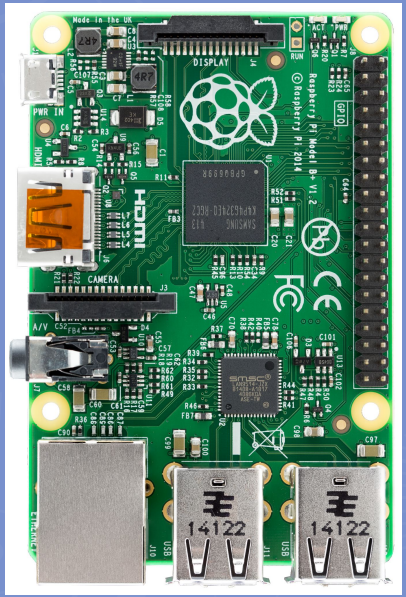
- Apply machine vision and machine learning to an integrated robotic system
- Train the model with a predefined dataset
- Deploy the system in a physical environment

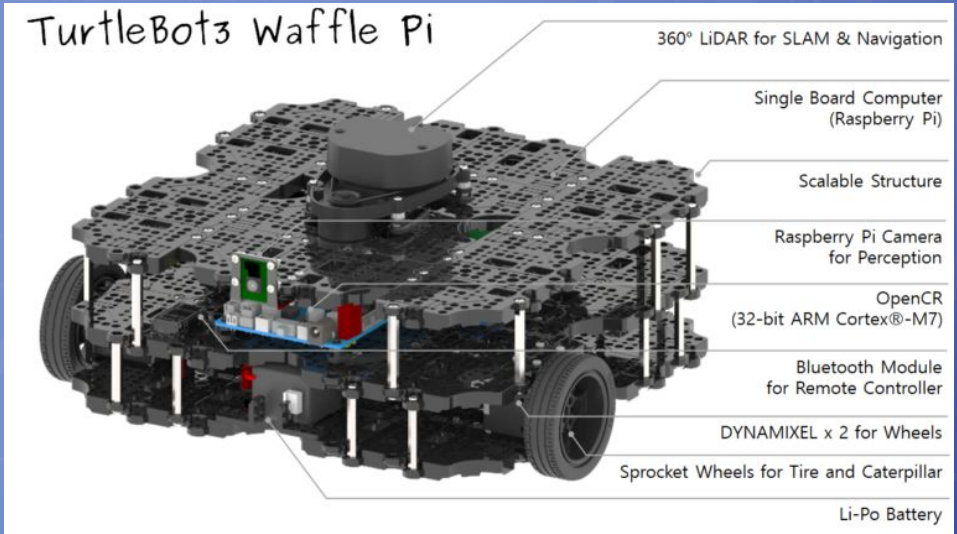
Hardware



TurtleBot3 Waffle Pi

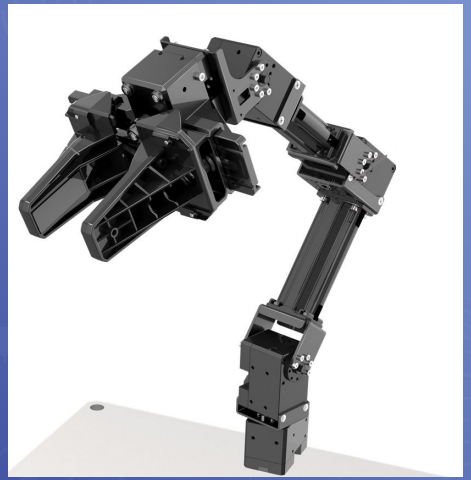
Mobile robot by ROBOTIS equipped with a camera, LIDAR, and a Raspberry Pi microcomputer

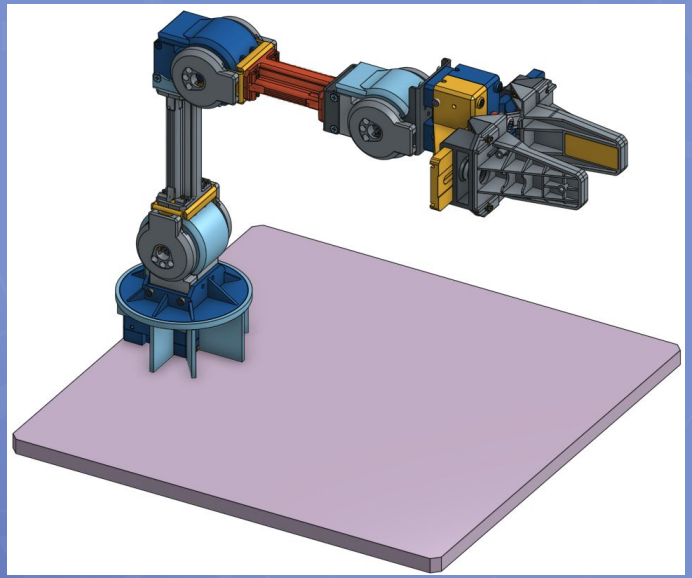




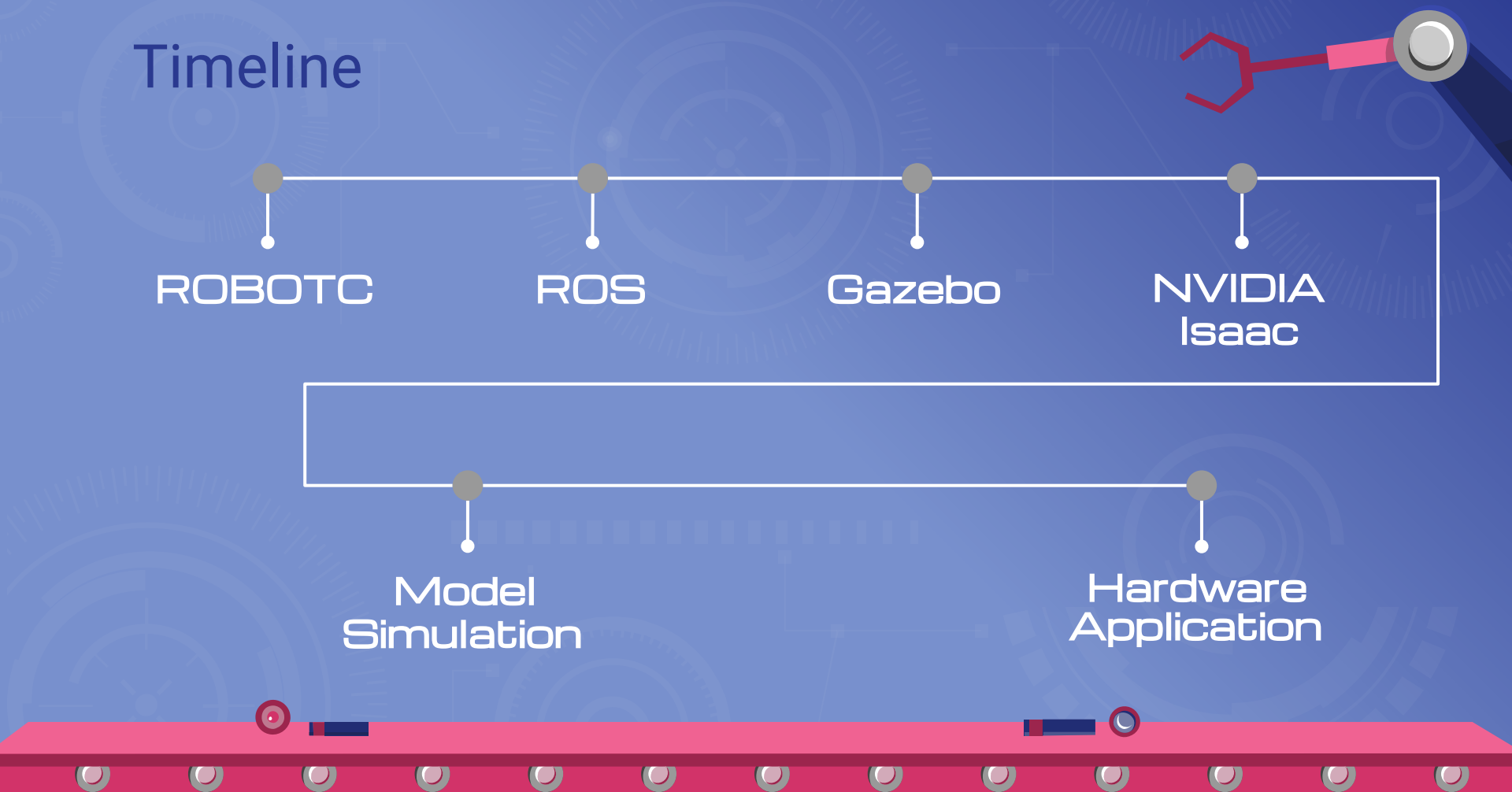
OpenManipulator X

Robotic manipulator by ROBOTIS with five degrees of freedom





Timeline


ROBOTC
ROS
Gazebo
NVIDIA Isaac
Model Simulation
Hardware Application

ROBOTC

- C based simulation environment for designing and testing robot configurations
- We utilized this tool as an introduction to robotics and model setup
- Virtual world loaded with default robot model depicted below

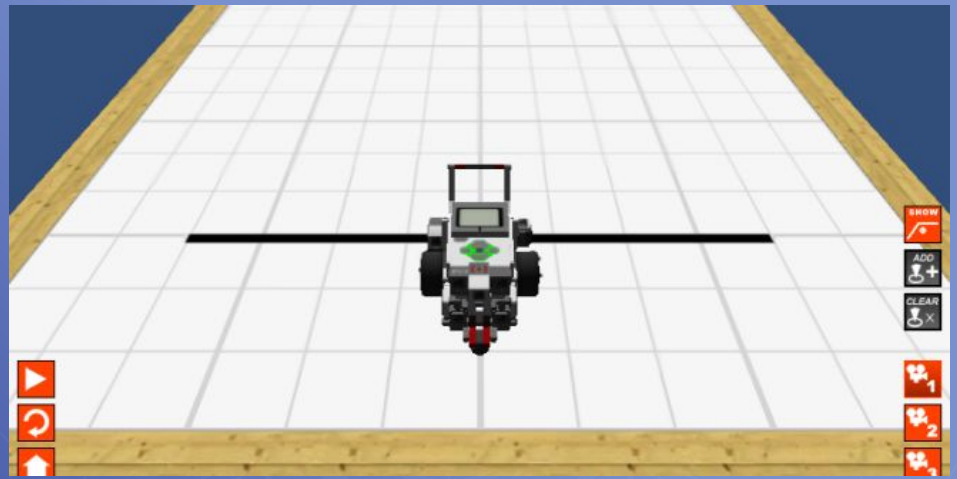


Image sourced from Google Images

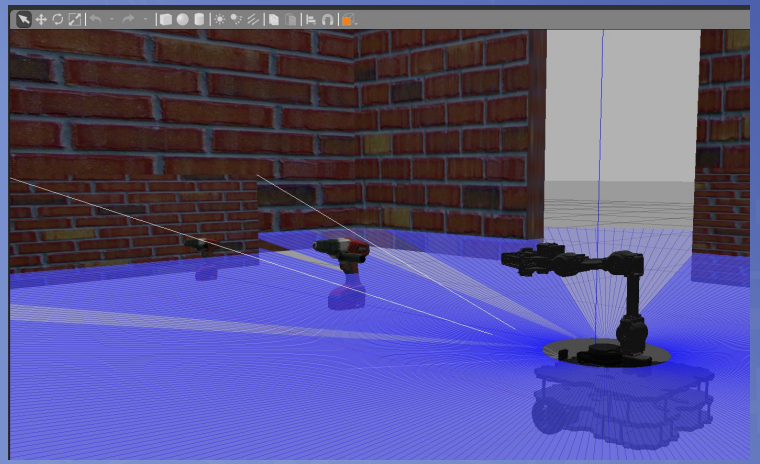
ROS and Gazebo

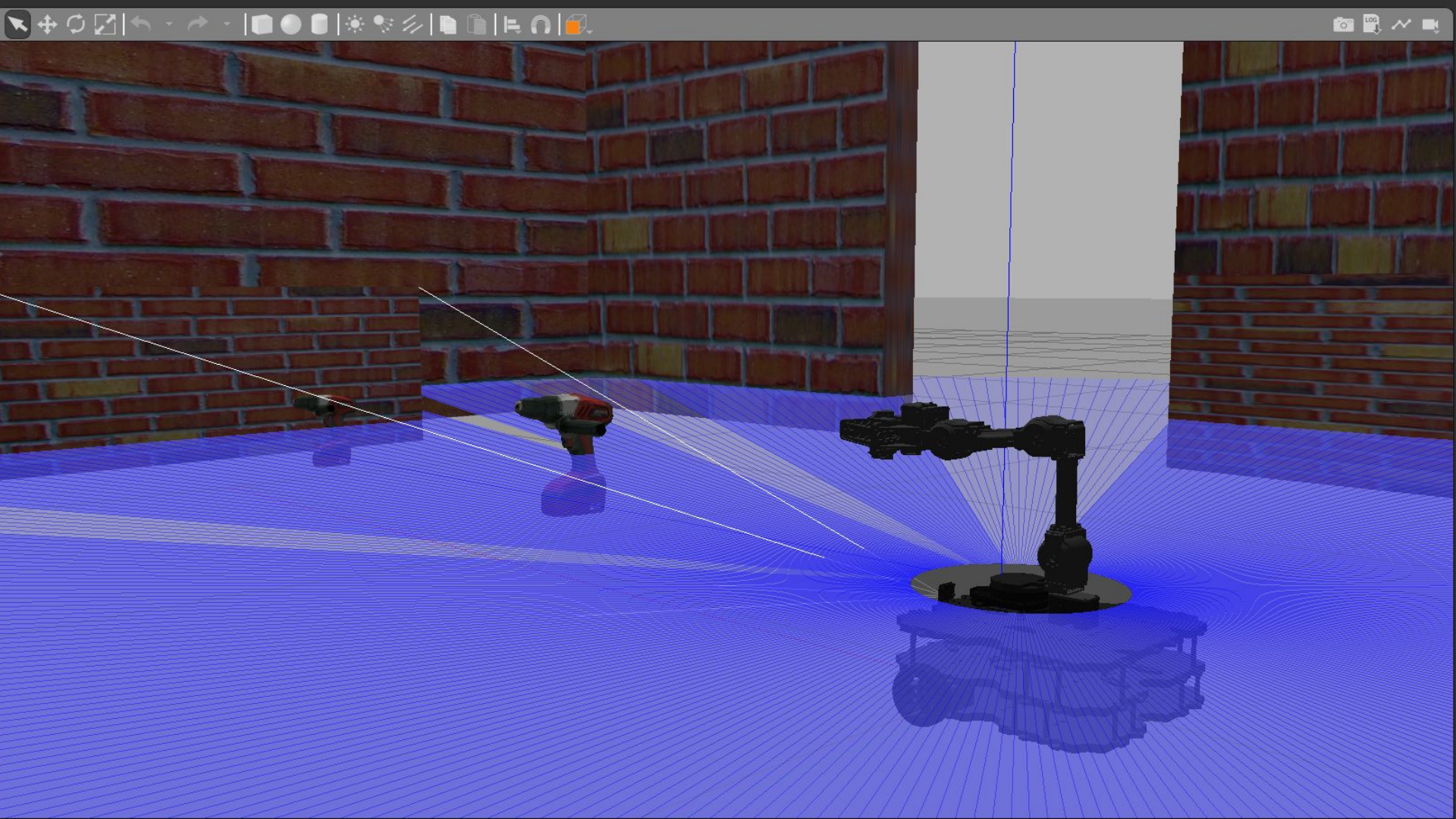
ROS

- Set of software libraries for building robot applications
- Uses a CLI for scripting and control
- Implementation via nodes
  - Communicate between individual robotic components
  - Allows for the entire system to act together
- Includes tools for robot simulation and visualization

Gazebo

- Simulation environment hosted on ROS
- Allows models to interact with world objects





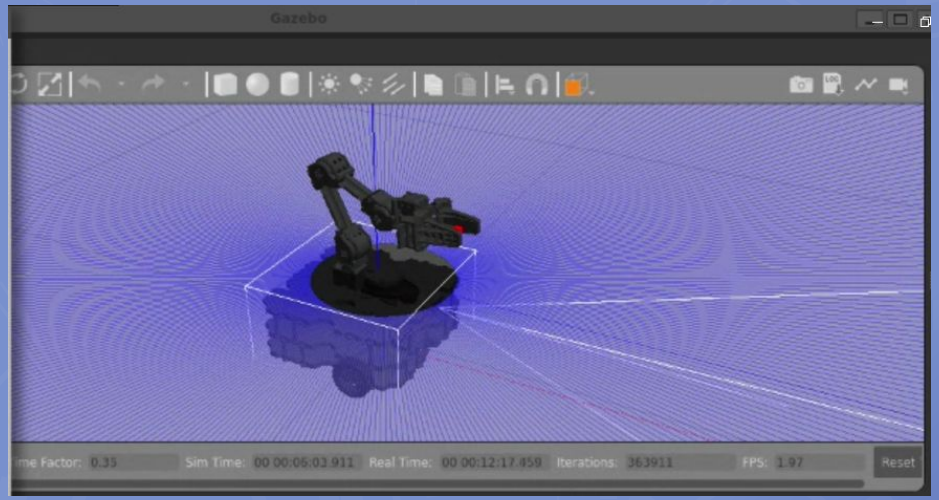
NVIDIA Isaac

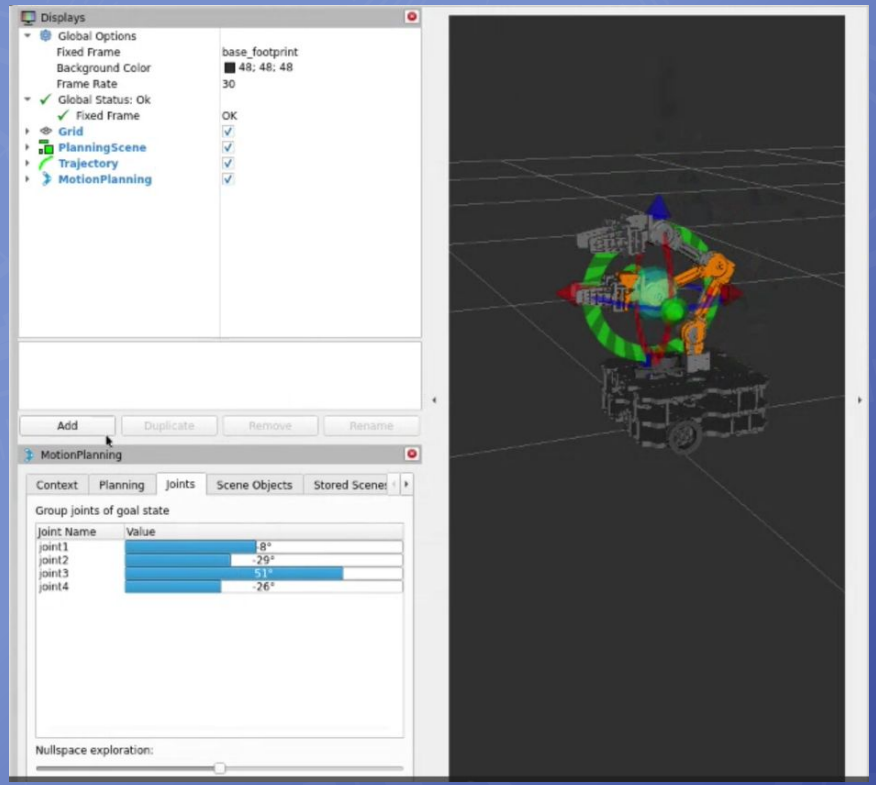
1. Isaac Sim is a software platform built by Nvidia.
2. Comes with a collection of workflows for importing and tuning mechanical systems designed in the most common formats
3. Can directly access to Nvidia Geforce RTX GPU to support the simulation of various kinds of sensors (cameras, LiDAR, and contact sensors)

Model Simulation

Simulation in ROS

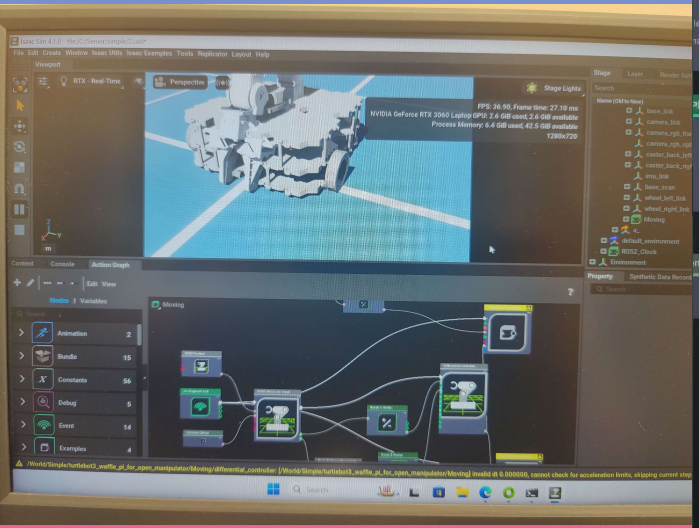
ROS: firmware/software libraries
Rviz: 3D visualization tool for trajectory control
Gazebo: simulation environment and world editor

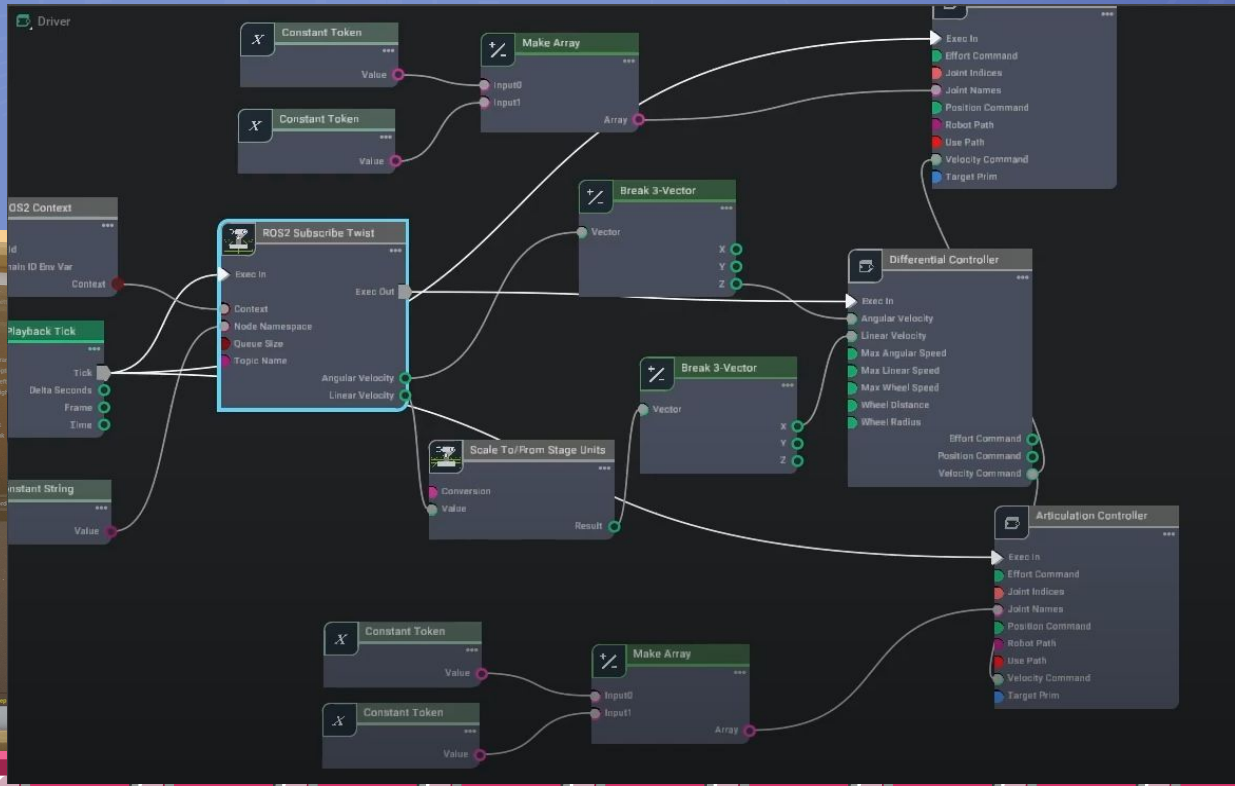




Simulation in Isaac

NVIDIA Isaac: utilizes CLI interface and action graph





Hardware Application and Future Goals

Hardware Shipment

We are currently waiting on the hardware to be delivered to the school.

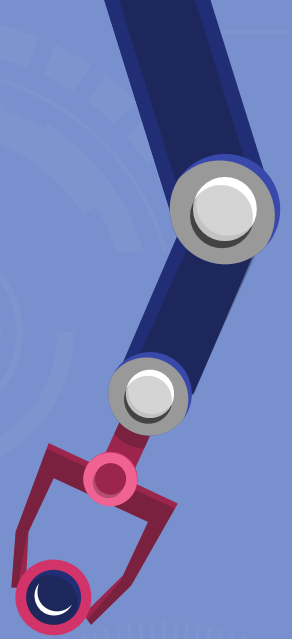
Model Improvement

We are actively enhancing the model in simulation while we wait for physical resources to become available

Future Goals

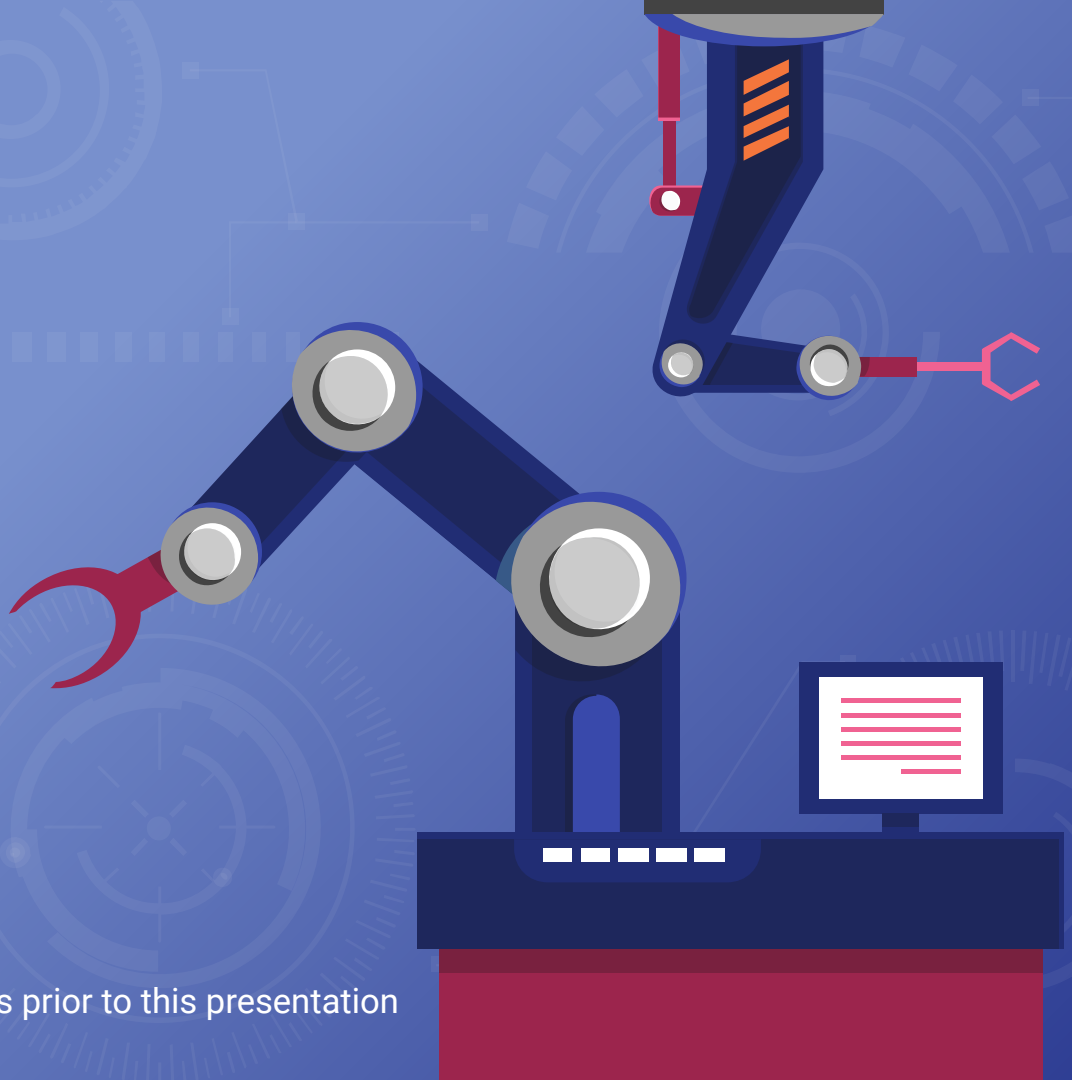
Upon hardware delivery:

- Upload the models to the physical system
- Test in a lab environment
- Modify the models as needed



Thank you

Any questions?



We submitted our powerpoint slides prior to this presentation