EE3305 / ME3243: Robotic System Design (Part 2)

1 Introduction to Part 2

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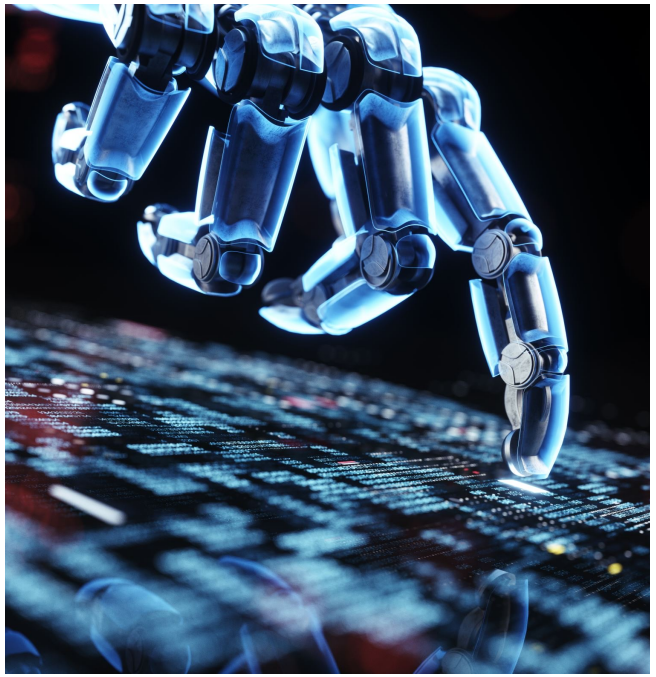
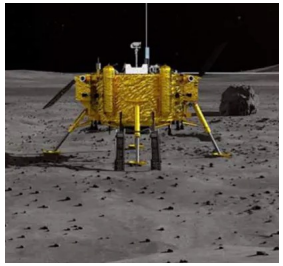
By the end of this module, students should be able to:

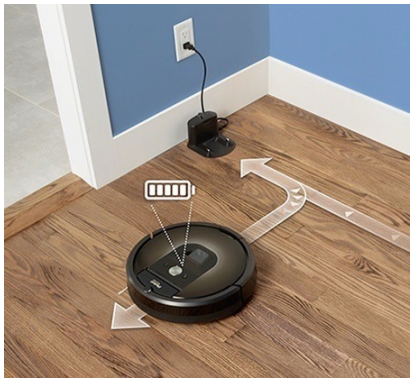
1. Analyse motion of different locomotion mechanisms
2. Understand key working principles of selected sensors and actuators used in robots; and select appropriate sensors and actuators for a robot system to achieve a given task
3. **Apply basic robot motion control principles**
4. **Utilise ROS for mobile robot simulation in a virtual environment**





CNSA's Moon Probe

www.nationalgeographic.com.au/science/



iRobot's Roomba

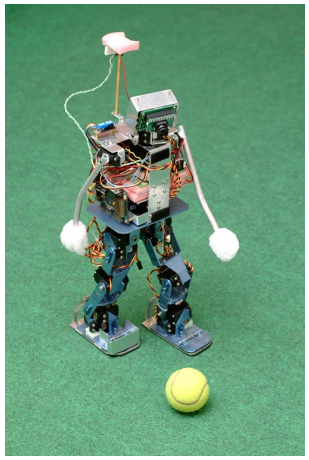
www.irobot.com/roomba

KIA's Car Assembly Line

www.metalworkingworldmagazine.com

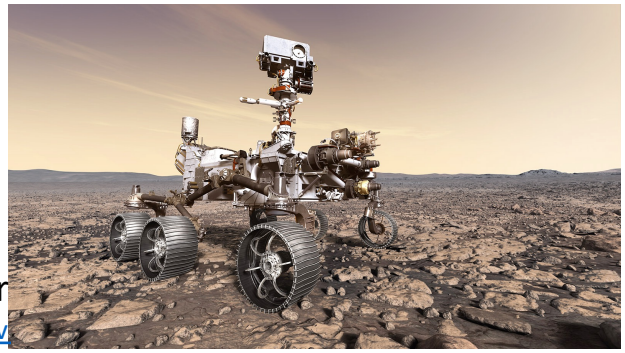
NUS' MaNUS

www.ece.nus.edu.sg/stfpage/elepv/robosapien.htm



Kuka's Cobot

www.directindustry.com



NASA's Mars Rover

www.jpl.nasa.gov

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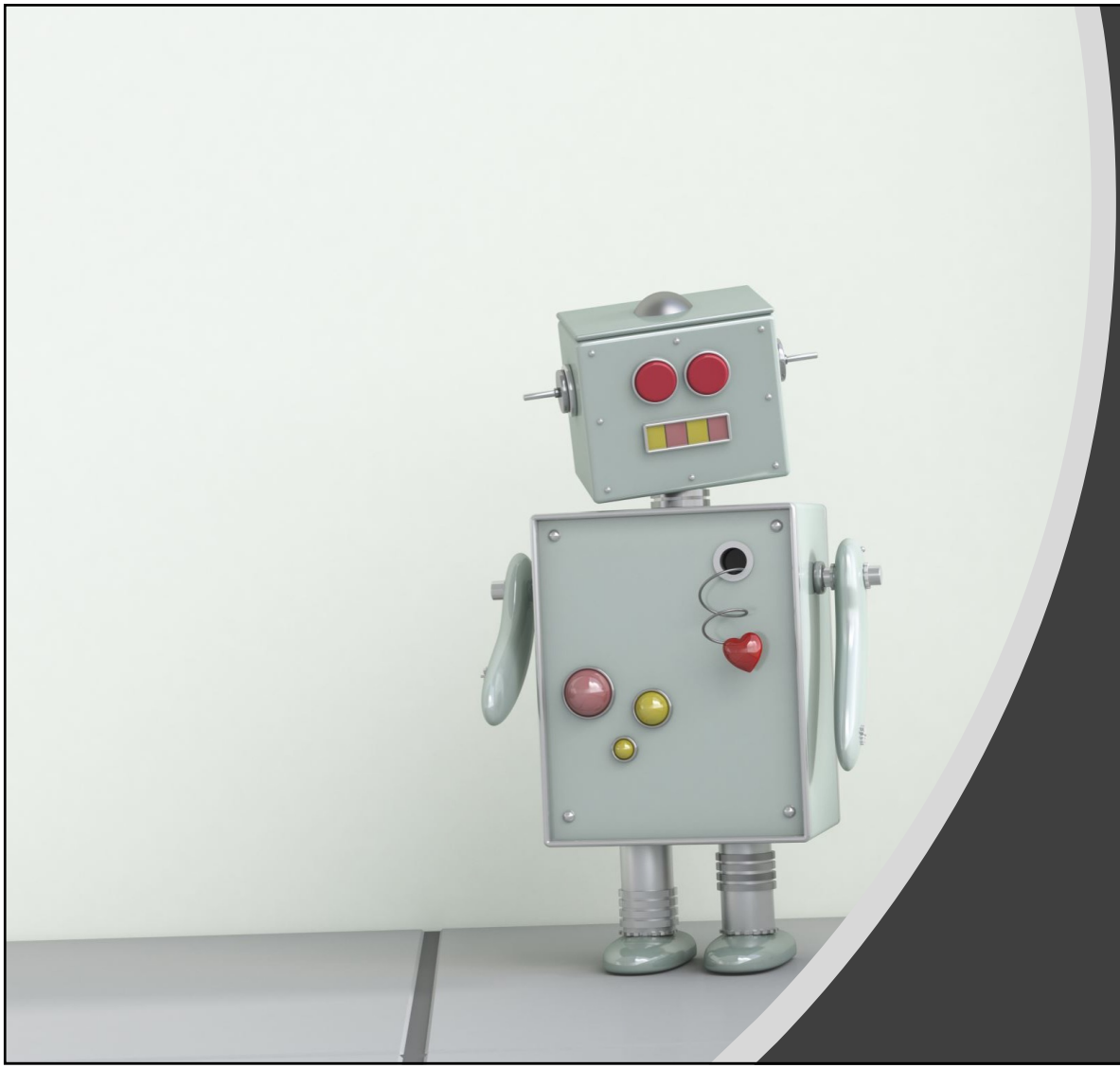

What are characteristics of a robot?

Definition of Robot

Robotics Industries Association

A robot is a reprogrammable, multifunctional manipulator designed to move material, parts, tools or specialized devices through variable programmed motions for the performance of a variety of tasks.

ISO 8373:2012

A robot is an actuated mechanism programmable in two or more axes with a degree of autonomy, moving within its environment to perform intended tasks.

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Vocabulary in Robotics

(ISO 8373:2012)

- **Actuator**: power mechanism used to effect motion of the robot
- **Reprogrammable**: designed so that the programmed motions or auxiliary functions can be changed without physical alterations
- **Autonomy**: ability to perform intended tasks based on current state and sensing, without human intervention
- **Manipulator**: machine in which the mechanism usually consists of a series of segments, jointed or sliding relative to one another, for the purpose of grasping and/or moving objects, usually in several degrees of freedom

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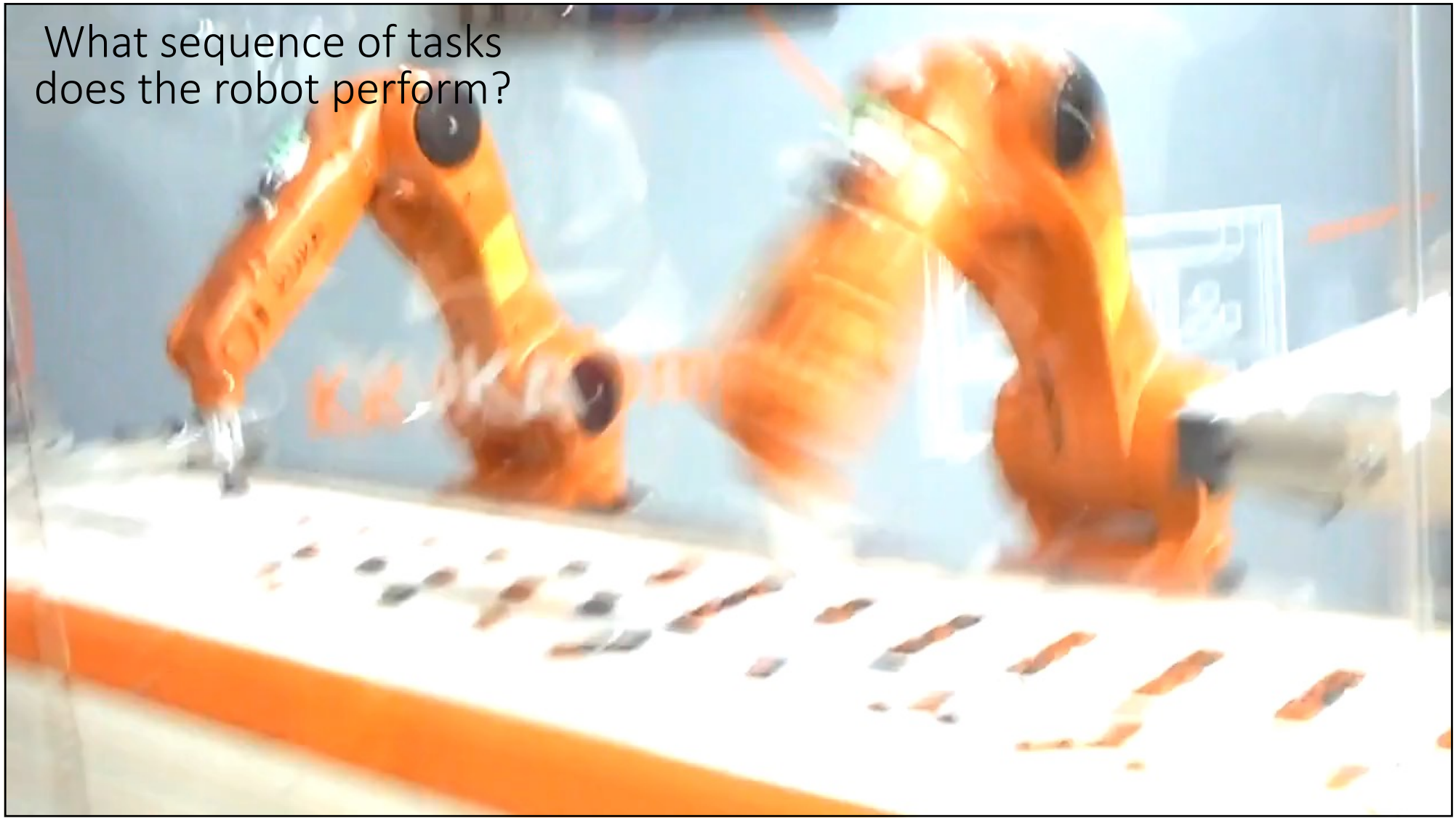
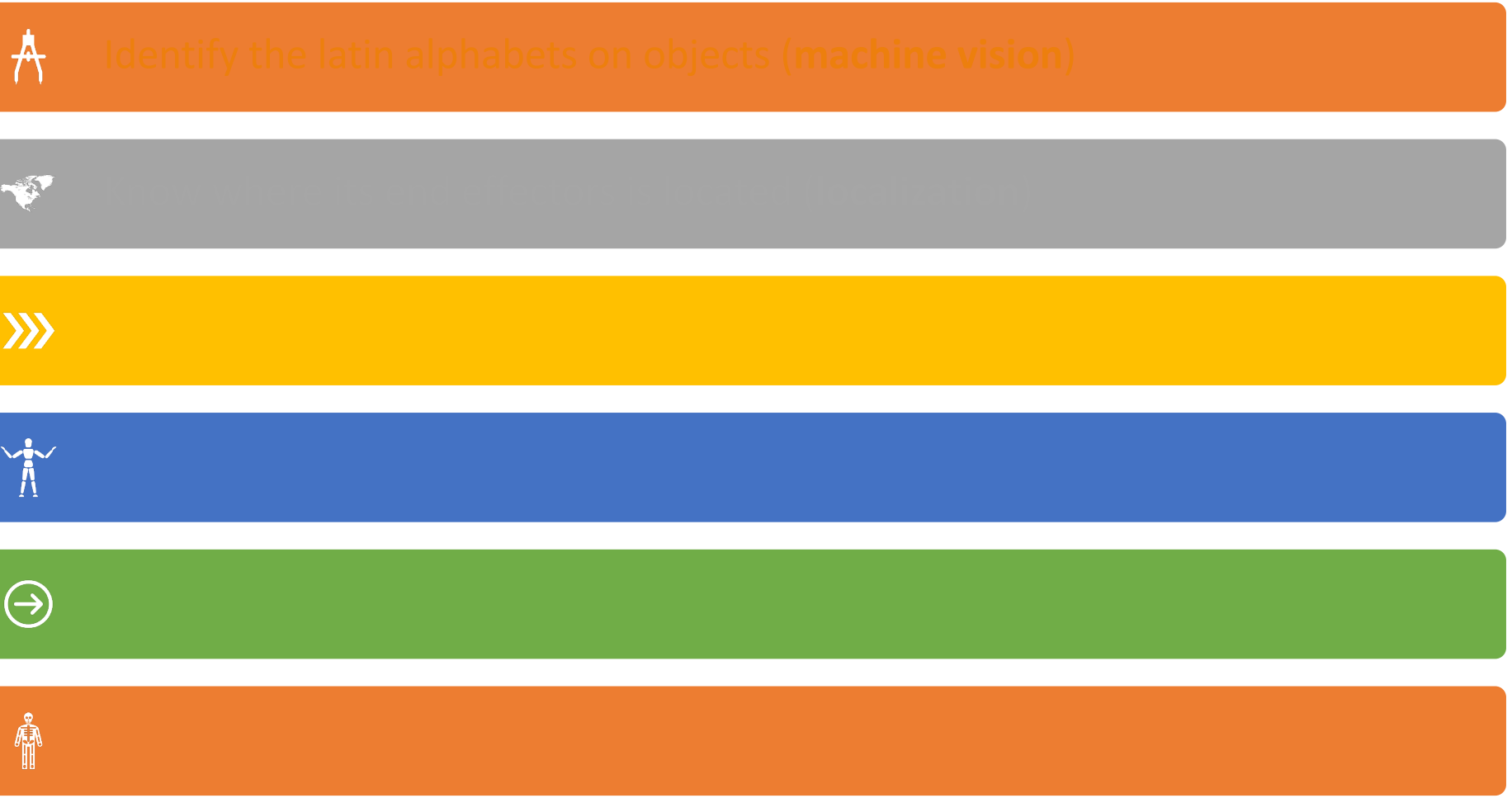
Notice:
• the robots
• the environments
• the applications
amazon
fulfillment


What sequence of tasks
does the robot perform?



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Academic and Administrative Matters of the Course (Part 2)

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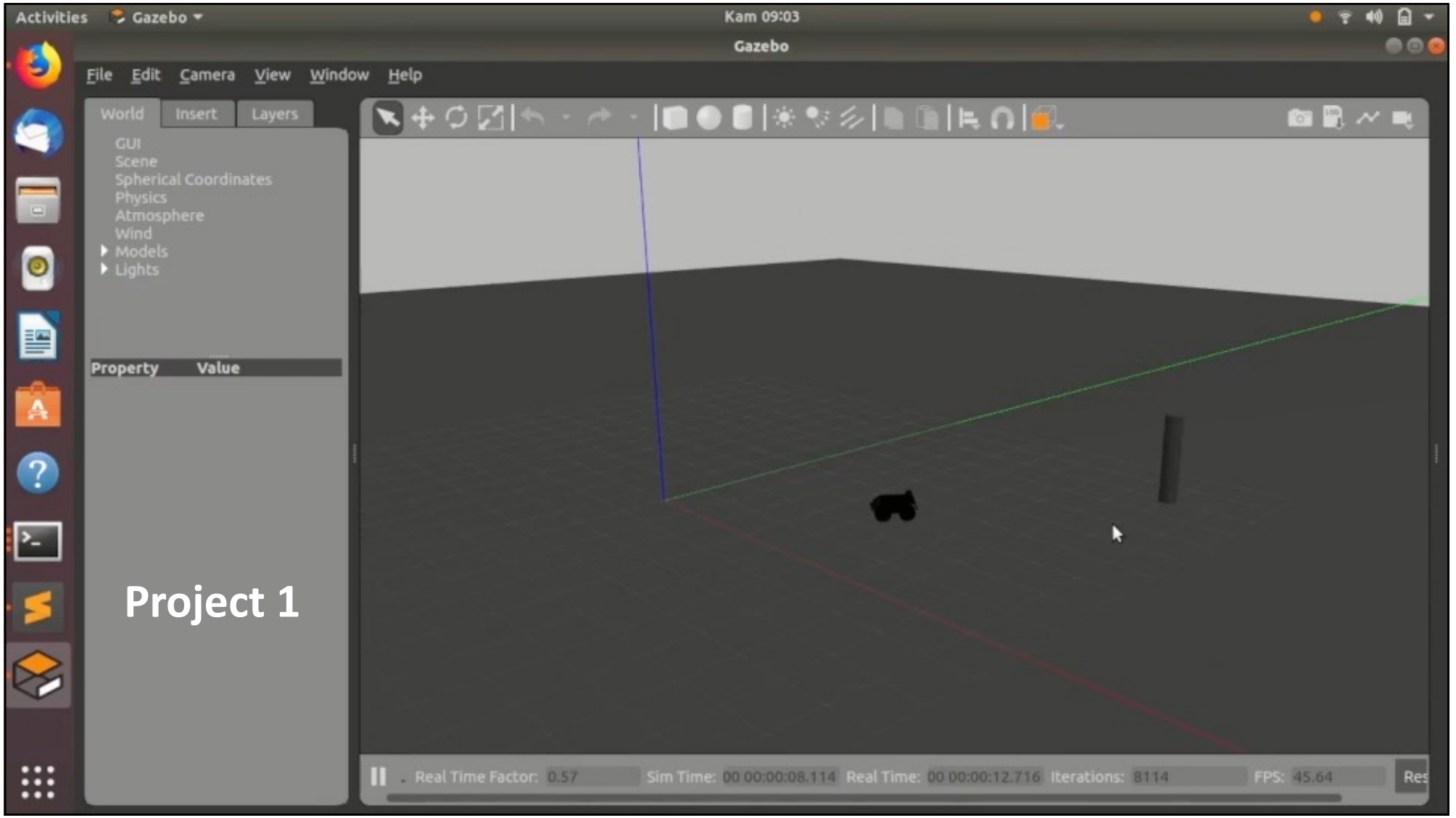
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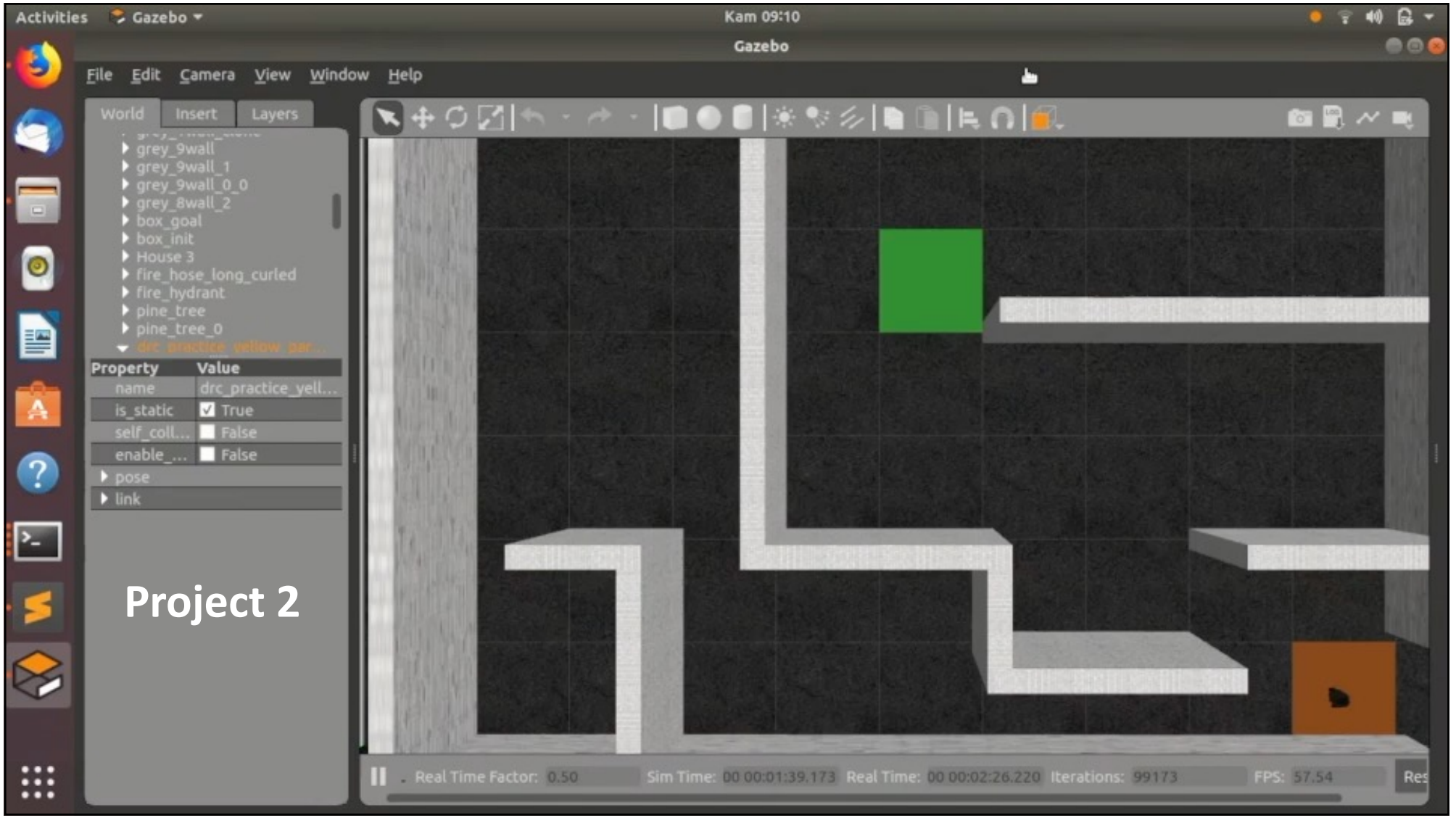
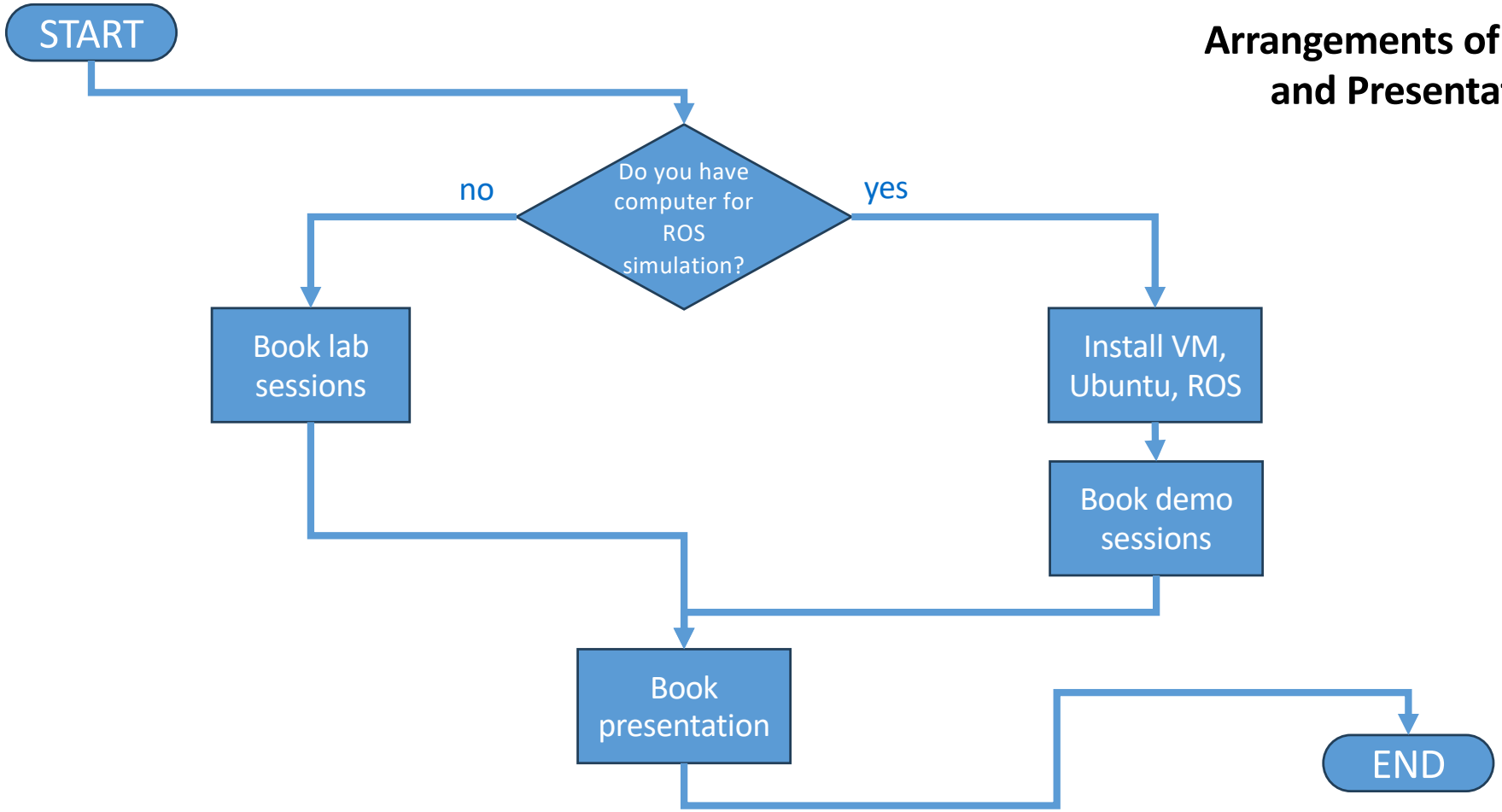
Gazebo
Kam 09:03
Gazebo
File Edit Camera View Window Help
World Insert Layers
GUI
Scene
Spherical Coordinates
Physics
Atmosphere
Wind
Models
Lights
Property Value
Project 1
Real Time Factor: 0.57
Sim Time: 00 00:00:08.114
Real Time: 00 00:00:12.716
Iterations: 8114
FPS: 45.64


Activities
Gazebo
Kam 09:10
Gazebo
File Edit Camera View Window Help
World Insert Layers
grey_9wall
grey_9wall_1
grey_9wall_0_0
grey_8wall_2
box_goal
box_init
House 3
fire_hose_long_curled
fire_hydrant
pine_tree
pine_tree_0
Property Value
name drc_practice_yell...
is_static True
self_coll... False
enable_... False
pose
link
Project 2
Real Time Factor: 0.50
Sim Time: 00 00:01:39.173
Real Time: 00 00:02:26.220
Iterations: 99173
FPS: 57.54

Arrangements of Lab and Presentation



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What to do after this session

- Book a slot for presentation. The link is in Canvas.
- Try installing Virtual Machine, Ubuntu 20.04 and ROS Noetic.
  - The guideline is in Canvas.
  - Practice “Ubuntu and Basic ROS” exercise. The guideline is in Canvas.
- If you are without access to a computer with Ubuntu 20.04 and ROS Noetic, you can book lab sessions. The link is in Canvas.

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THANK YOU

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