Robotics lab

Welcome to the Robotics Laboratory! This learning & research laboratory was established in the year 2022. A small group of faculty and students work here to advance the level of research in robotics and related areas. Major areas of focus of research are 3D Robot modelling and simulation, Mobile Robotics, Manipulator and Kinematics.

Students understand the basic concepts and principles related to robots and they explore industrial robotics with Mitsubishi SCARA Robot **(RH3CRH ROBOT)** 6-axial Industrial robot having 3 kg maximum load, along with its online control software RT toolbox 3.

This Robotics LAB for engineering students, focusing on wheeled mobile robots. The main goal of the lab activities is to learn/improve knowledge of:

- Webots Robot Simulator and Python

- Programming mobile robots

- Finite-State machines

- Obstacle avoidance

- Kinematics of differential-drive robots

- Odometry-based robot localization

- Go-to-Goal behaviour using PID controller

- Non-linear trajectory tracking controller

- Palettization with SCARA Robot

- Pick and Place Colour coding program using Python (OpenCv)

List of Software:

1) Webots
2) Robotics ToolBox
3) RVC ToolBox
4) ABB Robot Studio
5) Robot operating system (ROS)

Using the above softwares, students model various types of Robots (arm,mobile etc) and simulate them by writing control programs. Integration of various internal and external sensors is feasible in modelling. SLAM is an emerging area in robotics which is implemented using Webots and ROS. Hardware interfacing of ROS to boards like Raspberry Pi and Arduino. Students find Reinforcement learning research tutorials very interesting.

SCARA Robot
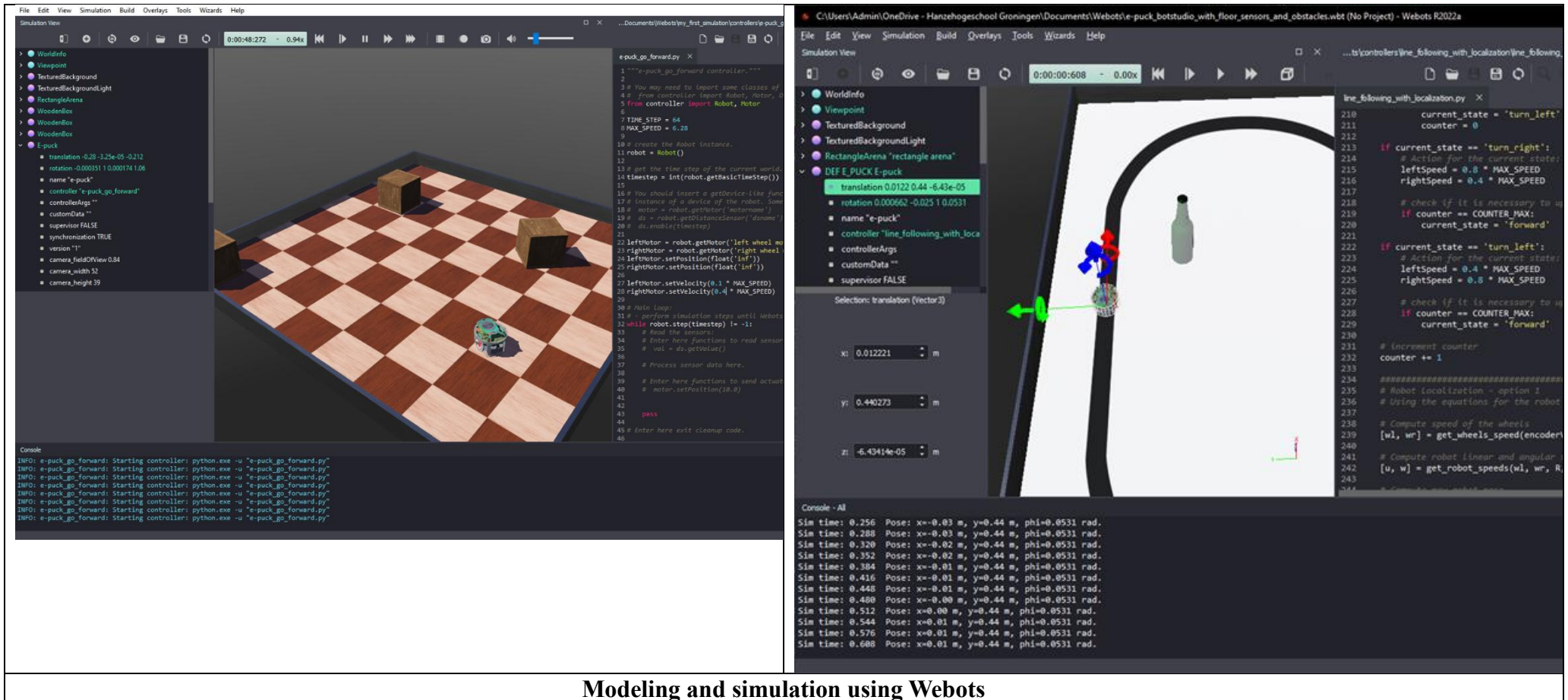
Modeling and simulation using Webots

Interesting Robotics mini projects by students:

1) **Gripper Balancing a ball trained using Reinforcement Learning**
   https://drive.google.com/file/d/1047Vnt67_kG92q7KngbkNAEUeHfnC9GJ/view?usp=sharing

2) **Robotics cart balance using RL**
   https://drive.google.com/file/d/1wBKAHYZyoCK31Ly7XKvX3YFPanCZdRR7/view?usp=sharing

3) **Model and simulate a robot to draw desired path**
   https://drive.google.com/file/d/1LApINsbR-h9QOOcBhMU030K-NupdAaMn/view?usp=sharing

4) **Colour based sorting using OpenCv and SCARA robot**
   https://drive.google.com/file/d/1w-hBVays_zws54XCksFF9pH65Ptqqv89/view?usp=sharing

5) **Pick and place using SCARA robot**
   https://drive.google.com/file/d/1NKM3GyzmRJHRYQw0GuaTEoF7292n_naY/view?usp=sharing

Robot programming Videos:

https://drive.google.com/drive/folders/1E6Cwt521TaDwe9rLVlcqCqKkv4vLP4It?usp=sharing