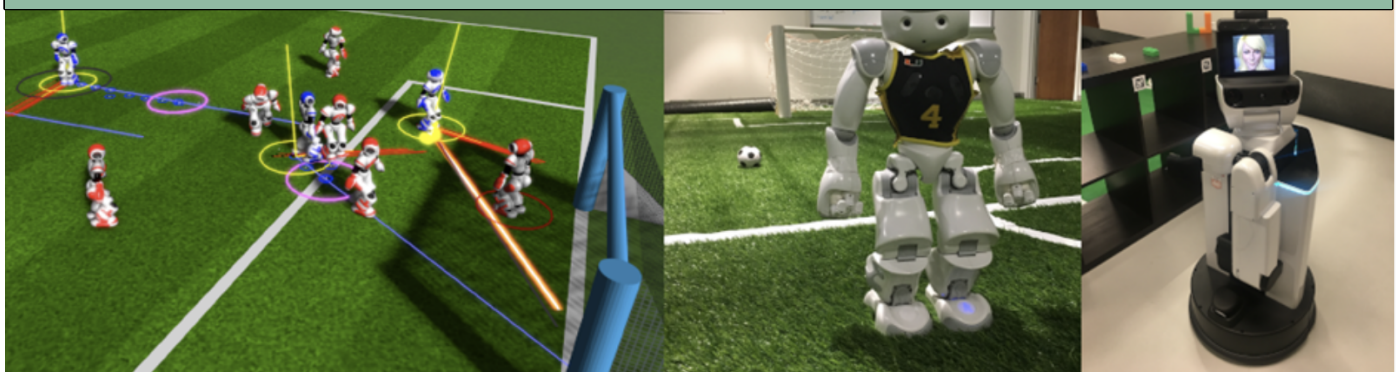
Fall 2025 - CSC752 Autonomous Robotic Systems - In-Class Activity 1



Due date: 08/28/2025, 11:00 AM, in-class activity. We will check the results directly in class.

Get to know ROS by inspecting the simulation of an HSR robot.

1. Setup the HSR simulation:
   - `cd` into your local folder `csc752`.
   - Run `xhost +local:root`. It grants the root user, running locally, permission to open windows on your X11 display when you are in the docker image.
   - Make sure the docker image is running. If not, start with `docker compose up -d`.
   - Run `docker compose exec --user csc752 isaac-sim bash`. It starts the docker image using the user `csc752` for the image isaac-sim and opens a bash shell.
   - Once inside the docker environment: `s` for sourcing the environment inside the docker image and `python isaac_sim_hsr_chris.py` for starting the entire simulation suite.

2. Open another terminal get in the docker container, source, and list rosnodes and rostopics using:
   `rosnode list`
   `rostopic list`
   `rostopic echo [TOPIC]`
   `rostopic hz [TOPIC]`
   For more information take a look at the slides or:
   http://wiki.ros.org/rostopic
   http://wiki.ros.org/rosnode

3. Command a desired velocity to the robot from the terminal (rostopic pub [TOPIC). Search for the right command_velocity topic in a new terminal and publish a left turn by using
   `rostopic pub [TOPIC] geometry_msgs/Twist '{linear: {x: 0.0, y: 0.0, z: 0.0}, angular: {x: 0.0, y: 0.0, z: 0.5}}'`
   This puts the angular.z component to **0.5**, which will make the robot rotate around the z-axis, resulting in a left turn. How many degrees did the robot turn? Suppose the entire command took 2 sec. Remember, the angular speed is in $\frac{rad}{s}$. And $\texttt{degrees} = \texttt{radians} \times \frac{180^\circ}{\pi}$.
   Publish a 90° left turn, followed by a 1m drive in the x-direction.

4. Use `teleop_twist_keyboard` to control the moves of the robot through a terminal. Run the command
   `rosrun teleop_twist_keyboard teleop_twist_keyboard.py cmd_vel:=/hsrb/command_velocity`