

# Lab Preparation Document

Course: 2IRR10

Group Name: Q3 survivors

Lab Session Number: 5

Date: 3. 6. 2025

## What are the specific objectives of this lab session?

*(Describe what your group aims to accomplish in this session. Be specific about tasks such as setting up hardware, testing communication protocols, or implementing a feature like obstacle avoidance.)*

In this lab session we aim to expand on the bidirectional communication of the turtlebot and its digital twin. Last lab session we managed to get some of the publishers and subscribers working, however our greatest enemy was the Lidar. Since that was the issue we would like to overcome it and use the data from the Lidar to do some basic stuff like stop before an obstacle. In case we still have some time left after trying all mentioned above we will test our path finding algorithms. Firstly using static data and then we will explore the options of using data from the simulation/turtlebot as an input to our algorithm.

## What steps will your group take to achieve these objectives?

*(Outline the key steps you plan to follow in the lab, including any setup, coding, testing, or debugging activities.)*

In order to achieve these objectives our team will follow these steps:

1. Copy the prepared scripts to a USB stick and transfer them to the lab laptop or optionally clone our github repository to the laptop
2. Properly reboot the turtlebot (sudo shutdown now), because that caused some issues
3. Establish the connection between the turtlebot and the unity environment
4. Iteratively add the scripts to the unity environment and test them
5. In case it works well we move on to testing the next script, otherwise troubleshoot and note down what was the issue
6. If all of the purely scripts work try to implement the one for our algorithm

## What potential challenges or risks do you anticipate in this session, and how will you address them?

*(Identify possible technical difficulties, hardware limitations, or software bugs that might arise, and propose strategies to manage them.)*

As we have learned from our previous lab sessions the largest issue is always the "magic" between the hardware and software. In other words when there are no compilation or run-time errors but the turtlebot/digital twin still refuses to do what we want. These bugs or issues are also incredibly hard to properly troubleshoot and fix, because of the lack of information available online and how they are "undetected" by the usual helpers such as a compiler.

To address these issues we will probably heavily rely on the documentation of both the turtlebot and Unity-ROS as those are the two most official resources we can find. Otherwise asking the tutors soon could also help, because they have arguably more experience with it than the internet.

## What tools, resources, or prior knowledge will you need for this lab session?

*(List any specific software, hardware components, ROS packages, or documentation you will use. Also, mention if you need to review any concepts beforehand.)*

We will mostly need to be quite comfortable with the ROS concepts as well as the usage of C# in Unity. We will be modifying the examples from:

[https://github.com/Unity-Technologies/Unity-Robotics-Hub/tree/main/tutorials/ros\\_unity\\_integration](https://github.com/Unity-Technologies/Unity-Robotics-Hub/tree/main/tutorials/ros_unity_integration)

as well as from:

<https://github.com/Unity-Technologies/ros2cs>

Therefore, understanding what each of the examples is supposed to test will be critical

Apart from this, we will obviously need all of the knowledge from the previous lab sessions. to mitigate the errors we have already encountered

## How does this lab session contribute to the overall progress of your project?

*(Explain how the work in this session connects to previous work and supports the final implementation of the twin system.)*

This lab session will be crucial for our overall progress on the project, as it will allow us to further test some fragments of the PoC, such as reading and interpreting data sent from the Lidar sensor, which is going to be essential for any kind of autonomous navigation. Moreover, getting more hands-on experience with Unity and the Turtlebot will also not go to waste for sure, as that time is one of our very scarce resources. Lastly if we get to actually integrating some part of the pathfinding algorithm, that would also move us a lot closer to our end goal.