# Final Project

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# Final project definition

Please review the following slides and decide on the topic for your final project.
RobocupHome-Project_definition-SS2025.pdf

Challenges can be found in the most recent rulebook: 2024_rulebook.pdf

**Please send the name list of your group to robocupathome.ics@xcit.tum.de before 20th June.**

# Always follow the safety instructions while operating the robot!

# ROS network setup

Check the IP of your PC with `ifconfig` command in the terminal.

```
enp0s31f6: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.1.110  netmask 255.255.255.0  broadcast 192.168.1.255
        inet6 fe80::12f1:c601:80a4:32b8  prefixlen 64  scopeid 0x20<link>
        ether 1c:1b:0d:24:13:78  txqueuelen 1000  (Ethernet)
        RX packets 47800  bytes 43550902 (43.5 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 25633  bytes 4936618 (4.9 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
        device interrupt 16  memory 0xdf100000-df120000

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 4150  bytes 587266 (587.2 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 4150  bytes 587266 (587.2 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

In this case, the IP address is 192.168.1.110 in the 2nd line.

Add the alias to `.bashrc`

```
alias tiago_mode='export ROS_IP=(Your IP) && export ROS_MASTER_URI=http://192.168.1.200:11311'
```

Then, you can use `tiago_mode` / `hsrb_mode` in the terminal for the setup

## Prepare environment on remote PC for Tiago

The packages on the Tiago robot is different from the packages used in simulation.

Please install Tiago_packages_full to keep the libs consistent with the packages on the robot.

Please refer to the handbook for more information about the robot: Tiago Handbook

## If you want to use moveit on Tiago robot

Make sure moveit is installed on your development PC: ```sudo apt install ros-noetic-moveit```
Uninstall the installed moveit_msgs packages and the related ones with

```
sudo apt remove ros-noetic-moveit-msgs
```

Download and extract the following zip and run the bash with `bash setup.sh` to install the packages related to MoveIt.

Tiago_MoveIt

Clean and rebuild the packages using MoveIt in your workspace with `catkin clean your_package_name` and `catkin build your_package_name`.

Find package `tiago_moveit_config`, copy the `demo.launch` file, and set argument `fake` to `False` in your new launch file.

Make sure your terminal is connected to the robot by setting correct `ROS_IP` and `ROS_MASTER_URI` .

Try to launch your new launch file, and check if the robot model shown in Rviz is the same as the real robot.

Then you can try to visualize and check the motion plan.

You can also check the planning scene, etc. in Rviz.

**Useful Tutorials and links:**

Train new objects in YOLO:

Robocup_YOLO_Training.pdf

**MediaPipe for gesture/face recognition**

**OpenPose for posture recognition:**

Robocup_Openpose_v1.0.pdf

**Good cloud-based speech recognition tool Wit**

wrs_speechrecognition.pdf

https://github.com/LoyVanBeek/wit_ros

# Connect to Tiago

## Synchronize the PC and Tiago

Tiago is using UTC, so changing the time zone on your PC to UTC zone is better.
In a terminal, check the date with the command `date`.

In another terminal, login to the robot with `ssh pal@192.168.1.200` using password `pal`.

Check the date on the robot with the command `date`.

Check the consistency of these two dates.

If they are not synchronized, then use Tiago as the time server of your development PC:

In a terminal, install ntp package with:

```
sudo apt-get install ntp
```

open `/etc/ntp.conf` with `sudo`, and add `server tiago-0c iburst` under the line `# Specify one or more NTP servers.` Close and save.

Check the status of ntp:

```
systemctl status ntp.service
```

If it is active, Restart the `timesyncd` daemon, and use `date` to check if the time on Tiago and your PC is the same. If it is the same, you can ignore this step's error.

```
systemctl restart systemd-timesyncd.service
```

## Register Tiago as a host

```
sudo gedit /etc/hosts
```

Add `192.168.1.200  tiago-46c` to the beginning of the file and save.

# Mid-term Checkup

Mid-term checkup on **Wednesday 15th January**, each team should have a 5 min presentation about the progress and a simple demo if possible.

# Final Presentation Guidelines

The final presentation will be held in the last week of the teaching period, i.e., the end of January or the beginning of February. Tentatively, on the 5th of February.

- Every team will have 10 minutes to present, following a 5 mins Q&A session. All team members must present.
- After the presentations, you should give a live demo on the robot.

# Final Submission

The following LaTex template can be used for the final report: Report_template.zip
The report should include at least the goals, the structure and function of your package, the description of the 3rd party package applied, and the division of labor in the team.

The report should be as long as needed and as short as possible.

Please submit your team's **final version of the code** and **report** within a week after the final presentation.

# Q&A

Q: rostopic list shows the topic list but nothing displayed when echoing them
A: Don't forget to register the tiago ip as host

## Comments