

Development of intelligent systems (RInS)

Task 1: Autonomous navigation and human search

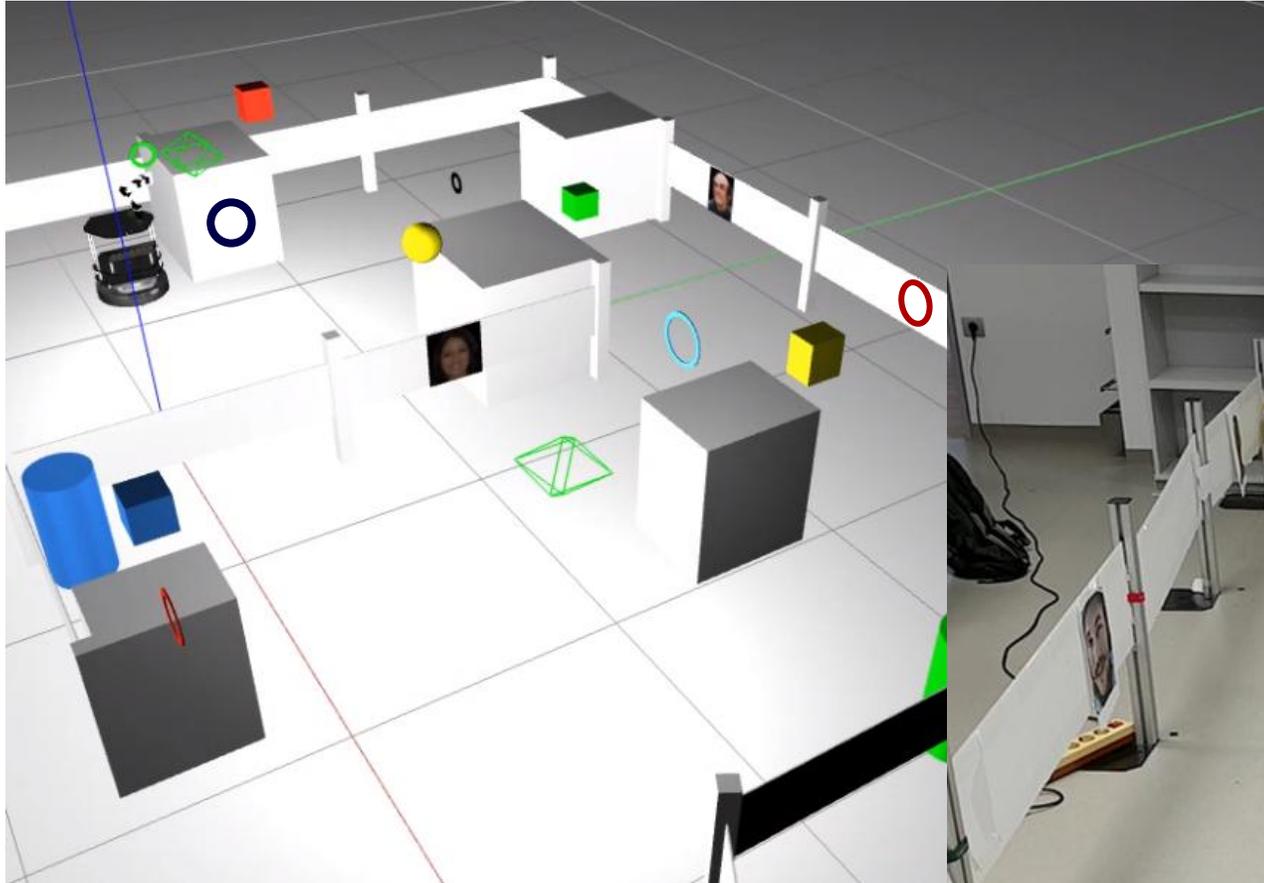
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Evaluation setup



First in simulator (T1s)

Until the end of semester
on a real robot (T1r)

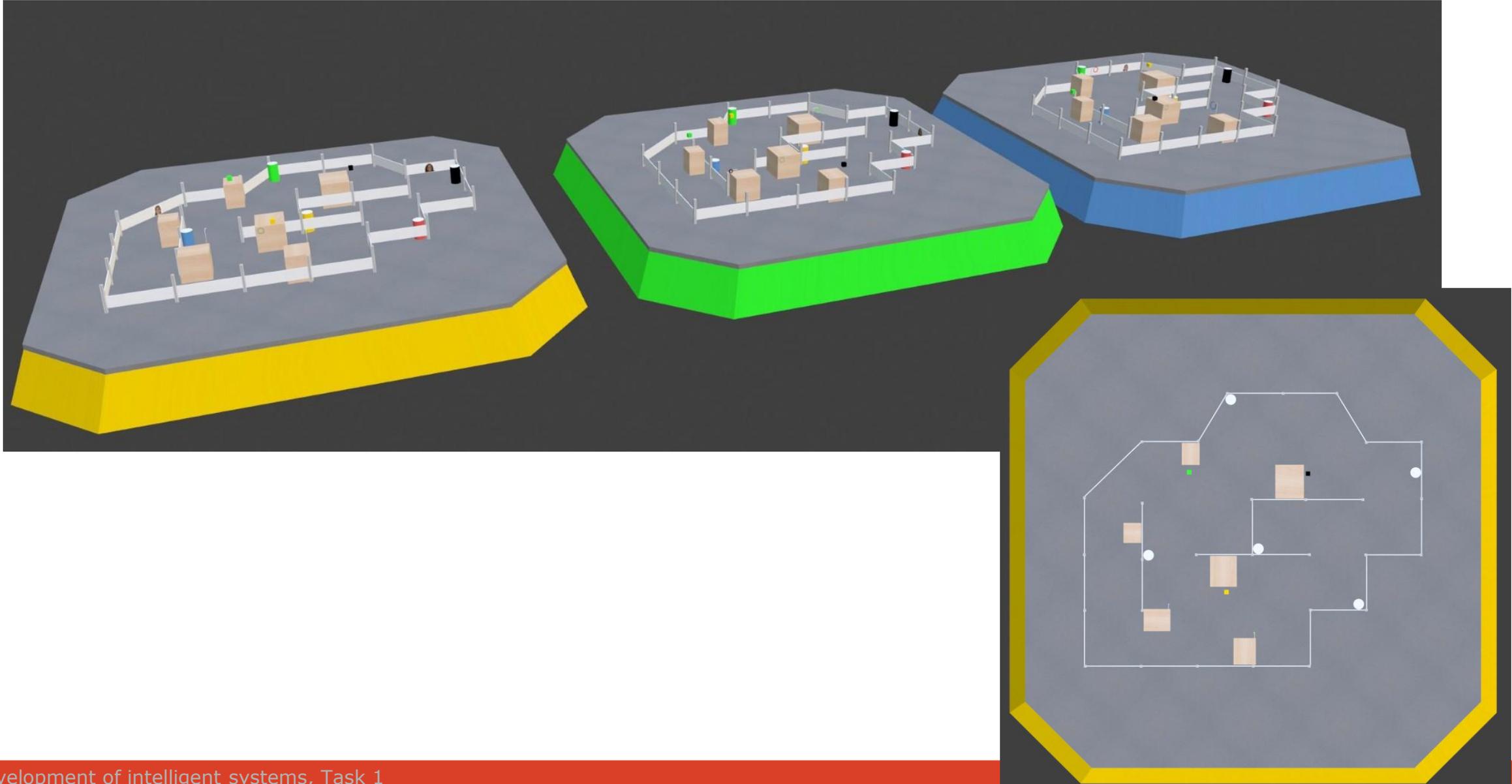


Taks T1

- Setup:
 - fenced area
 - three printed faces at random places
 - two rings at random places
- Task:
 - build the map of the competition area
 - search the space and look for faces and rings
 - when a face is detected approach, or at least pass by, (and greet) the face
 - when a ring is detected approach, or at least pass by, the ring and say its colour
 - when all three faces and both rings are detected, stop
 - do not approach a face or ring more than once
 - do not have false detections
- Goals:
 - the robot should detect as many faces and rings as possible
 - the robot should not detect something else as a face or ring
 - perform the task as fast as possible



T1s worlds



Evaluation protocol

- The evaluation course will be set up in advance
- The teams will be allowed to build the map in advance
- The faces and rings will be positioned on the day of the evaluation
- The positions of the faces and rings should not be hand coded
- The robot search goal positions can be hand coded
- The robot has to operate completely autonomously
- The teams will be allowed to tune the parameters

- The teams should be ready before the start of evaluation
- Every team will be able to run their robot twice

- T1s: The evaluation in simulation will be held on 1. 4.
- T1r: The performance of a real robot should be presented until 27. 5.

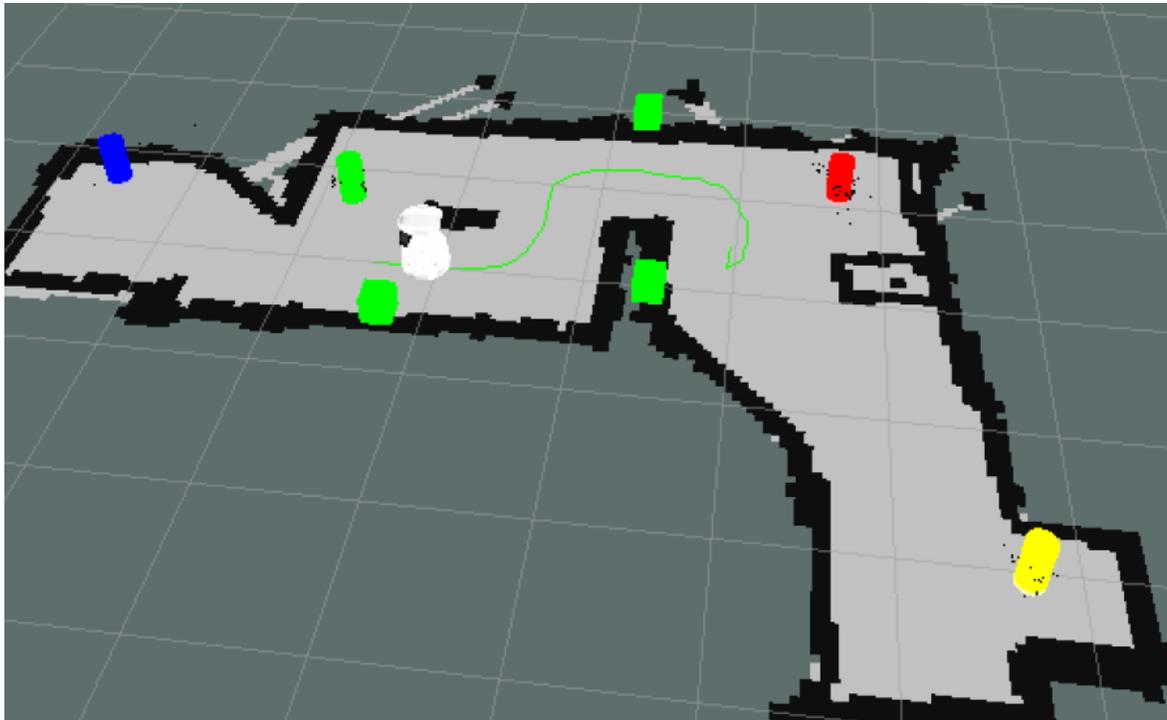


Evaluation criteria

- Measuring:
 - number of faces correctly detected, approached (or passed by) and greeted
 - number of rings correctly detected, approached (or passed by) and recognised colours
 - number of false detections
 - the time until the robot stops
- But also:
 - Robustness of the performance
 - Repeatability
 - Innovation
 - Clarity of demonstration
 - Elegance of solution
 - Approximately 5 (navigation) + 5 (faces) + 5 (rings) points
- Scoring:
 - T1s (in simulation): 15 points max
 - T1r (on real robot): 15 points max

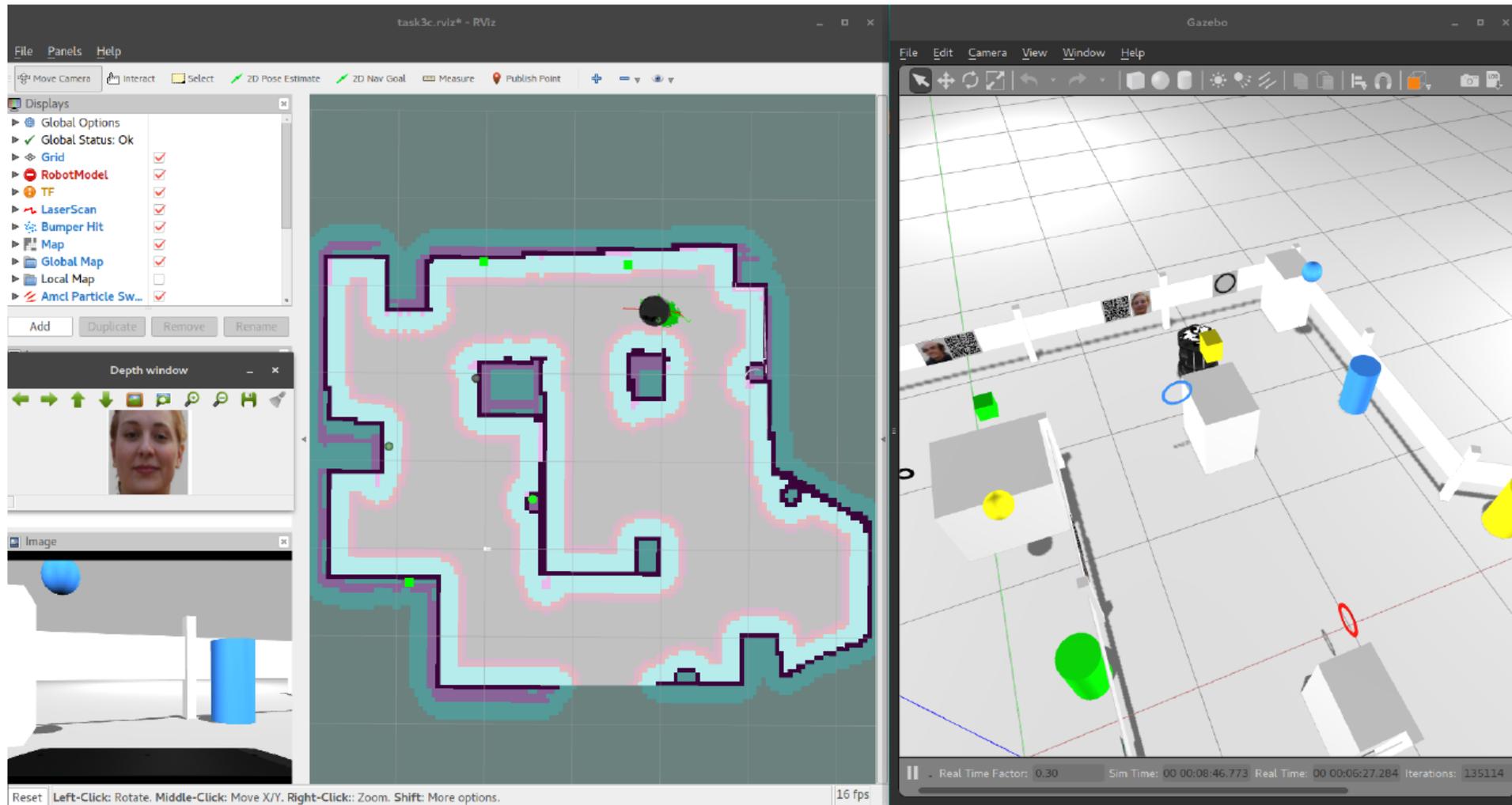
Demonstration

- Demonstrate what is going on in the robot
 - visualisation of detected locations
 - mark locations in Rviz (also goals, detected colour, etc.)
 - verbalisation of detections
 - simple speech synthesis (greeting, colours)



Presentation

- (Gazebo), RVIZ, camera view as well as images of detected faces should be shown



Tasks

- System setup
 - Running ROS
 - Tele-operating TurtleBot
- Autonomous navigation
 - Autonomous control of the mobile platform
 - Acquiring images and 3D information
 - Simultaneous mapping and localization (SLAM)
 - Path planning, obstacle avoidance
 - Advanced fine manoeuvring
 - Basic mobile manipulation
 - Intelligent navigation and exploration of space
- Advanced perception and cognitive capabilities
 - Detection of faces, 3D rings, cylinders, and objects
 - Recognition of faces and ring colours
 - Segmentation of the ground
 - Object detection and counting, defect detection
 - Speech synthesis, speech recognition, dialogue processing (reading QR codes)
 - Belief maintenance, reasoning, planning

Task 1

Task 2

Task 1 goals

- The main goals of the first task are:
 - to learn how to use ROS
 - to get familiar with the hardware
 - to set up the mobile platform (software and hardware)
 - to learn how to build and use a map
 - to learn how to set a goal and to instruct the robot to go to the goal position
 - to learn how to relate points in different coordinate frames
 - to use LIDAR
 - to use RGBD camera
 - to learn how to process images
 - to learn to work with 3D data
 - to robustly detect faces
 - to robustly detect rings
 - to search the space
 - to learn to work in Gazebo
 - to learn to work with a real mobile robot

