

Development of intelligent systems (RInS)

Task 2: Parking

Danijel Skočaj

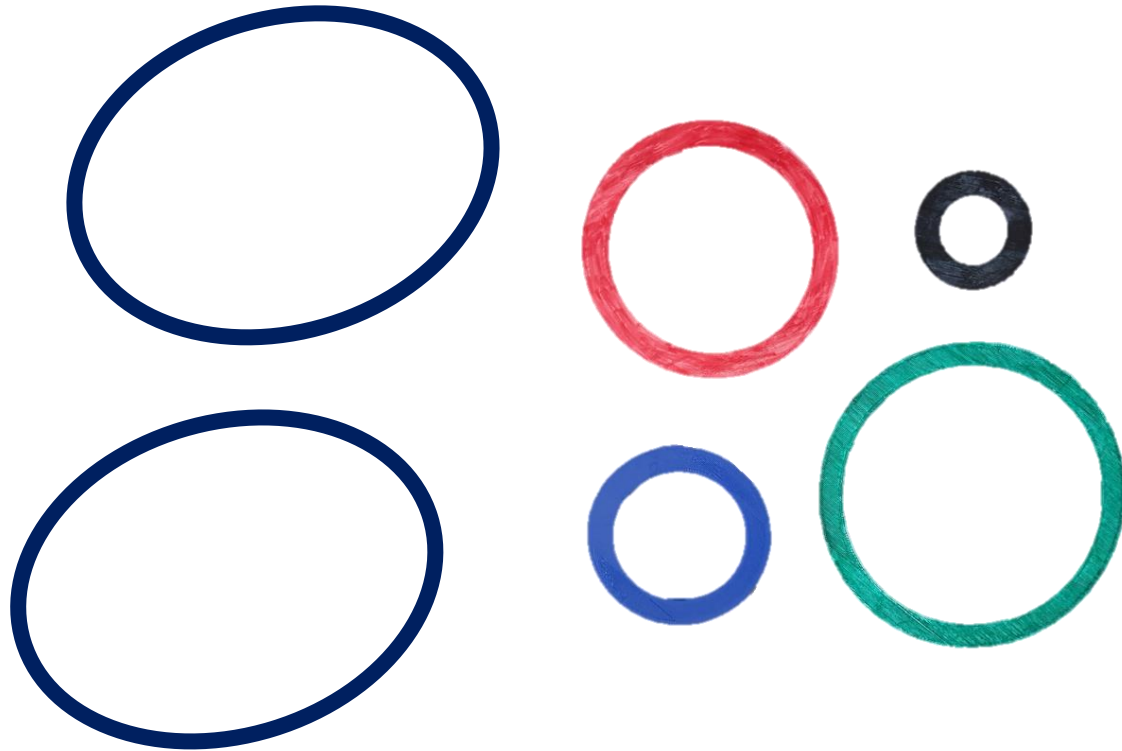
University of Ljubljana

Faculty of Computer and Information Science

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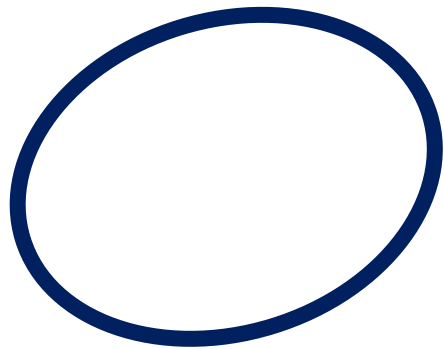
Rings and cylinders

- Four rings of different colours and different sizes
- Circles on the floor
- (Four cylinders of different colours)

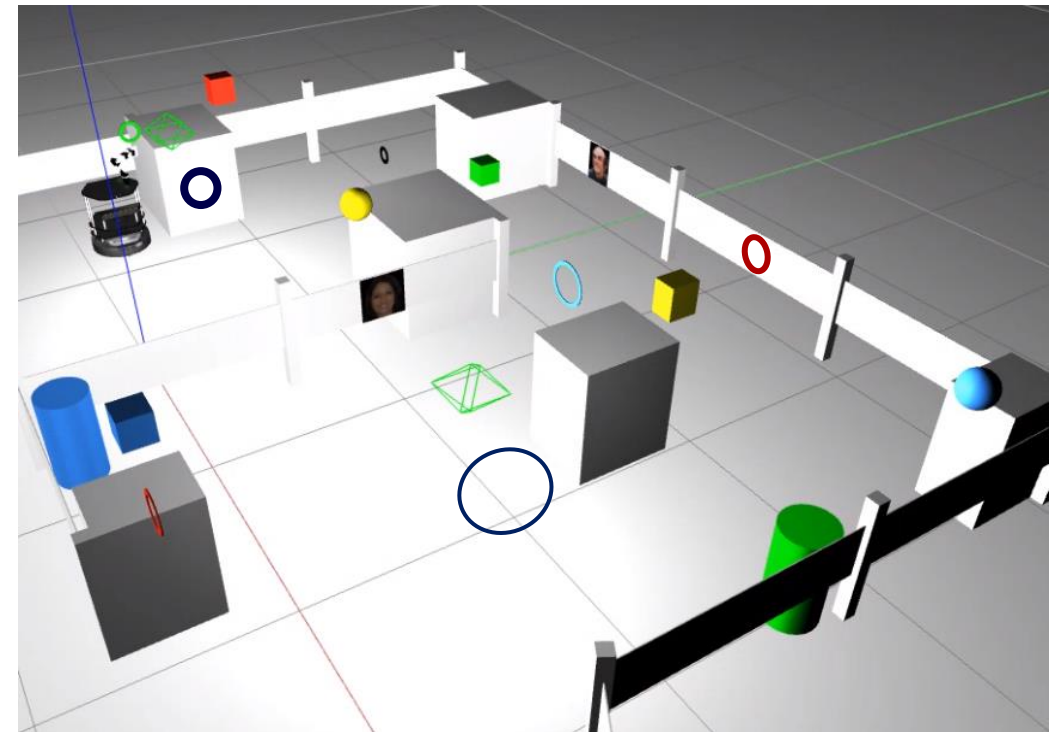
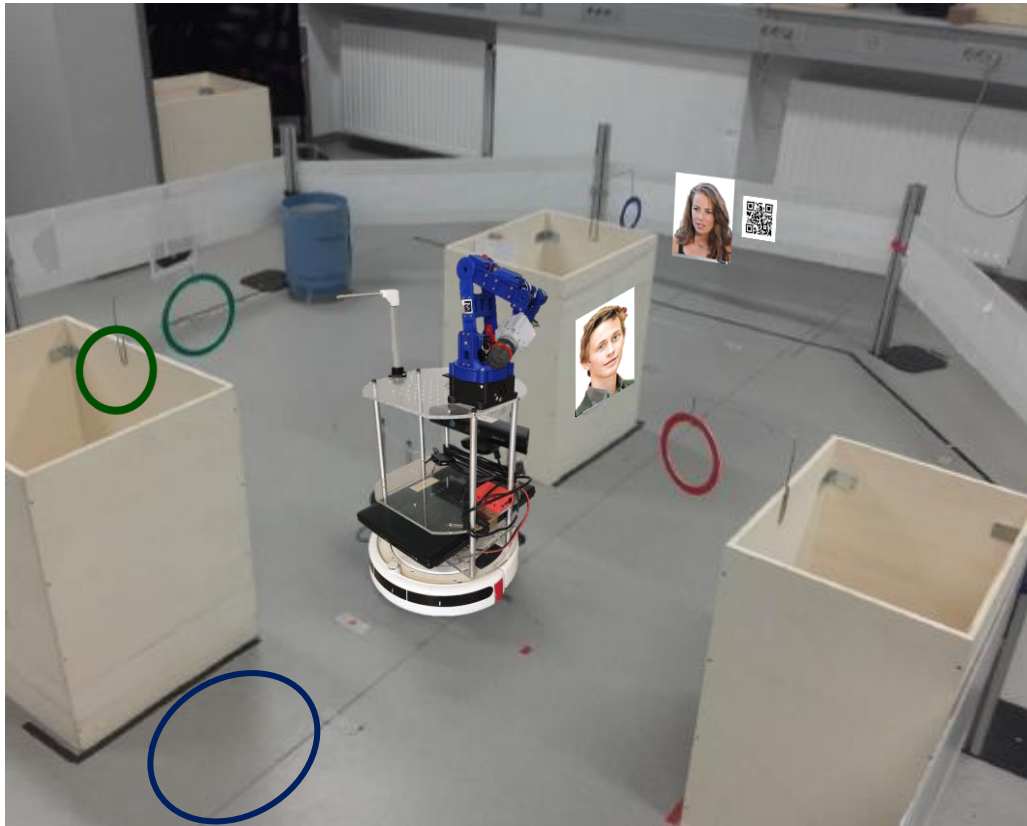


Parking robot

- Additional camera pointed towards the floor
- You can choose whether in front or in the back of the robot
- Park in the circular parking place



Evaluation setup

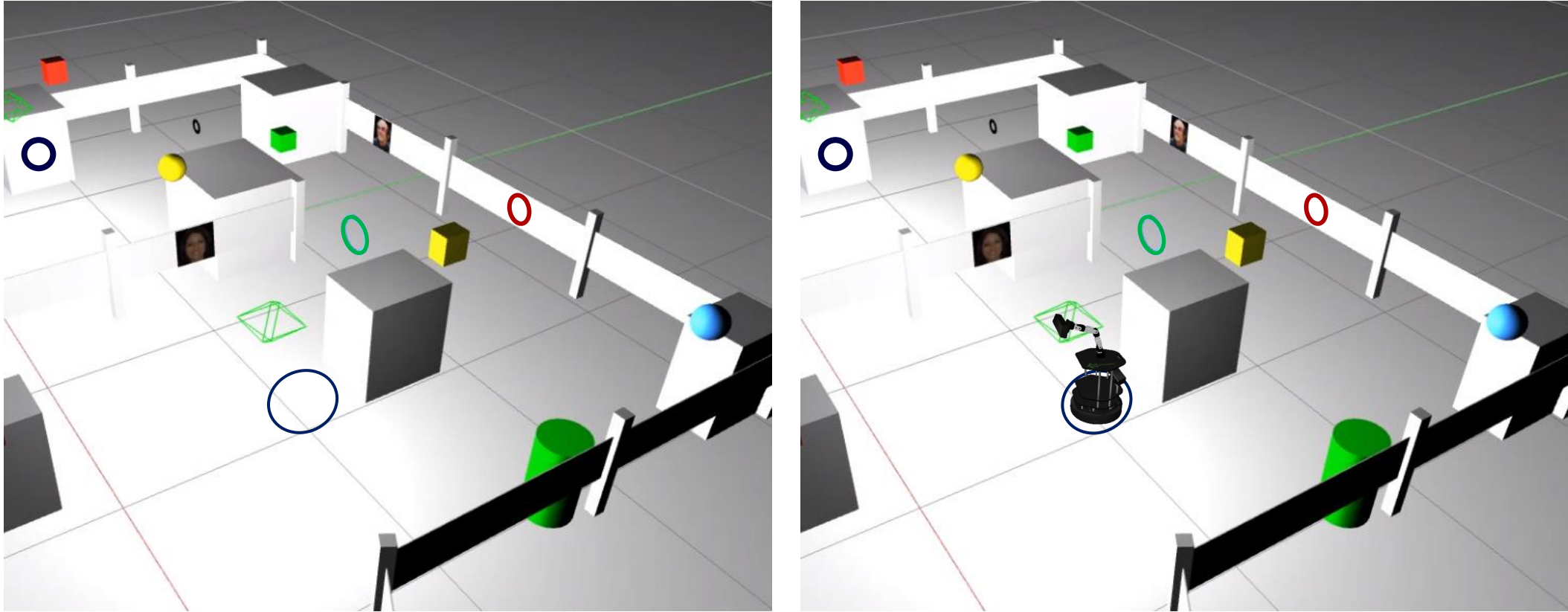


- in simulation...

Evaluation rules

- Setup:
 - fenced competition area
 - three rings of different sizes and colours at random places
 - three cylinders of different colours at random places
 - three circles of the same size at different positions
- Task:
 - build the map of the competition area
 - search the space and look for the rings (and cylinders)
 - recognize and say the colour of the rings (and cylinders)
 - approach the green ring
 - park into the circular parking space marked below the green ring
- Goals:
 - the robot should detect as many rings as possible
 - (the robot should detect as many cylinders as possible)
 - the robot should park as accurately as possible (with the circle)
 - perform the task as fast as possible

Parking



- The robot should be positioned completely within the boundaries of the circular parking space

Evaluation protocol

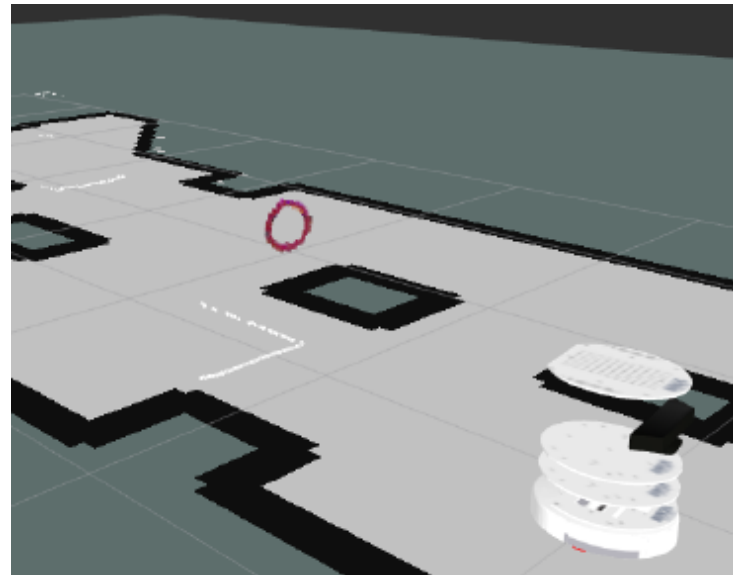
- The evaluation course will be set up in advance
- The teams will be allowed to build the map in advance
- The rings and cylinders will be positioned on the day of the evaluation
- The final parking place will be drawn on the day of the evaluation
- The robot has to operate completely autonomously
- The teams will be allowed to tune the parameters
- (You should preferably not manually set the goals for exploration of space)
 - It is therefore advisable to implement automatic exploration of space
- Detection of rings (and their colours) is mandatory
 - (detection of cylinders (and their colours) is recommended, but not mandatory)

Evaluation

- Measuring:
 - number of rings correctly detected (up to 3)
 - number of correctly recognized colours of the rings (up to 3)
 - (number of cylinders correctly detected (up to 3))
 - (number of correctly recognized colours of the cylinders (up to 3))
 - parking accuracy
 - number of false detections
 - the speed of execution
- But also:
 - Exploration strategy
 - Robustness of the performance
 - Repeatability
 - Innovation
 - Clarity of demonstration
 - Elegance of solution

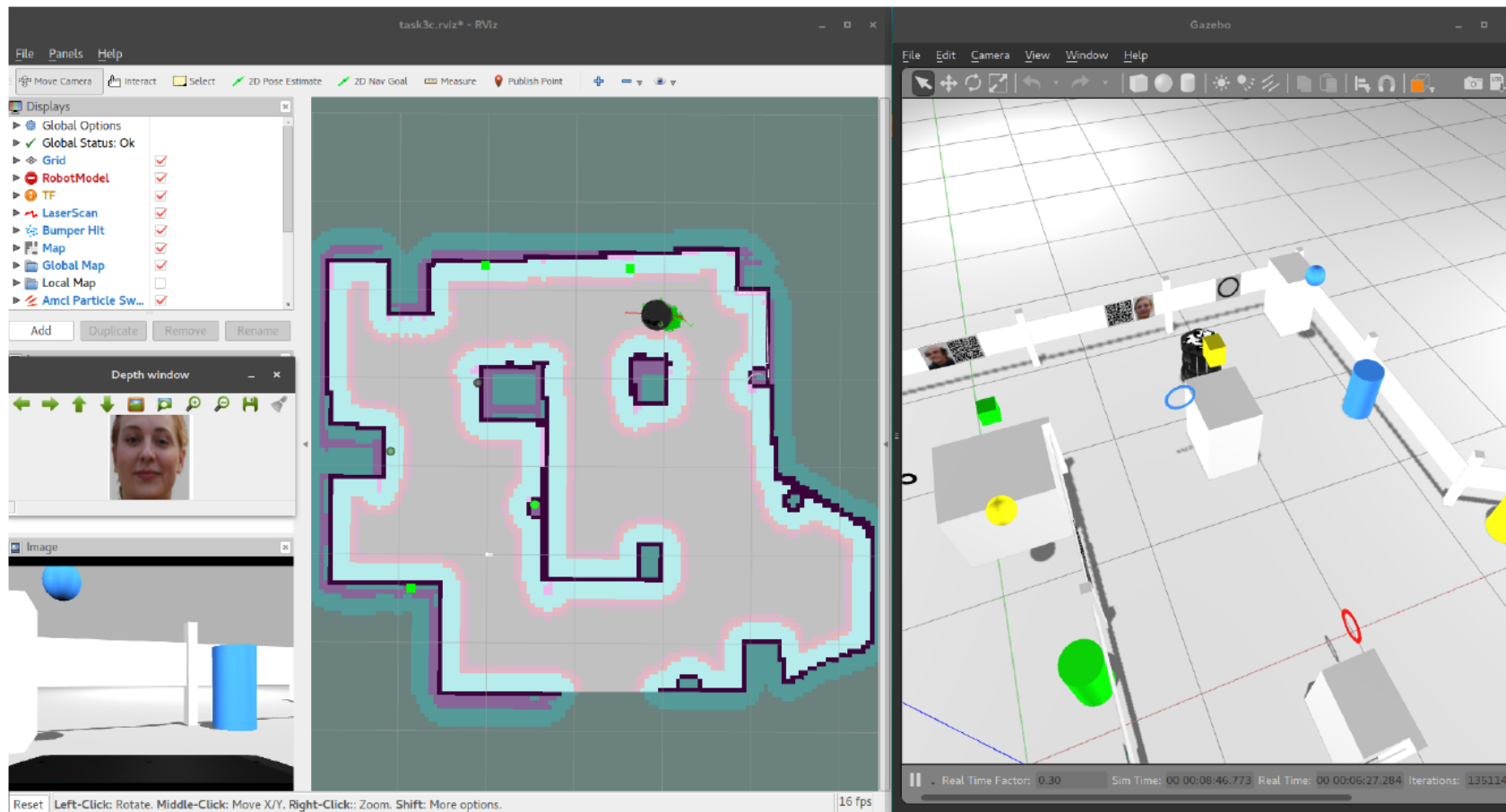
Demonstration

- Demonstrate what is going on in the robot
 - visualisation of detected locations
 - mark locations in RViz
 - verbalisation of detections
 - simple speech synthesis



Presentation

- Gazebo, RVIZ, camera view as well as images of detected rings should be shown
- Close view of the approaching events and parking



Tasks

- System setup
 - Running ROS Task 1
 - Tele-operating TurtleBot Task 2
- Autonomous navigation Task 3
 - Autonomous control of the mobile platform
 - Acquiring images and 3D information
 - Simultaneous mapping and localization (SLAM)
 - Path planning, obstacle avoidance, approaching
 - Advanced fine manoeuvring and parking
 - Intelligent navigation and exploration of space
- Advanced perception and cognitive capabilities
 - Detection of faces, circles, 3D rings, 3D cylinders, surface defects
 - Recognition of colour, faces
 - Basic manipulation and visual servoing
 - Speech synthesis, speech recognition, dialogue processing (reading QR codes)
 - Belief maintenance, reasoning, planning

Task 2 goals

- The main goals of the second task and competition are:
 - to improve the navigation
 - to search the space
 - to detect objects in 3D point clouds
 - to robustly detect the rings
 - (to robustly detect the cylinders)
 - to relate 3D point clouds and colour information from RGB images
 - to recognize colours
 - to master fine manoeuvring of the robot

