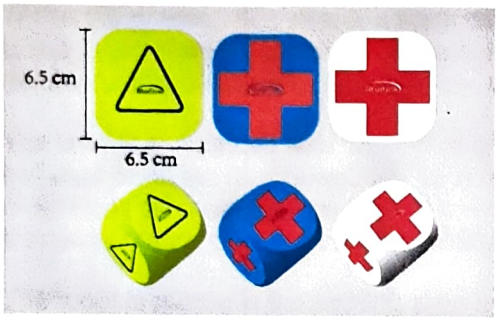
KNAPP PRIA skillsAustria

STM 2023 „Mobile Robotics“

Module 2: Object-Handling

In this module, the robot must use the OHM (Object Handling Mechanism) to locate cubes at various locations in the arena and transport them to designated collection points in the Storage Area.

The side length of a cube is 65mm, and there are three different variations of cubes (see illustration).



There are navigation aids available in the arena (see sketch, actual distances must be measured directly in the arena). Before each evaluation run, it is randomly determined which cube variant needs to be collected and how the cubes are distributed in the arena. The to the robot through a QR code. Other types of cubes may also be placed in the arena; however, the robot must ignore them.

QR Code 31: White cubes, QR Code 32: Blue cubes, QR Code 33: Yellow cubes

Rules for transportation:

- Cubes may be picked up and transported in any order.
- Multiple cubes may be transported simultaneously.
- Dropped cubes may be picked up again. Cubes on the ground at the end of the scoring run result in deductions in the evaluation.
- Incorrectly moved cubes may be transported but must be returned to their original positions at the end of the scoring run (otherwise there will be deductions).

Subtasks:

T1: With the start signal (see "Start of the scoring run"), the timing begins. The robot must leave the starting box, read and save the QR code, and display it on the laptop.

T2: The robot must now search for all cubes of the announced color in the arena (places 1-6 are randomly filled, places 7-9 are always filled as shown in the sketch). The cubes must be picked up by the robot and brought to the collection points in the Storage Area.

T3: At the Storage Area, the robot must place the correct cubes in the marked collection points. Only cubes of the correct color may be placed on the collection points.

T4: The robot must return to the starting box. As soon as the robot is stationary there, the time stops.

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Solution Presentation and Evaluation

Each team has **three** presentation phases for Module 1, each lasting 15 minutes, during which ONE scoring run of a maximum of 10 minutes can be started at any time. The **better two** of the scoring runs will be considered for evaluation. The remaining time can be used for preparing the scoring run, connecting the robots, etc. The presentation order can be found in the schedule.

Start of a Scoring Run

Within the presentation phase, a team can start ONE scoring run at ANY TIME. This must be announced to the jury. Before the actual start, the color of the cubes to find and the position of the cubes 1-6 are determined by a dice roll. Subsequently, the jury prepares the arena accordingly (maximum 1 minute).

The start is announced with "three-two-one-go," and at "go," only the "Start Button" in the programming software or on the robot's web interface or robot itself may be activated. In the case of an early start, the program is stopped, and the scoring run is restarted. If there is another early start, the scoring run for that presentation phase is considered consumed and will be evaluated with 0 points.

The robot is placed in the starting zone by the team before the start of a scoring run. The orientation can be freely chosen as long as the robot is fully positioned within the starting zone with all parts (the lines themselves are not part of the starting zone).

During the Scoring Run

The robot must autonomously complete the given task, meaning the program deployed is executed on the robot itself. A control computer connected via WIFI may be used by the team, but this is done at their own risk (e.g. WIFI disconnections). The scoring run must not be influenced from outside. Any attempt to influence the robot, the arena, or the optional control computer leads to the termination of the scoring run. The jury may abort and restart a scoring run under special circumstances.

End of a Scoring Run

A scoring run ends:

- when the robot has completed all tasks and comes to a complete stop within the starting zone. Only in this case is the task considered completely solved, qualifying the team for a time bonus (see evaluation), or
- after the maximum scoring run duration of 10 minutes or the expiration of the time slot of the presentation phase - whichever occurs first, or
- if the robot moves/alters the setups of the tasks in the competition arena, damages or leaves the arena, or
- if the evaluated team requests the termination of the scoring run, or
- an unauthorized interference occurs in the competition arena or on the control computer.

In the first four cases, the points achieved until the end of the scoring run are always evaluated. In the last case, the jury decides.

Evaluation

If at least one robot completes the entire task within a scoring run, a time bonus is awarded. This is distributed proportionally to all robots with a complete solution, weighted according to the time required.

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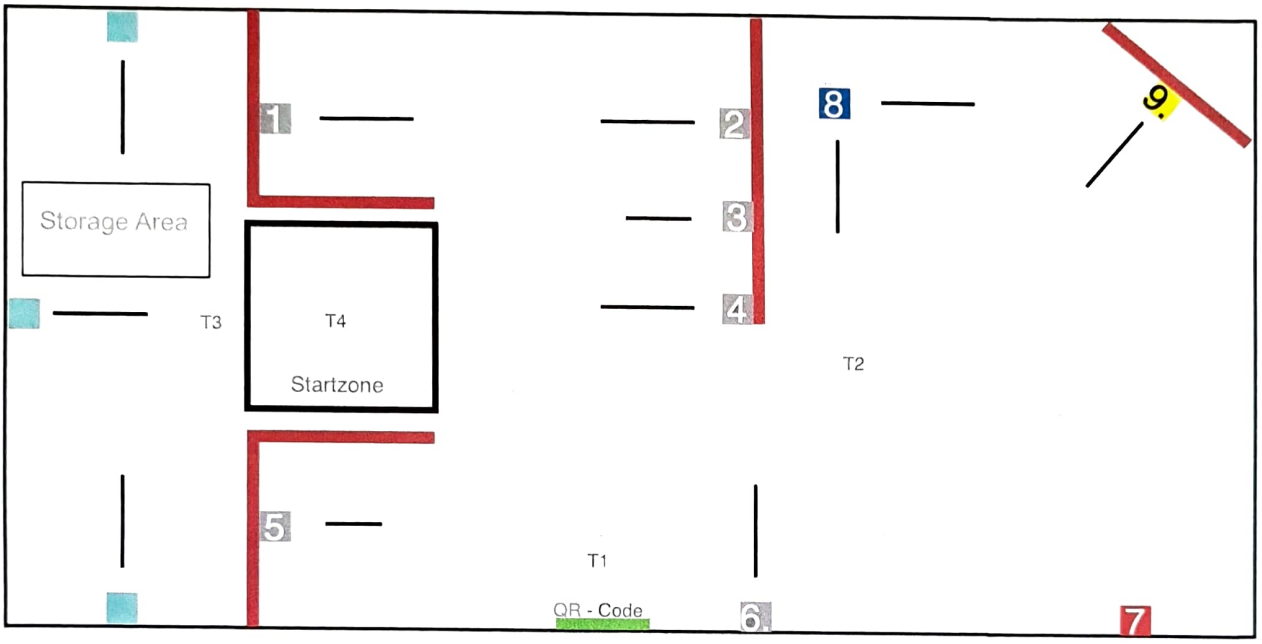
The following illustration is only a schematic representation of the principle. Actual distances, sizes, and angles, as well as path trajectories, must be measured directly in the arena.



Key:

	Wall		Robot camera showing upwards
	black tape lines		
	QR-Code	T1 .., T4 Storage Area	Notes only for description, not visible in the court