Module 3: Sensor Integration and Presentation

In this module, the robot needs to be equipped with an Ultra-Wide-Band (UWB) receiver (Tag) that allows the robot to position itself accurately (~10cm) with anchors mounted around the arena. The sensor's measurement data can be read, for example, via UART and used for robot positioning (other possibilities to get the sensor data are described in the documentation). The full manufacturer's documentation, including programming examples in the C language, is available for integrating the sensor.

The anchors mounted around the arena are already connected and pre-configured in a network (using an Android app, accessible to the teams for viewing), with each team receiving a valid "Tag" sensor in this network. The task is to make the sensor usable and obtain valid measurement data for robot positioning.

<p style="text-align:center; color:red">Don't move the anchor poles!</p>

Subtasks:

T1: The sensor is mounted on the robot, data and power connections are established. The sensor must be mounted in a way that maintains the full functionality from Module 2, and the sensor does not detach during maneuvers. It is good practice to test different sensor orientations for stable results.

T2: Position data read from the sensor must be displayed on a laptop. The robot is placed at various points in the arena, and it must display correct data.

T3: Position data read from the sensor must be used in robot control. The robot must be able to read points from a text file and navigate to them sequentially, stopping at every waypoint waiting for a button press (keyboard or robot). Jury will tell the team when to continue.

Teams are responsible for gathering coordinates of the different points during working time.

To ensure that odometry is not used, the robot must not make "alignment movements" against walls, etc. and **all sensors except the UWB sensor must be unplugged!**

T4: Like T3, but during movement, obstacles must also be considered.

T5: Make an oral presentation with help of slides and the robot and answer questions. The team should present the robot in its current state (including everything added/fixed etc. during the competition).

The format of the text file is as follows:

- Each line is a point number.
- The first 4 points can be reached directly without obstacles (T3).
- The final 2 can be reached but are behind walls (T4).

The robot must respect the sequence of points in the file and must move between two stops!

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Solution Presentation and Evaluation

For this module, each team has two presentation phases, each lasting 15 minutes (see schedule). Within these phases, ONE scoring run with a maximum duration of 10 minutes can be started at any time. The better of the two scoring runs will be used 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.

Starting a Scoring Run

During the presentation phase, a team can initiate a scoring run ONCE at any time, which must be announced to the jury. Before the actual start, the robot's starting position and the points to be reached are determined by a dice roll. The team receives a text file with the points to be reached and must transfer them to the robot (eventually rename it to make it work with your program.
Changing the program is forbidden during this process!

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

The team places the robot independently at the assigned starting point before the start of a scoring run. The orientation can be freely chosen.

During the Scoring Run

The robot must autonomously perform the assigned task, meaning the program used is executed on the robot itself. A control computer connected via WIFI can be used by the team, but this is done at their own risk (e.g., possible WIFI connection disruptions). The scoring run must not be influenced from the outside. Any attempt to influence the robot, the arena, or the optional control computer, even if only attempted, leads to the termination of the scoring run. The jury can, under special circumstances, abort and restart a scoring run.
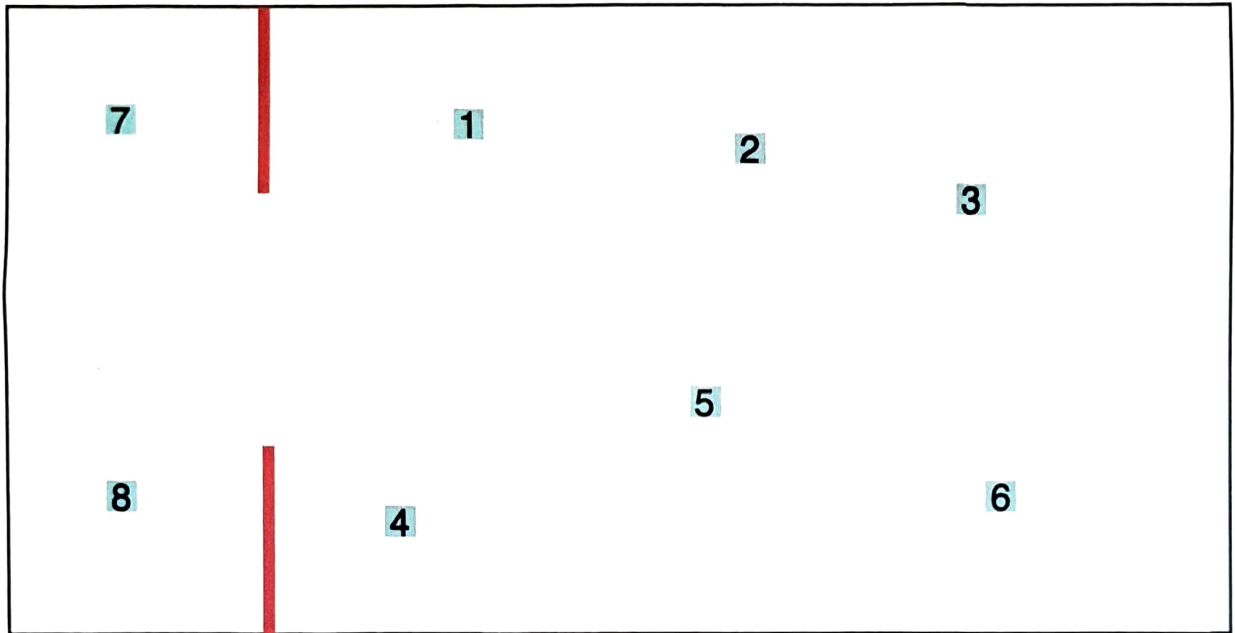
End of a Scoring Run

A scoring run ends:

- When the robot has completed all tasks and remains at the position of the last coordinate specified in the file.
- After the maximum scoring run duration of 10 minutes or the end of the time slot of the presentation phase – whichever occurs first.
- If the robot moves, alters, damages, or leaves the structures of the tasks in the competition arena.
- If the evaluated team requests the termination of the scoring run.
- If 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 considered. In the last case, the jury makes the decision.

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The following illustration represents only a schematic diagram. Actual distances, sizes, angles, and path lines must be measured directly in the arena.

Key:

——	Wall		
▪	target point		