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Romania

HARD & SOFT 2025 SUCEAVA

11.05.2025 - 18.05.2025

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Smart Wheels: Navigating the Future with Analog Sensors and Ethical Hacking

Design and build a fully autonomous RoboCar capable of navigating a randomly structured physical maze with no human intervention. The system must rely on analog sensors to interpret the environment and react through intelligent, real-time decision-making.



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WHAT YOU GET

Hiwonder Raspberry Pi 5 Robot Car



Raspberry kompatible Linear



2 x SW-420 Vibration Shaker Vibration Sensor Module

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HC-SR04 Ultrasonic **Distance Sensor**



Breadboard Kit



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WHAT YOU HAVE TO DO



Key Objectives

- Navigate the maze autonomously from start to finish
- Detect and respond to environmental signals: obstacles, vibrations, magnetic fields, alcohol presence
- The system must stream real-time logs including timestamps, estimated position, and key events to a custom web-based cloud platform
- Hardware–Software Integration: Ensure seamless coordination between sensors, actuators, and ROS2-based control logic.

Highlights

- Challenges your ability to combine hardware design with AI-driven logic
- Starting Thursday, participants may identify (but not exploit) security vulnerabilities as part of the ethical hacking component
- Black-hat hacking will result in disqualification!

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THE JURY EXPECTS YOU TO



- Every design choice should be purposeful, functional, and part of a clear overall strategy
- Use all essential hardware components provided in the kit from the Raspberry Pi and sensors to the camera and MicroROS board. Show us how they work together
- Build a truly autonomous system. After start, the RoboCar should rely entirely on its own logic and sensors no human help, no external processing
- Pay attention to the security of RoboCar and Web platform. From Thursday, you may probe for vulnerabilities but only to find and report them, not to exploit them
- ✓ Be energy-aware. Smart power management matters your robot needs to finish the maze efficiently considering energy saving strategies
- ✓ We're looking for a working, well-integrated prototype that can navigate, respond, log, and adapt on its own.

EVALUATION CRITERIA



Deliverables & Milestones

- Design Document: Submit a brief design PDF by Tuesday, 10:00 AM via email to the Jury.
- Jury Lab Visit: On Wednesday, the Jury will visit the lab for approximately 15 minutes to review work-in-progress.
- Final Report: Submit a final summary PDF by Friday, 8:00 AM via email to the Jury.
- Public Demonstration: On Friday morning, the RoboCar will undergo final testing and public demonstration.

Evaluation Criteria

- Autonomy: The RoboCar must navigate and complete the maze without human intervention after starting.
- Hardware Utilization: All components from the kit (Raspberry Pi, sensors, camera, MicroROS board, etc.) must be used meaningfully.
- Security and logging: A defined logging concept ensuring safe operation and ethical vulnerability testing.
- **Power Management**: Efficient energy use to complete the task without waste.
- Al-Driven Logic: Intelligent, adaptive decision-making based on real-time sensor data.

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JURY



President:

Sorin BORA - Cognizant Mobility Romania

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Thank you

BMW 5 Series

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