# Internship: Kyosho mini-car modelling and control

**Supervisors:** Daniel Barbuto-Rossato, Christophe Farges, Tudor-Bogdan Airimitoaie.
**Keywords:** feedback control, mini-car, robust control, iterative learning control, path planning, optimization.

**Internship description:**

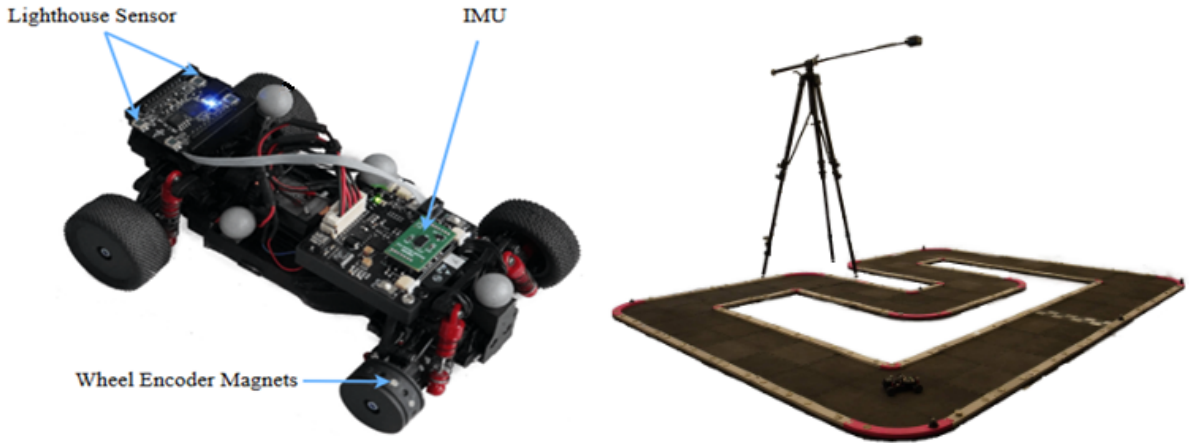


Figure 1: Mini car (left) and positioning system (right).

A new test-bench is being developped at the IMS-lab to implement, test and validate innovative control and supervision algorithms. The test bench is based on the CRS project at ETH Zurich (see https://gitlab.ethz.ch/ics/crs). It consists of a mini vehicle, an indoor positioning system (lighthouse) and a computer for control algorithms. A Kyosho AWD mini buggy car (left in fig. 1) has been adapted to accommodate a custom PCB for measuring displacement and speed via IMU, custom wheel encoders and a lighthouse sensor (right in fig. 1). An ESP32 MCU with FreeRTOS firmware and Wi-Fi communication is used. A real-time computer executes the control, estimation and navigation algorithms using the CRS library and ROS tools. It receives and sends messages to the MCU via the UDP protocol.

Based on this mini-car system, the objective will be to design and validate different control strategies to follow a predefined trajectory. Among the considered strategies, one should consider comparing:

- PID control,
- LQR/LQG control,
- robust control,
- model predictive control,
- linear periodic control,
- iterative control.

The main tasks of this internship are:

- Mini-car modelling and simulator design including its validation.

- Design the various control law and validate them in simulation.
- Implement the control law and validate them experimentally.

**Skills:** dynamic systems modelling and control, path planning, optimization, robust and adaptive control, and good coding skills in Matlab/Simulink are highly desired.
**Period:** February - July 2026 (6 months).
**Grant:** approx. 600€/month.
**Location:** IMS-lab, UMR 5218, 33405 Talence Cedex, France.
**How to apply:** send CV, motivation letter, and available grade transcripts to:


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