

## Analog foot sensor design

### Context:

The EPFL Xplore Research Pole has the objective of building a legged robot. The robot is designed to autonomously navigate through challenging terrain using its on-board sensors. Contact sensors are widely used today in legged robots. The goal of this project is to design such a sensor.

### Project description:

The objective of this project is to design and integrate a contact sensor in the foot of the robot. This sensor should provide a continuous force measurement.

Furthermore, the student will be an integral part of the Xplore Legged Robot Team, actively participating in its weekly meetings and working sessions. This collaboration will facilitate close interaction with other team members, and the student is expected to share their findings and progress with the team regularly.

### Tasks:

The project involves a series of tasks, outlined below (note that this list is not exhaustive):

- **Literature Review and Familiarization** – conduct a literature review focused on existing contact sensors.
- **System design** – Design PCBs and choose communication protocols to interface with the rest of the system. Take into account tradeoff between robustness, bandwidth and complexity. Design mechanically the foot and sensing system.
- **Prototyping**: Assemble the PCB, and 3D print the foot.
- **Coding** – implement software for reading force measurements and integrate it into existing firmware, either through FDCAN, I2C or SPI

### Requirements:

- Experience with PCB design (KiCAD, Altium).
- Experience with CAD design for 3d printing.
- Experience with embedded systems development on STM32 in C++.
- Experience with standard protocols such as I2C, SPI, CAN-FD.

### Contact:

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