

## Design and Prototyping of a Cycloidal Gearbox for Robotic Arm Application

### 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. Last semester an integrated actuator was designed for the legged-robot. Another pole of EPFL Xplore works on a space rover with a 6 DoFs robotic arm. We would like to develop a completely new gearbox for this arm using the knowledge acquired during the development of the actuator.

### Project description:

The goal of this project is to design a gearbox specifically tailored for a robotic arm application. Unlike the leg actuator, the gearbox prioritizes a larger transmission ratio, minimal backlash, low backdrivability, accuracy/precision, and does not require high transparency. The proposed solution involves the design of a cycloidal gearbox. The project encompasses prototyping, characterization of the gearbox, evaluating performance efficiency, determining maximal load admissible in theory, and ultimately, fabricating the prototype in the university workshop.

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
- Cycloidal Gearbox Design
- Prototyping Planning
- Gearbox Fabrication
- Characterization and Performance Evaluation

### Expected Outcomes:

- A comprehensive understanding of gearbox design principles, specifically cycloidal gearboxes.
- Proficiency in utilizing CAD software for detailed design and prototyping planning.
- Successful fabrication of a functional cycloidal gearbox prototype.
- Characterization results providing insights into performance efficiency and load-carrying capacity.

### Contact:

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