



Mechanical design & electrical integration of the chassis of a large quadruped robot.

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. To be able to train accurately a model to control the robot, the overall chassis shape and joint positions needs to be determined. This step is critical for the rest of the project.

Project description:

The goal of this project is to design and prototype the main chassis of the robot. This includes connections to the legs, housings for the battery, the electronics and the sensors. The design must prioritize rigidity, balanced weight distribution, lightweight construction, and structural strength. Placement of sensors, cables, and user interfaces must be carefully considered and seamlessly integrated into the design. The chassis will then be prototyped and assembled.

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:

- **Literature Review and Familiarization** - conduct a literature review focused on existing legged robot chassis topologie, material choices, electronics and cable management solutions.
- **Mechanical Design** - Complete the chassis modeling in Fusion 360, integrating components such as the battery, electronics, sensors, and user interfaces. Collaborate with the student responsible for the leg design to ensure proper integration and placement of the legs and actuators.
- **Mechanical Analysis** - Perform Finite Element Analysis (FEA) on the structural components if possible. Assess weight distribution, electrical pathways, and heat dissipation.
- **Prototyping** - An inexpensive prototype can be produced to test preliminary design choices.
- **Manufacturing** - Production and manufacturing of all parts, as well as assembly of the final chassis are expected.
- **Description** - A Complete and working URDF will need to be produced to allow future students to work on Reinforcement Learning.

Requirements:

- Experience with CAD design, advanced Fusion360 skills are a solid plus.
- Experience with mechanical simulation tools would be appreciated.
- Experience with mechanical assemblies, and components like bearings, tolerances...
- Experience with materials, prototyping, machining techniques & manufacturer capabilities.
- Critical thinking, autonomy and initiative across mechanical and electrical domains.

Contact:

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