Bimodal Quadruped Robot (BiQu)

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Abstract

The focus of this project is on the development of a quadruped robot named Solo 12, which is designed to switch seamlessly between **quadrupedal and bipedal modes** of locomotion. This adaptability makes it ideal for navigating unstructured environments. The project delves into the technical aspects of the robot's development, including hardware architecture, electronics installation, and software stack with an emphasis on **locomotion controls**. Additionally, the project explores the use of computer vision technology for **person tracking**.

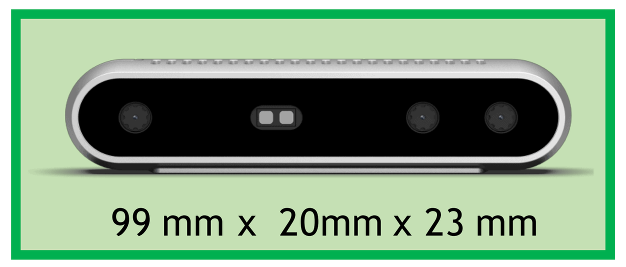
Vision: Person Tracking

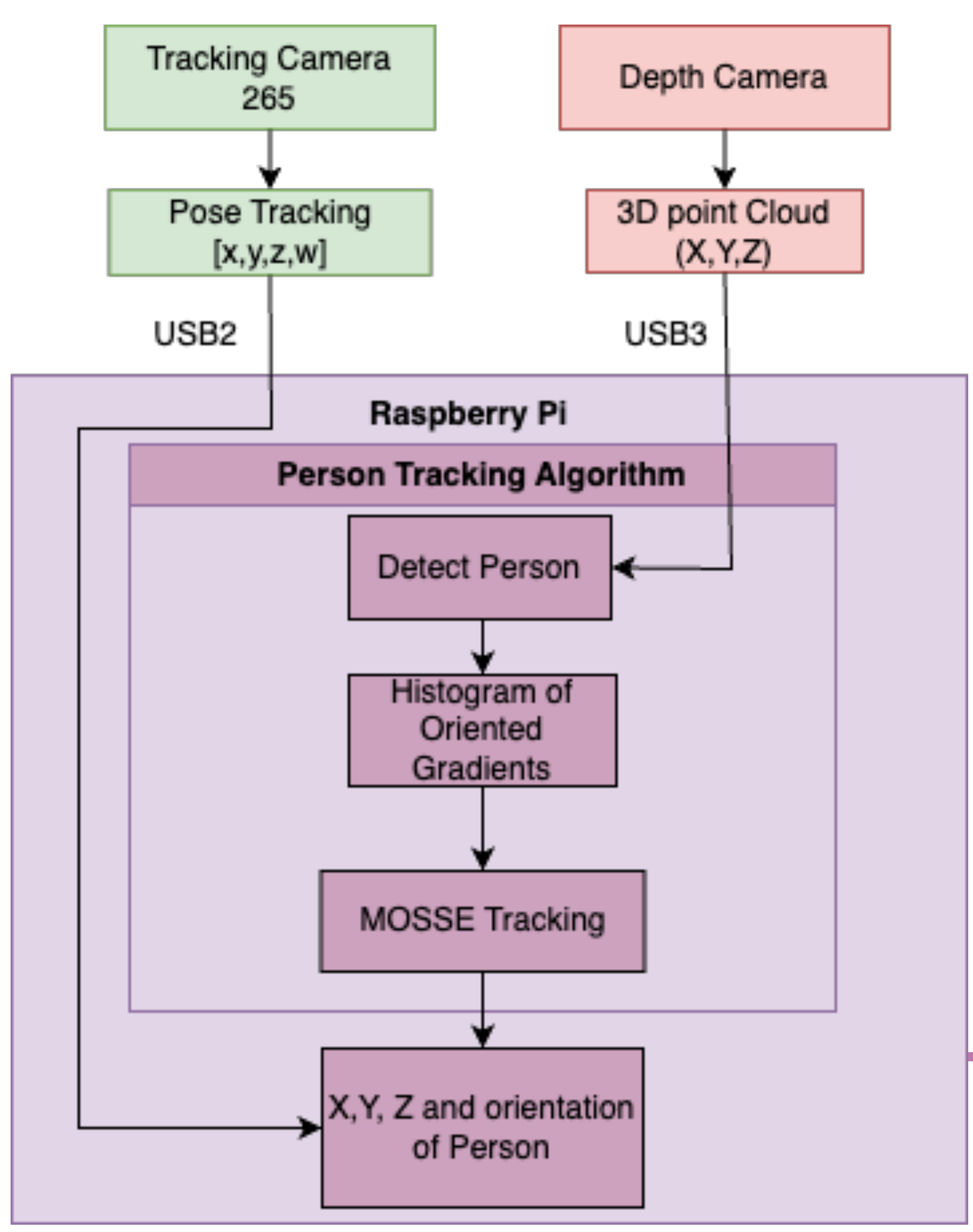
Intel RealSense Tracking Camera T265

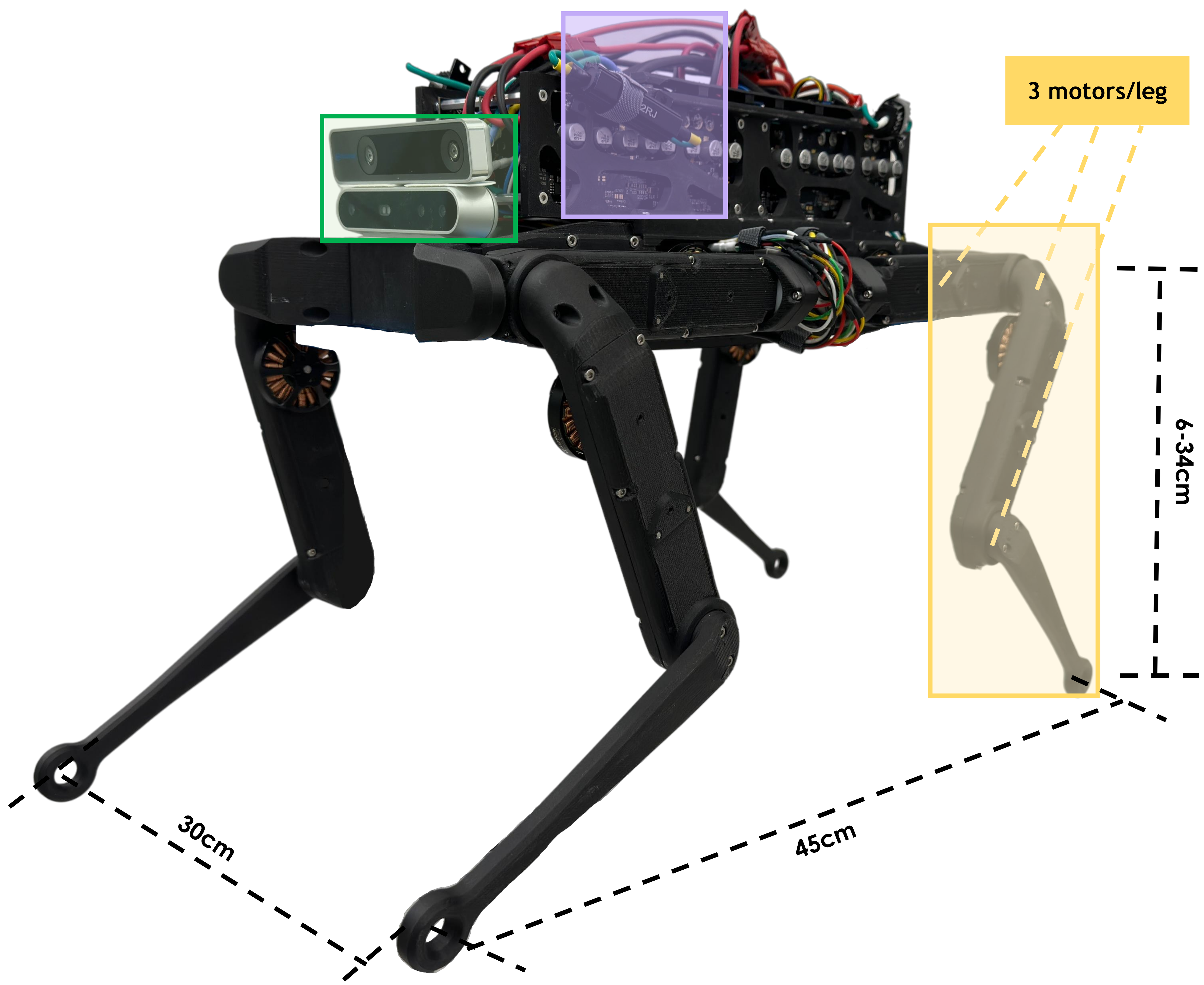
- Angle orientation [x,y,z,w]
- Linear velocity and acceleration
- Pose stream 200 Hz

Intel RealSense Tracking Camera D415

- Returns a 3D point cloud (X,Y, Z)





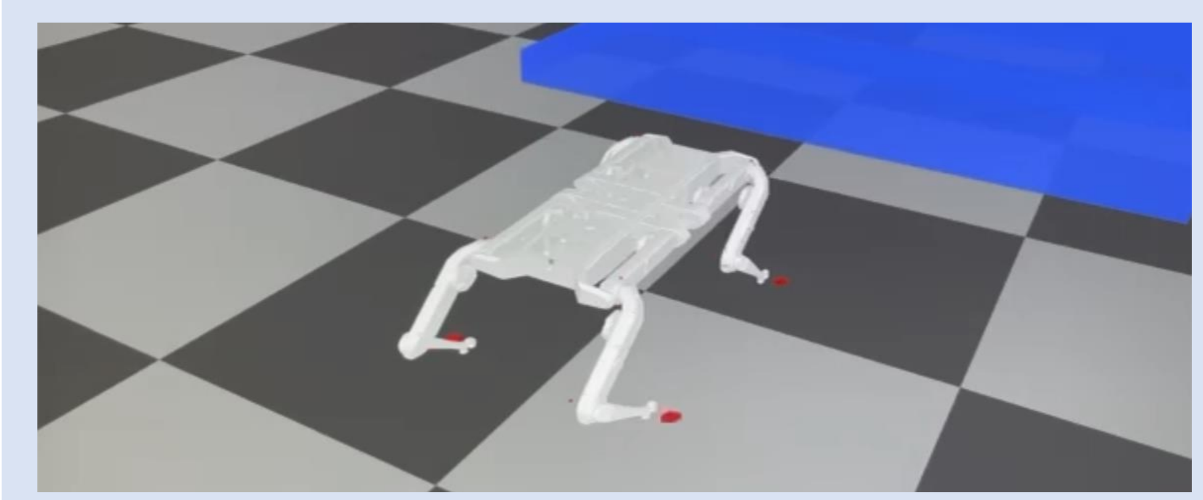


Objectives

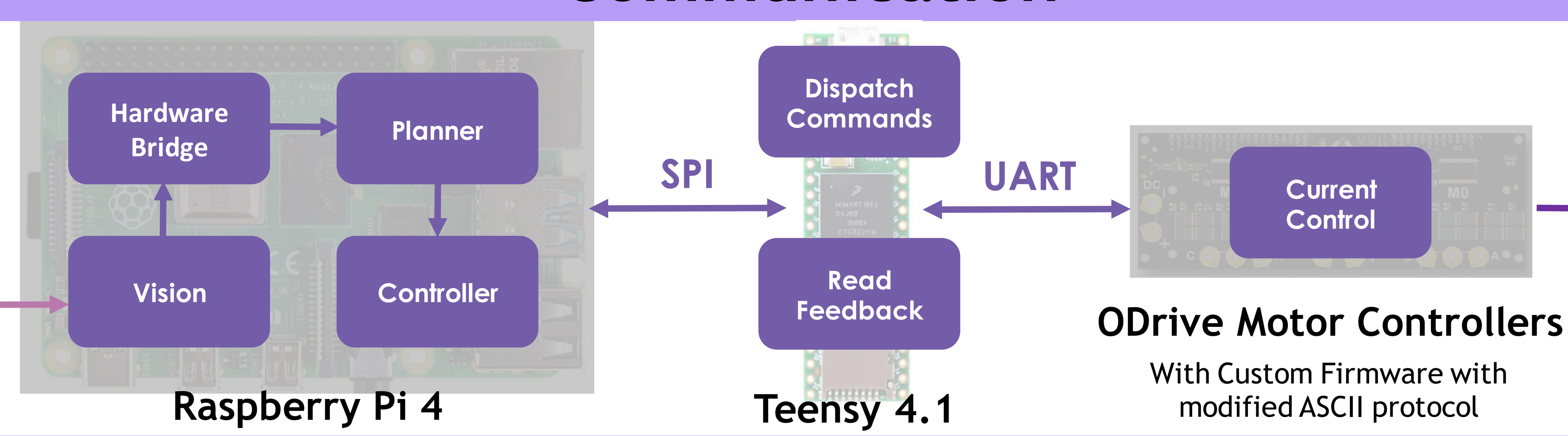
- Extend 8-DOF to a 12-DOF quadruped robot
- Implement dynamic and reactive control system to allow robot navigation on different surfaces
- Enable robot with perception for person tracking

Results

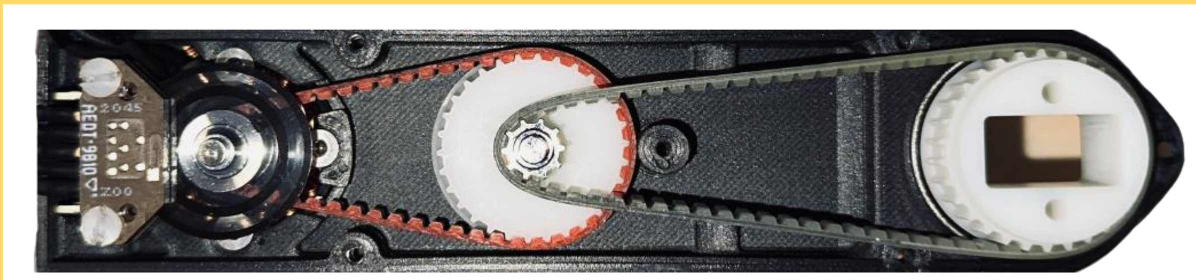
- 12-DOF Robot Fabrication and Assembly
- Adaptation of Solo 12 with hardware from previous MQP
- Perception system to track person
- Floating-base Dynamic Model
- Implementation of Model Predictive Control and Whole-Body Control
- Adaptation of Solo 12 to MIT Biomimetics Cheetah Software
- Simulation with robot walking and doing 3D acrobatics (back flips and front flips)



Communication



Mechanical



12 Actuator Modules:

- Brushless DC Motor
- Optical Encoder
- Code wheels
- 9:1 gear train

Fabrication material

- Onyx
- Accura Xtreme