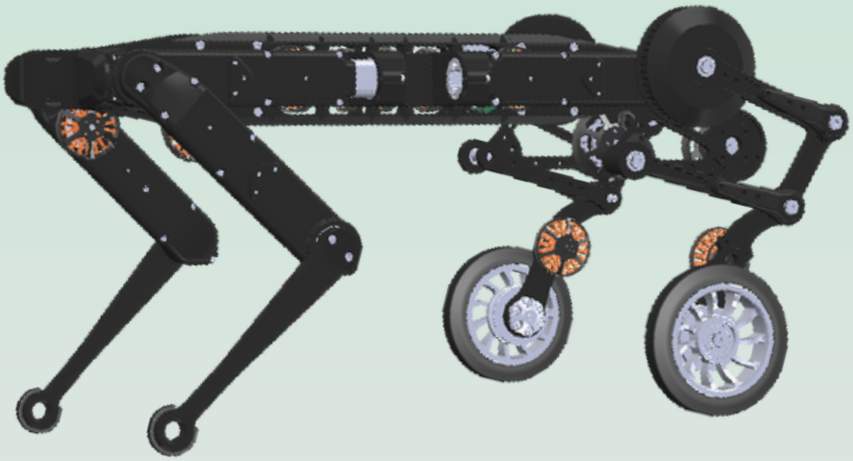
Bimodal Quadruped Robot

WPI 2022-2023 Major Qualifying Project

BiQu



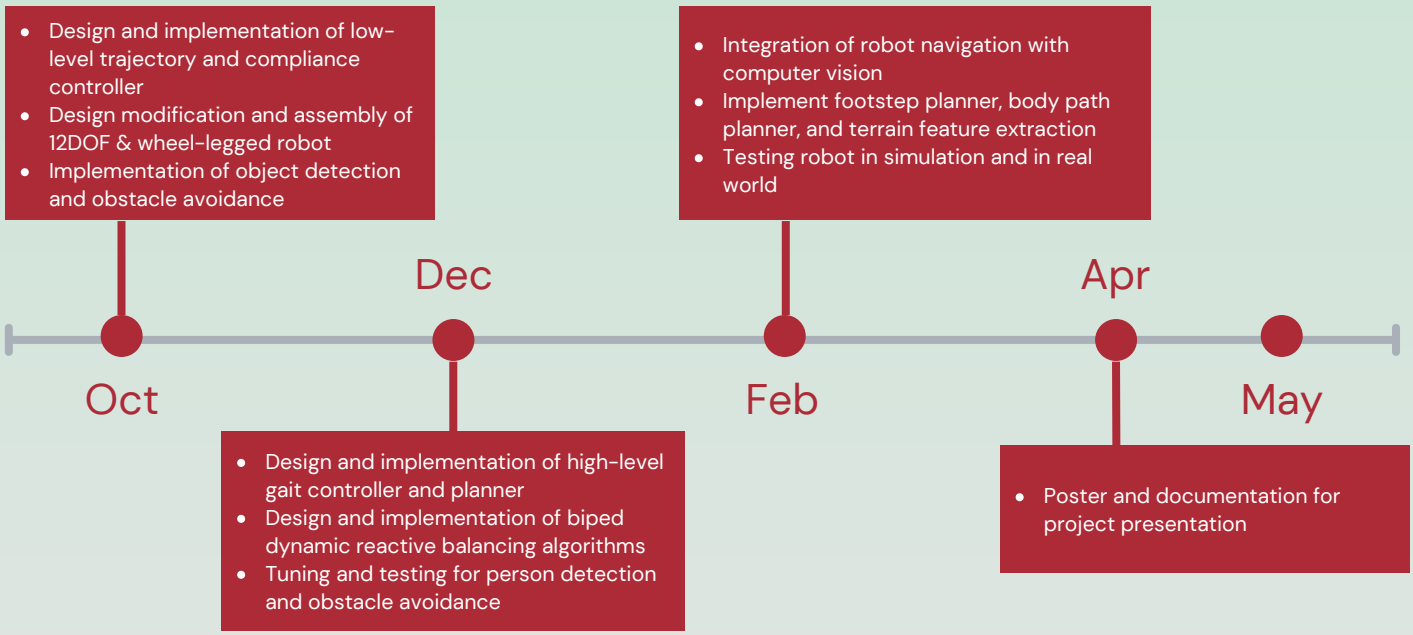
Motivation

Legged robots have been used for workflow automation, deployment in hazardous environments, and variety of other tasks. The task requirements determine which type of legged robot to use, limiting to one form of locomotion. For example, when traversing uneven terrains, one can benefit from the stability of quadruped robots. When it comes to manipulating objects, reaching high objects, or navigating in narrow spaces, the dexterity of bipedal robots might be beneficial. When high-speed locomotion is needed, wheeled robots would be a good choice. What if the robot has all these together? BiQu is a quadruped robot that can stand on two legs and has two wheels on the rear legs. By combining multiple forms of locomotion – walking, crawling, climbing, and driving – the robot is much more versatile with increased mobility. This allows the robot to accommodate a wider range of tasks, increase energy efficiency, and better recover from external disturbances. Furthermore, the integration of Computer Vision enables the robot to perceive obstacles and process terrain features, allowing it to transition between modes and adjust walking gaits to better adapt to the environment.

BiQu Specifications

- 12 Degrees of Freedom
- Hybrid locomotion: quadruped crawling and climbing, bipedal walking and driving
- Dynamic and reactive control system with self-balancing and compliance
- RGBD camera with built-in IMU for obstacle and terrain features detections
- Rigid and lightweight chassis in PC-ABS and rear legs in aluminium

Timeline



Cost

Quadruped Chassis	Cost
Actuators	$900
Electronics	$500
Hardwares	$400
Raw Materials	$500
Total	$2,300

The Team

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Robotics Engineering
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Contact

BiQu is a Major Qualifying Project (MQP) at WPI, a team-based capstone project and research experience. You can contact us via the following email: yleung@wpi.edu. The BiQu team is located in Unity Hall 150 on WPI campus. We will be presenting our work on the annual Project Presentation Day on Apr 21, 2023.