Design and Development of a Robotic Hexapod

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Introduction

This project aims to design and development of a 6-legged robot. Legged robots have more advantage than the wheeled robots for rough terrains, climbing up stairs and other not flat surfaces. Hovewer, legged robots are more complex structures because balancing the robot, movement structure and contact of legs to surfaces are difficult problems for these robots.

## Specifications and Design Constraints

We developed a mini-scale robotic hexapod that can realize the basic locomotion gaits such as walking/running. The legs are C type from elastic materials. Each leg is controlled with a DC motor. Encoders on each motor are used to measure and control leg position. A microcontroller is used to control all of these motors.

The robot should synchronize all legs and control them simultaneously to perform stable locomotion. Robot works indoors and outdoors on slightly uneven terrain.

Solution Methodology
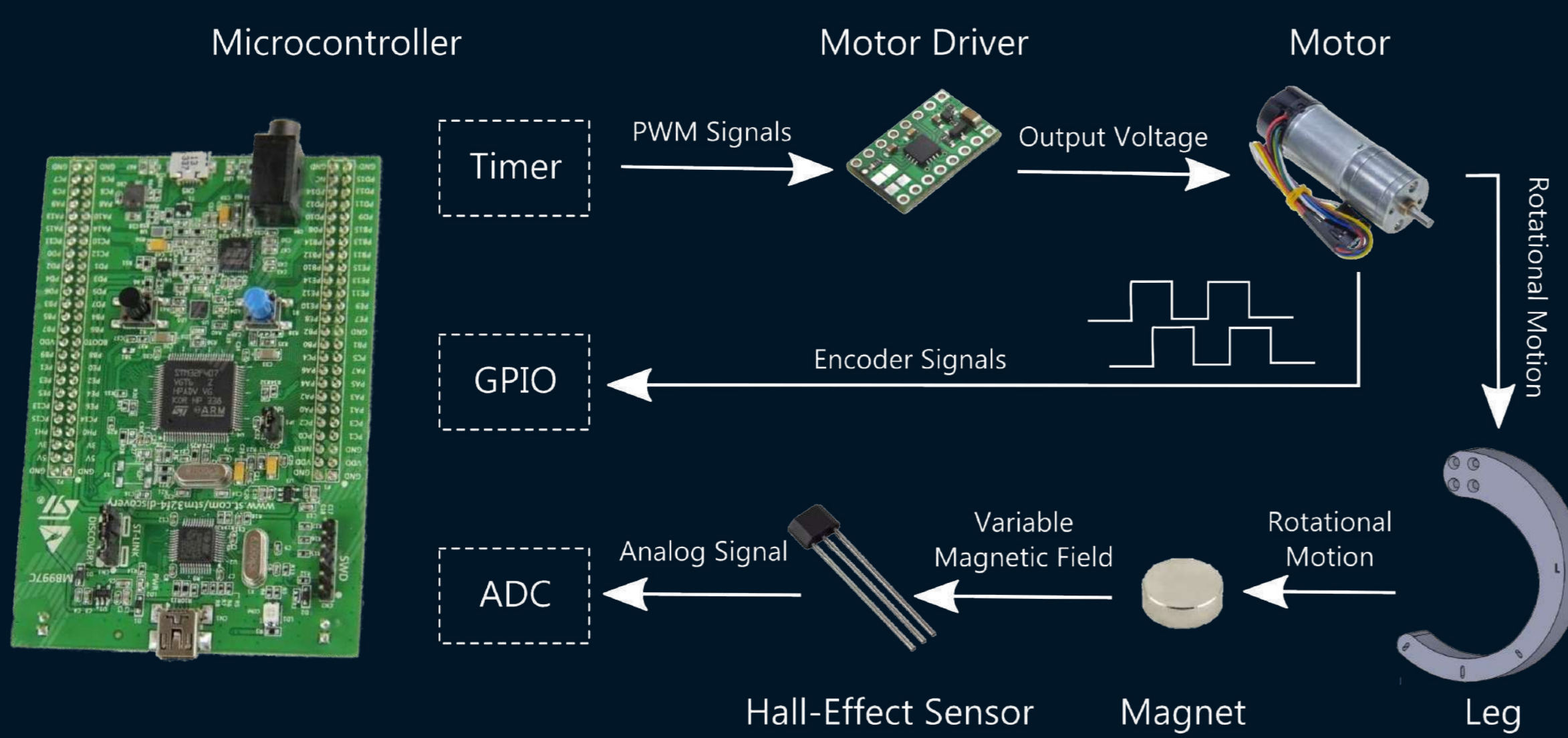
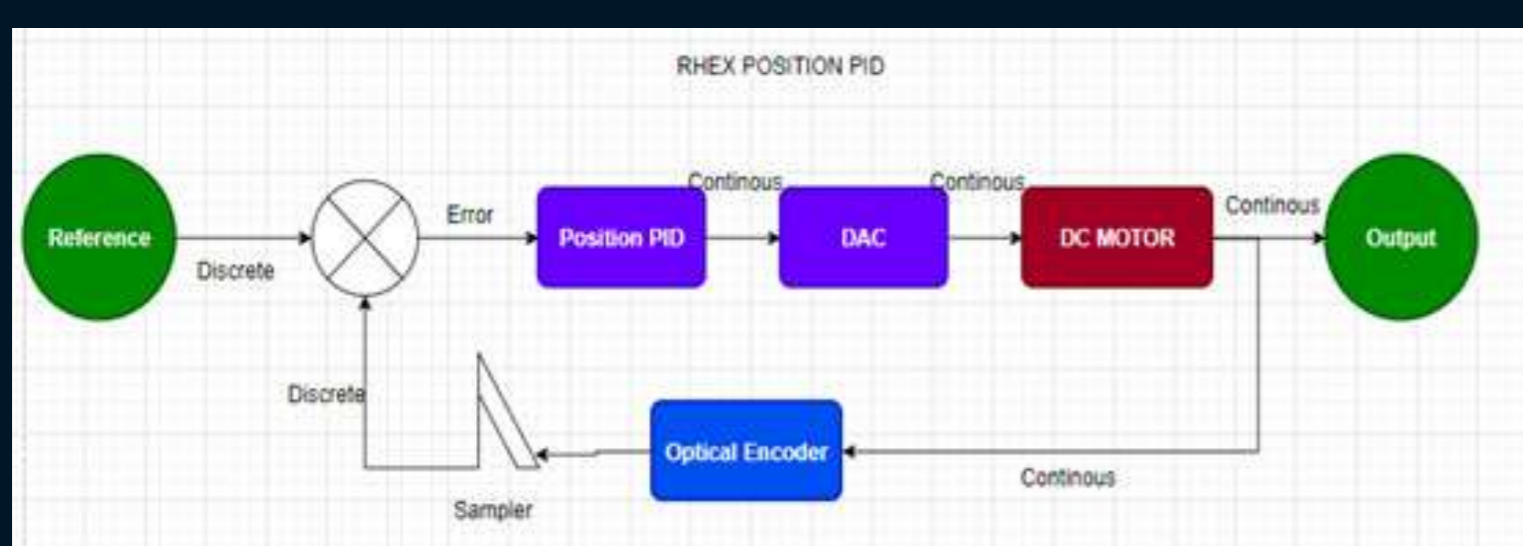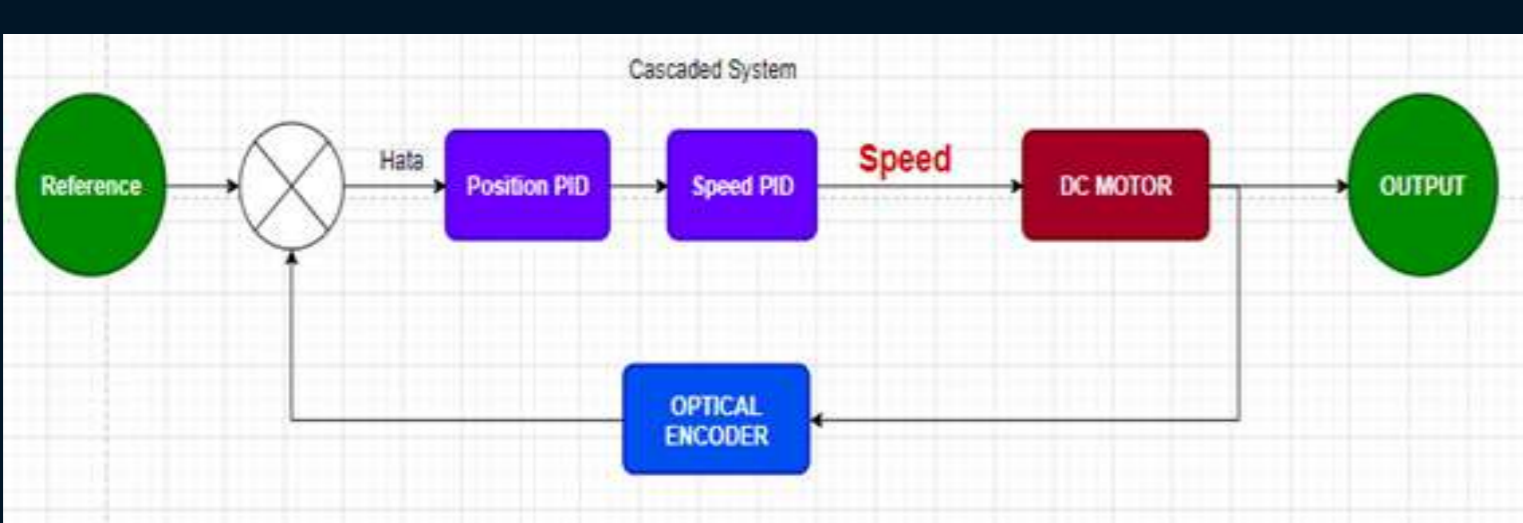

for each leg **x6**
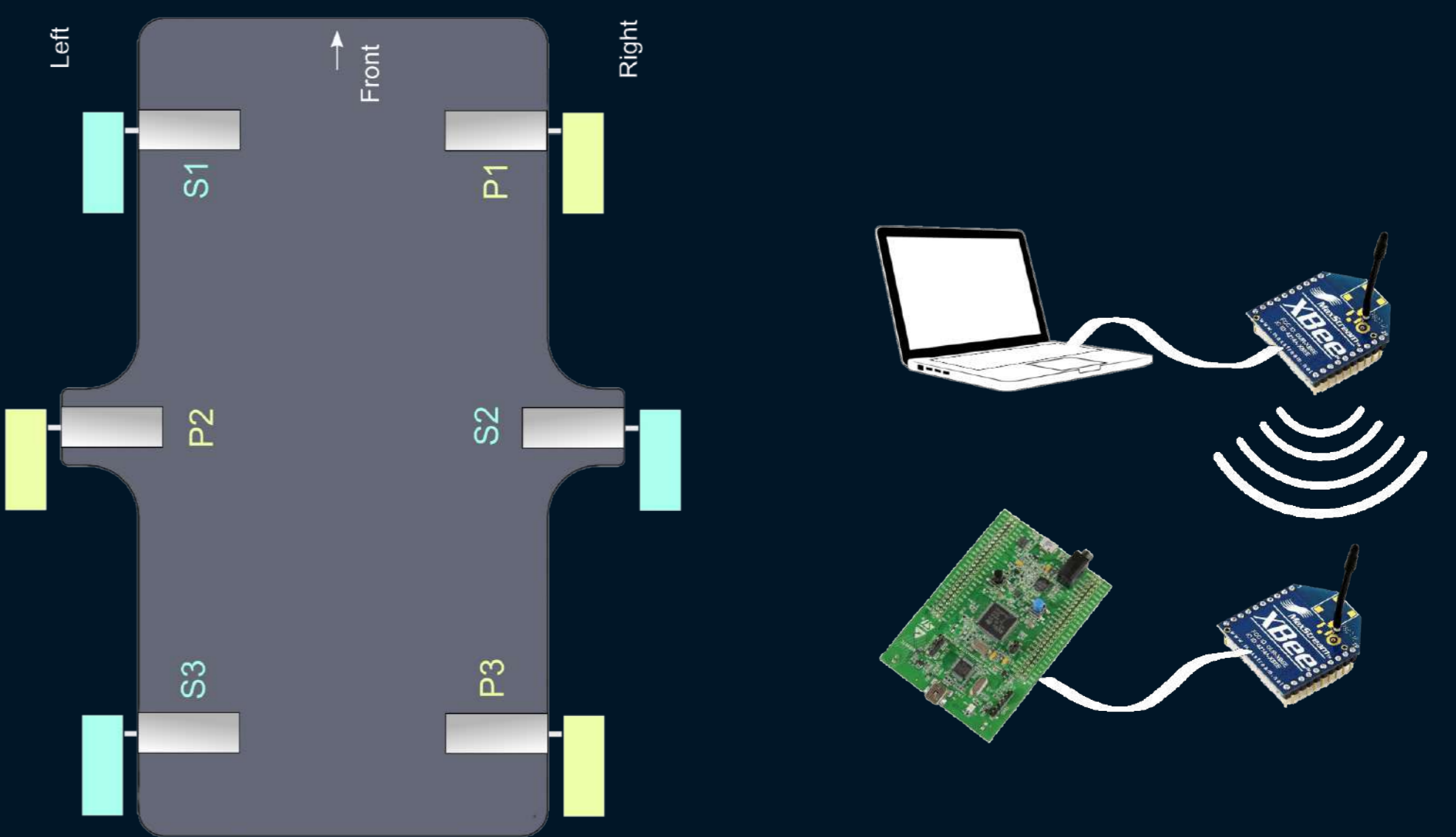
Leg Configurations

Telecommunication

Results and Discussion

Position controller is so important for synchronization. Speed controller is important for decreasing nonlinearity for position controller. Also, speed controller increases the robustness and stability.
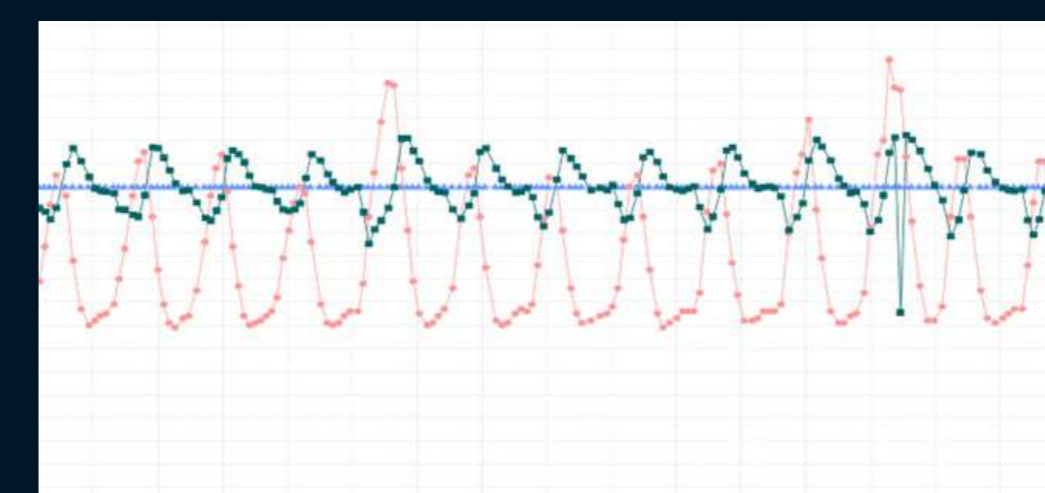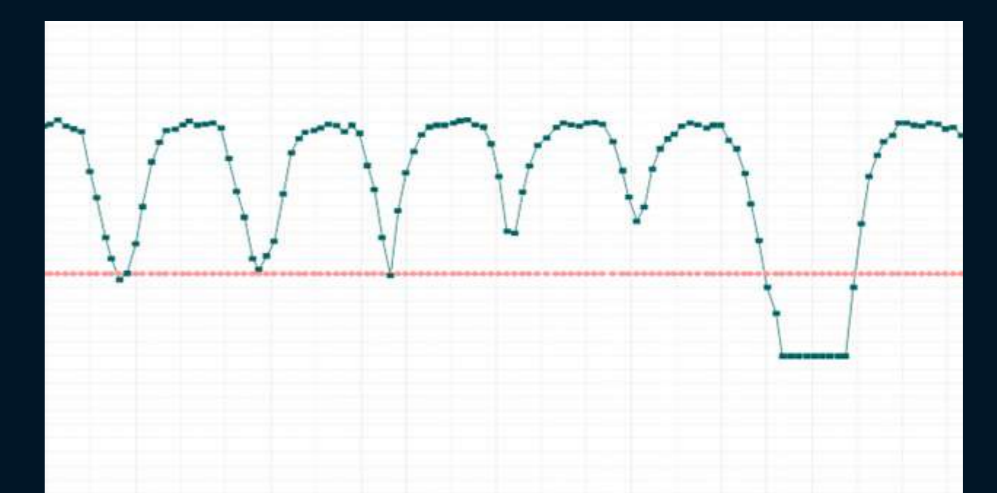
Without speed controller, system reaction is faulty. Motor's response is affected by the disturbances a lot. When speed controller is enabled, system reacts and resists to changes.

Position Controller

Position Controller cascaded with Speed Controller

Speed Controller Enabled Response

Speed Controller Disabled Response (Constant PWM)

green: speed of the motor, r**ed:** PWM duty cycle (vs. time)

Application Areas

Due to its flexibility on rough terrains, our robot can be used in various applications such as search and rescue, exploration and defense industry.

Acknowledgements