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DEVELOPMENT OF A QUADRUPED ROBOT

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Abstract

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ABSTRACT

Quadruped robots are four legged robots. This field has been extensively researched in the past and continues to be one of the most researched fields in robotics as more innovations happen. Very well known robots in this field include but are not limited to ANYmal [1], BigDog [2], HyQ [3], Sotch [4] and Spot [5]. These have proven that legged robots are a better solution to challenging terrain compared to their wheeled counterparts. Due to their adaptability to challenging environments, these are being used in construction sites, inspection in hazardous environments, disaster management and assessment and even entertainment. Leading the demand is the defense industry where it's required to perform surveillance under tough terrain and even carry heavy payloads atop mountainous slopes. Despite there being published research in different fields, there exist very few publications describing the entire robot as a whole. Even fewer of them are beginner friendly. The main aim of this project is to develop a quadruped platform that will act as a prototyping bed to testing different ideas in the field of quadrupedal locomotion and navigation. For this, the quadruped is made using simple parts and consists of simple protocols for control. However, the platform is made such that making improvising modifications is as easy as learning about the modifications themselves. Additionally, this document aims to serve as a beginners introduction to quadrupeds, where brief description about various concepts can be found along with the design and theory at one place. The model is made using SolidWorks and Fusion 360, firmware is programmed using MPLAB IDE. ROS and MATLAB are used for communication between programs, algorithm design and testing. Adams is also used for simulation. The main achievements of this project is the proof of concept for the entire robot. The quadruped robot can trace a particular trajectory with its legs, even showing the time delay and offset necessary for execution of periodic gaits. An intuitive method for generating a particular gait is also demonstrated. System wise modeling of the robot is also done, in order to understand the system better and to help in simulations.