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Design and Development of Under Acctuated All-Terrain Octabot

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Abstract

Background: Legged robot can walk in unstructured terrain and can handle complex nature of task that wheeled robot can't handle [1, 2]. Legged robots are of various types and include bipeds, quadruped, hexapod robots [3-5]. In nature many insects have eight legs and have stability while walking and executing the desired work.

Objectives: In this paper a sprawling type octabot is targeted which is the best choice among all legged robots related to mobility and stability of locomotion. The octabot design is inspired by nature, where the spider has a stable locomotion. A constrained legged motion is provided by actuators as the most of the motion of the spider legs are constrained to certain degrees.

Methodology: The robot can be designed by synthesizing a mechanism, connected by actuators and controllers that will help the robot to mimic the walking trajectory of a spider. To design the robot, CATIA CAD software has been used. Based on the preliminary design of the mechanism a large modification can be added based on the available actuators and other electronic mountings. Once the CAD is finalized the fabrication was done using the laser cutting on an acrylic sheet and assembled using the purchased hardware.

Result and Discussion: The design of the robot has gone through many changes over the time. In the first model, acrylic board was used to fabricate the bot and was powered using chain drive with high torque motor. But was not successful due to axis alignment issues. In the second model, the octabot was powered using dual axle stepper motors and joints were connected using ball-bearings and bot has LDR and LM-35 sensors. Thus, a desirable working of the bot was achieved, again further modification is needed to achieve more efficient model. This design is in the development stage where the flexure joints can be used instead of ball-bearing joints and replacing the acrylic sheet with Teflon sheet which is more flexible and robust.

Future work: This kind of robot has numerous applications specially for the case of distal planet exploration where the terrain is unstructured. Some experiments were performed to estimate the motion of the robot in-order to re-design the system to meet the desired target of developing a nature mimicking robot. The experimental setup can be updated by using the computer vision.

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