Motor Control System for a Quadruped Robot

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The Problem: Develop a Motor System for a Quadruped Robot that allows it to control its gestures, posture and walking.

Motivation: In order to obtain any useful behavior from a robot, it is necessary to control the movements of its limbs. The movements of the limbs should be smooth and adequate to the task (i.e., if the robot is standing, it would control the force exerted by the limbs against a surface, and if the robot is pointing, it would control the position of its arm.)

Previous Work: Extensive research has been done on Control Walking Robots [1, 2, 3] and Robotics Arms [4, 5]. Work has also been done towards understanding the architecture of the animal and human motor control [6, 7, 8]. Therefore, this information will be used to develop a motor control system for a quadruped robot.

Approach: A quadruped robot named "Coco" has been constructed. It has two 3DOF arms, two 2DOF legs and a 5DOF head. The robot currently has been controlled using Position Control and Torque Control. The Torque Control method is similar to the Series Elastics Actuators [9], but the controller generates the elastic element.

Difficulty: The motor control system in humans and animals is not completely understood. It is not clear what the functions of each of the organs used are and how the parts interact with each other. Therefore, it is difficult to try to implement an animal-like motor control system. Additionally, the actuators that the humans and animals use are completely different from the ones used by robots. That makes the problem more difficult.

Impact: The implementation of the motor control system will help us to better understand the animal motor system. This better understanding will be useful in developing human-aid devices. Additionally, different methods of control will be tested.

Future Work: Integrate the system with high-level functions to develop interactive behaviors.

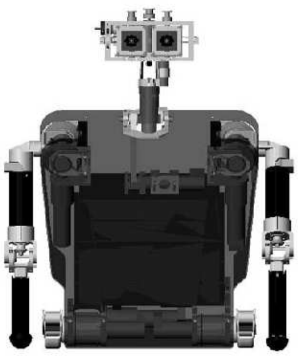

Figure 1: Robot Coco

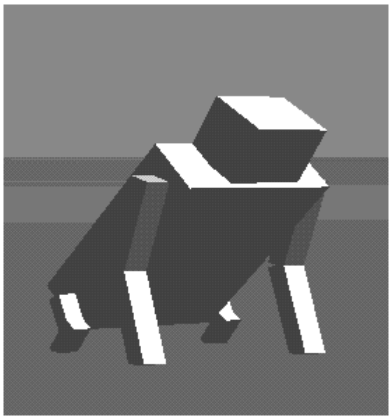

Figure 2: Simulation

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