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Tesis: "CONTROL OF A QUADRUPED LEG USING AN ANALYTICAL APPROACH"

Resumen:

This thesis presents the control of a simulation of a quadruped robot that mimics the locomotion of a cheetah. This robot has the capability of mimicking many gait patterns of real quadrupeds such as trot, pronk, gallop, and pace. In order to mimic the gaits of the quadruped, a robot was used for the software in the loop (SIL) visualization, this robot was the Laikago robot from the Chinese company Unitree Robotics which has proved to demonstrate outstanding performance. This robot is capable of responding to external disturbances using the control technique of Model Predictive Control (MPC). The majority of quadruped robots have used the Model Predictive Control technique for their control scheme because of their feasibility in their performance and their capability to respond to external disturbances.

In the state of the art, in simulation and in real quadrupeds, quadrupeds use two controllers for the locomotion of their legs, one for the stance phase and another one for the swing phase. For the stance phase, they have used MPC, and its variations in order to test the locomotion of quadrupeds in simulation as well as with the real quadrupeds. On the other hand for the swing phase, there has been used a PD controller with a feedforward term. In order to test something different, a quadruped leg was designed, as well as a new proposed controller for the locomotion of its swing phase. The objective of this work is to test its performance in simulation using the Simulink software. The main contribution of this controller is that in literature it has been tested a controller with another approach, while it will be proposed another controller with a feedforward term as well, using a different approach. This controller was tested in simulation in order to prove its behavior and its performance. With these tests it will be possible to contribute to the controller of a quadruped robot using a different approach, leading to an analytical solution. In the future, the proposed controller can be tested firstly in a real robot leg, and after testing its performance, in a whole quadruped using a platform with the SIL technique, and later, after having a good functionality in simulation, test the controllers in a real quadruped.