MODELING AND CONTROL OF A QUADRUPED ROBOT

A thesis submitted in partial fulfillment of the requirements for the award of the degree of

B.Tech

in

INFORMATION TECHNOLOGY

By

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BONAFIDE CERTIFICATE

This is to certify that the project titled **MODELING AND CONTROL OF A QUADRUPED ROBOT** is a bonafide record of the work done by

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in partial fulfillment of the requirements for the award of the degree of **Bachelor of Technology** in **Information Technology Engineering** of the **VJTI,Mumbai**, during the year 2018-2019.

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ABSTRACT

In this paper, the problem of modeling and control of a planar eight-degrees of freedom quadruped robot is investigated. First a new methodology for dynamic modeling of quadruped robot introduced based on the tree structure of the quadruped robot and using the Euler-Lagrange method. Then, a new control scheme is proposed based on the presented model. The control scheme is composed of a robust control term and an iterative learning controller The robust controller is designed based on the Lyapunov theorem to overcome the degrading effect of the disturbances and uncertainties exist in the system model. Whereas the iterative learning strategy accounts for enhancing the performance of the quadruped robot. The effectiveness of the proposed approach is demonstrated via simulations performed on a obtained model for a eight-link quadruped.

TABLE OF CONTENTS

Title **Page No.**

ABSTRACT . . . . . **ii**

TABLE OF CONTENTS . . . . . **iii**

LIST OF FIGURES . . . . . **iv**

1 Introduction **1**

1.1 A Section 1

1.1.1 A Subsection 1

2 References **3**

List of Figures

1.1 This is Arduino Nano 2
1.2 This is a servo controller. 2

Chapter 1

Introduction

The problem of modeling and control of legged locomotion systems has recently received increased attention due to their higher mobility than conventional wheeled vehicles. Although wheeled robots are very popular, they suffer from several limitations that reduce their efficiency. For instance, they can reliable navigate only in some limited types of terrain. In contrast, legged robots provide great flexibility in choosing the type of the terrain they can proceed. Quadruped robots are one of the important types of legged robots. Due to the importance and practical application of quadrupeds, they have been attracted researchers and scientists in recent years. Similar to the biped robots.

1.1 A Section

Quadruped robots have multiple closed chains in their structure and it makes the modeling problem of these robots very difficult. These closed chains impose constraints on the dynamic equations of motion. Depending on the walking phase of the quadruped, number of closed chains and therefore number of constraints vary

1.1.1 A Subsection

The control problem of quadruped is also of great importance. Legged robots and specifically quadrupeds is used in outdoor environment that usually contain rough terrains and so disturbances, noises, foot slippage and are inevitable. To overcome these problems robust scheme should be considered.

Single equation

$$e^{i\pi} = -1 \tag{1.1}$$

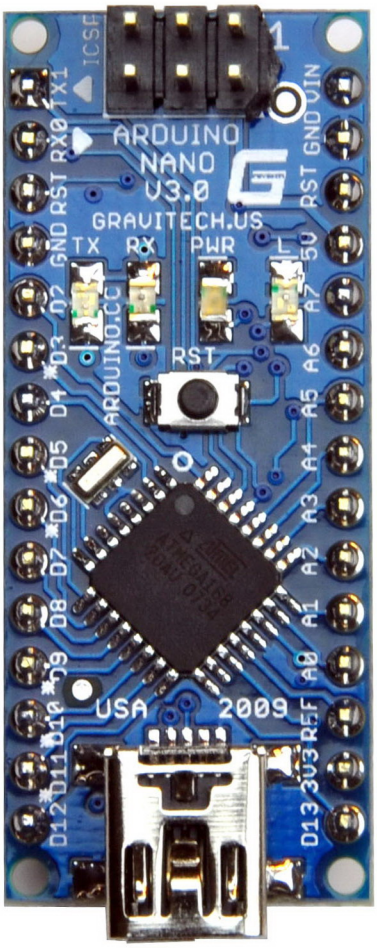

Figure 1.1: This is Arduino Nano

Figure 1.2: This is a servo controller.

Chapter 2

References

[1] American Mathematical Society (2002).
URL ftp://ftp.ams.org/pub/tex/doc
[2] M. Baudoin (1997). Apprends
[3] P. Daly (1998). Graphics and Colour URL http://tex.loria.fr/ graph-pack/grf/ http://directory.google.
[4] A. Diller (1999). L ATEX Line by Line
[5] S. Fear (2005). Publication
[6] P. Flynn (2005). A beginner's introduction
[7] M. Goossens, F. Mittelbach, and A. Samarin
[8] M. Goossens, S. Rahtz
[9] G. Grätzer (1999)