A CONTROLLER DESIGN FOR QUARTER CAR ACTIVE SUSPENSION SYSTEM

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ABSTRACT

Active suspension control system is used today because of their ability to manage the compromise between ride comfort and vehicle road-handling. In this project, the ride controller part of an active suspension system is presented and evaluated. A mathematical model of the suspension system was derived analytically and validated experimentally. Matlab/Simulink was used to analyze and design a controller for this system.

The performance of the proposed controller will be compared to LQR controller. There are three parameters to be compared in this project which are wheel deflection, the body acceleration and the suspension travel. From the simulation result and analysis, it could be concluded that the model is reliable and it can be applied to any quarter car suspension system.

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

1.0 Introduction

This chapter will provide the fundamental and overall view of this project. It comprises of several topics such as background to the project, objective, software purposed, and lastly thesis organization. First, the shortcomings of conventional passive vehicle suspension will be discussed.

1.1 Project Background

Development of control methods for passive and active suspension systems is a major topic of automotive industries. A good suspension system shall improve ride quality and passenger comfort simultaneously. For ride quality improvement vertical acceleration that caused by road profile shall be limited. This means that suspension system shall absorb road disturbances.

This project discusses the development of a controller for a passenger car using a recently developed active shock absorber. Based on the identified linear car model, linear controllers are derived. Using of an automotive active suspension has two main reasons which are increase ride comfort and improve handling performance. Both of these requirements are contradictory and it's impossible to satisfy them only with passive suspension simultaneously.

The suspension system must support the vehicle, provide directional control during handling manoeuvres and provide effective isolation of passengers/payload from road disturbances. Good ride comfort requires a soft suspension, whereas insensitivity to