AN OBSERVER DESIGN OF NONLINEAR QUARTER CAR MODEL FOR ACTIVE SUSPENSION SYSTEM USING BACKSTEPPING CONTROLLER

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ABSTRACT

This paper presents the use of backstepping controller in order to construct an active suspension for a quarter car model with observer design. The implementation of backstepping controller is presented in non-linear quarter car model for active suspension system. The movement of the rotational motion of arm has been taking into consideration for this system which has been neglected by the linear system. Backstepping control is a recursive control procedure which breaks a design problem for the full system into a sequence of a design problem for lower order systems [1]. The performance of the proposed controller will be compared with the linear quadratic regulator controller to help validate the result.

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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 proposed, and lastly thesis organization.

1.1 PROJECT BACKGROUND

At the beginning, modeling of the active suspension systems has only considered the linear force input to the system. Recently, with the developments of new control theories, the force input to the active suspensions has been replaced by an input to control the actuator. The active suspension system now consists of the dynamics of suspension system plus the dynamic of the actuator system.

The purpose of this paper is to utilize the concept of backstepping controller to the non-linear quarter car motion equation in the state space form.

1.2 OBJECTIVE

The objectives of this project consist of:

i. To study the mathematical modeling developed by previous researchers for a non-linear active suspension system with an observer.
ii. To design an observer for the non-linear quarter car model for active suspension system based on the mathematical modeling developed.