CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

An automobile or car are used for transporting passenger which also carries its own engine and are designed to run primarily on the road. Today, many automotive companies produce highly developed model. They develop a good performance model with new design and technology. One of the performance requirements is advanced suspension systems which prevent the road disturbances to affect the passenger comfort while increasing riding capabilities and performing a smooth drive. There are two main functions for car suspension system. The first function is to isolate the car body from shock and vibration caused by irregular road surface. The second function is to maintain constant contact between road surface and the tires.

In the last few decades, many researchers have been carried out to improve vehicle suspensions. Among the proposed solutions, active suspension is a possible way to improve suspension performance although the passive system can effectively handle some control of suspension system. Passive suspension systems have been design to achieve performance of vehicle but intrinsic limitations prevent them from obtaining the best performances for both objectives. Replacement of the passive suspensions of car by active systems has the potential of improving safety and comfort under nominal conditions because active system offer more design flexibility. Many methods are applying to improve the suspension problem especially the performance of active suspension designs, such as linear optimal control, fuzzy logic and neural network control, adaptive control, H1 control and nonlinear control. Fuzzy logic is an intelligent

control method that currently uses to investigate this suspension system problem. (Shao-jun et al, 2004)

For this project MATLAB SIMULINK will be used to design an active suspension for a quarter car model. The block diagrams are drawn in SIMULINK based on the quarter car model according to the given parameters.

1.2 PROBLEM STATEMENT

Passive control method has a disadvantage of disturbance rejecting when used to control suspension system**.** Active control is believed can give a better control for active suspension system in term of maintaining a smooth drives for the drivers. The pneumatic tyre is the first line of defences and is the most important of all the suspension mediums. To the extent that, while uncomfortable, it would be quite feasible to drive a car around the roads, at reasonable speeds with no other form of bump absorption. The loads fed into the wheels without such tyres would be enormous and continual wheel failure would be the norm.

The Road disturbances can lead to a number of undesirable circumstances. It can be a reason to driver discomfort and decrease ride quality. The basic problem in suspension system of car is the ability of the car to move on its suspension to response the road shock. Another problem is weight transfer during braking and acceleration causes pitching movement depending on their direction. These pitching motions lead to steering geometry variations as well as rider discomfort. Next problem is the suspension compression at each end during the action of cornering forces.

1.3 OBJECTIVES

The main objectives in this project is to assess performance of active suspension system in comparison and passive suspension system using quarter car model by implementing Fuzzy and Proportional-Integral-Derivative.

1.4 SCOPES

The scopes of the research are:

(i) Experimental data/result from previous study will be taken as references.
(ii) Find dynamic model of suspension system.
(iii) Find mathematical modelling based on dynamic model.
(iv) Simulation study on dynamic model with various active controls
(v) Applied fuzzy control on the system.
(vi) Comparative study PID and Fuzzy-PID

1.5 ORGANIZATION OF THE PROJECT

This project work towards developing active suspension and passive suspension for quarter car, using MATLAB SIMULINK is presented in five chapters. As the development progress can be divided in to 5 main categories.

The first chapter introduces the suspension system and details the problem statement, objective and scope of this project.

The second chapter reports on the review of literature on passive and active suspension system that inspires the scope of the present report. This chapter also review the controller that will used for simulation such as PID and Fuzzy Logic Controller.

Chapter three proposes a novel method of design of the system in software by using Simulik software. In this chapter the dynamic model of passive suspension will be develop and the mathematical modeling will occurred based on the dynamic model. This mathematical modeling will be used to run the simulation after block diagram for dynamic model is developed.

Chapter four, deals with result and discussion of active suspension system's operation and design. Besides that, performance of each control scheme and comparative study between various control schemes will be discussed.