CHAPTER 1

INTRODUCTION

1.1 Introduction

Ride comfort and road handling have usually been considered the most important factors in evaluating suspension performance. Ride comfort is proportional to the absolute acceleration of the vehicle body, while road handling is linked to the relative displacement between vehicle body and the tires (Eslaminasab, 2008). Most automobile suspension systems consist of a damper, a spring and a set of linkages as shown in Figure 1.1. The three parts of the suspension system are responsible for varying the resultant absolute acceleration and relative displacement. Each of these elements has their own functional purpose within the suspension system; the spring element provides energy storage by providing stiffness, the damping element provides energy dissipation as a function of its damping coefficient, and the linkages provide mechanism constraints on the suspension motion and controls motion.

Figure 1.1 Parts of a typical vehicle suspension system.
Source: http://vr-12.com/5th-international-conference-advanced-suspension-systems/
With the advance of sophisticated electronics in the last few decades, suspension performance has drastically enhanced beyond the traditional capabilities of a passive suspension system (Ebrahimi & Hamesee, 2009). Passive systems are limited in performance and in one way or another must make a compromise between the two properties. This can be modified by equipping a suspension system with sensors, controllers and control algorithms, active changes to the various properties can be made. This thesis will focus and deliver deeper into the design and fabricating of one such system, a semi-active damper.

1.2 Problem Statement

The current absorber cannot be controlled the damping force electronically by the driver, the driver must open the hook or the trunk to adjust the damper manually. Therefore, the electrically controllable semi-active shock absorber is to be developed that makes it possible for the driver to control the damping force at the touch of a button while in the driver's seat. This is accomplished by controlling stepping motors installed on each shock absorber. Because the damping force can be controlled with such ease, the driver can adjust the suspension to suit all road/track conditions. Thus, allowing the driver to adjust the damping to provide a better performance that can describe the actual behavior for interest of both passenger and car.

1.3 Objectives

The objectives of the study are:

1. To develop electronically damping adjustable semi-active absorber for a passenger car.

2. To the test the developed controlled shock absorber on the car to capture the difference in performance compared to the with various adjustment of the damper.

1.4 Thesis Outline

This thesis focuses on the developing and testing of an electronically controllable semi-active suspension system. It includes the design and fabrication of the controller. This process is presented and organized in five chapters, as follows:
Chapter 1 presents a brief introduction on the vehicle suspension system, and defining the objectives.

Chapter 2 introduction on different vehicle suspension types. That is followed with an overview of dampers in vehicle suspension, including a review of the literature on passive and semi-active dampers. Also, discusses some of the background information necessary to understand the function that a damper has in a suspension system. This chapter concludes with a concise summary of damper.

Chapter 3 discusses the design, fabrication, and characterization of the dampers used in this study. It details the basic function and design of the different components of the dampers. The damper characterization methods used in this study are also discussed. And deals with the field testing of the controllable dampers that were presented earlier. It starts with a description of the test vehicle and describes the implementation of the dampers onto the test vehicle along with the addition of the data acquisition systems.

Chapter 4 discusses the data acquired during the field tests that presented in Chapter 3, the processing of the data, and a review of the results of the field test data.

Chapter 5 summarizes the study, the significant findings, and provides recommendations for future studies in this area.

Appendix A explains about the project activities and planning.

Appendix B gives brief explanation on specification of car used for testing the developed damper.

Appendix C discuss on the individual and assembled design of the shock absorber.

Appendix D shows the GPS capture of truck used during testing the developed damper in vehicle.

Appendix E presents the conference paper.