AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING
AUTOMOTIVE DEPARTMENT

PERFORMANCE OF A VEHICLE ADAPTIVE CRUISE CONTROL SYSTEM USING FUZZY LOGIC

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

Master of Science in Mechanical Engineering (Automotive)

Submitted by

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B.Sc. in Mechanical Engineering (Automotive), Ain Shams University, 2010

Supervisors

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CAIRO, 2015

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Date: 21 /11 2015

STATEMENT

This thesis is submitted as a partial fulfilment of Master of Science in Mechanical Engineering, Faculty of Engineering, Ain shams University.

The author carried out the work included in this thesis, and no part of it has been submitted for a degree or a qualification at any other scientific entity.

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SUMMARY

The thesis is concerned with the practical and theoretical evaluation of a vehicle performance equipped with dynamic control to keep safety distance between the vehicle and the other vehicles or obstacles using fuzzy logic and PID controllers.

The thesis contains a simple theoretical model to simulate the dynamic movement at fixed or moving obstacle and control speed of the vehicle by control throttle and brake pedals.

The thesis described both the fuzzy logic and PID logic controllers and how they can be used to control throttle and brake pedals positions in order to control the vehicle's speed.

The thesis includes the sensors, which used for measuring vehicle speed as well as relative speed and distance between the vehicle and frontal obstacle and how such data can transferred to the control unit, which is described also.

The thesis includes the curves of the vehicle acceleration and speed variations with time at different operating conditions and comparison between the theoretical and practical results.

The analysis of the experimental and theoretical results shows the advantages of the active safety system over the passive system. The active system can reduce possible number of accidents by keeping safe distance from leading vehicles using fuzzy logic controller, which have many advantages than other logic controllers for its capabilities of operating at different driving conditions. Finally, the thesis suggests some recommendations for the future studies in the same field.

Key words: Adaptive cruise control, Throttle by wire, Brake by wire, Fuzzy logic, PID logic, modelling and simulation

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Contents

LIST OF FIGURES AND PHOTOS

LIST OF TABLES