ABSTRACT OF PhD THESIS

”THE STUDY OF AUTOMOTIVES DYNAMICS IN CASE OF UNCERTAINTIES”

Author: eng. George ENE
e-mail: ene_george@yahoo.com, tel. 0724809108
Phd supervisor: bg. gen. (r.) univ. prof. eng. Ion COPAE, *PhD*

The paper begins from a practical observation namely that in the study of automotives dynamics appear multiple uncertainties, of different kind. So, there are uncertainties regarding automotives weight values, rolling radius, reduced mass coefficient, rolling resistance, aerodynamic coefficient, frontal area etc; experimentally speaking, there are uncertainties regarding the precisely complying of same conditions of tests through repeating and equipment precision.

In chapter 1 there are presented a synthesis of the approached topic and main objectives of PhD thesis. There were highlighted the concepts and algorithms specific to dynamics approach in case of uncertainties and there were defined the main 11 objectives of thesis. It is highlighted the necessity of using new algorithms from interval analysis to solve differential equation with intervals and there are presented paper’s characteristics in comparison with the approaches from specialty literature.

Chapter 2 is intended to experimental research, which can allow a database with functional parameters and which can cover main practice encountered situations in case of normal driving, with normal driving style. There were presented the purposes during experiments, methodology, the used equipment and software for the acquisition and data process. Field experiments were conducted with a Ford Focus automotive equipped with electronic control Diesel engine, being held 70 significant experimental samples.

It was made an experimental data statistical processing for the purpose of establishing dynamics and fuel saving performances of tested automotive. There were highlighted some characteristics and functional dependencies of the electronic control Diesel engine and it was proven that experimental data do not submit to distribution laws known from statistics, with implications on subsequent approaches.

Chapter 3 presents the study of automotives dynamics in case of experimental uncertainties. There are presented main uncertainties which appear in the study of automotives dynamics, with a proper classification and multiple examples. There are shown main aspects regarding uncertainty theory, a quite new branch of mathematics complementary to probability theory which targets human uncertainties and it is presented an example of adhesion coefficient establishment for a certain rolling track. There are emphasized the interior and international regulations regarding experimental uncertainties, which are considered to submit Gauss normal distribution law and there are estimated the values of functional parameters according to those regulations.

In chapter 4 it is presented the study of automotives dynamics in case of parametric uncertainties. There are presented basic elements of interval analysis and of solving differential equation with intervals. There are estimated parameters values in case of parametric uncertainties, both for the mathematical model of classical dynamics and models obtained through analysis based on experimental data obtained from tests.

Chapter 5 is intended to probabilistic study of automotives dynamics in case of uncertainties. It is highlighted the necessity to approach dynamics from a probabilistic point of view by using Dempster-Shafer structures and bootstrap algorithms. There are estimated values of functional parameters in case of uncertainties, based on experimental data obtained from tests.

Chapter 6 presents general conclusions and main contributions brought in the theoretical and experimental study of automotives dynamics in case of uncertainties. There are highlighted some openings offered by the PhD thesis. It is highlighted the dissemination of research results and it is presented the list of the 21 papers published during doctoral preparation.