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TRAFFIC ACCIDENTS USING LOGISTIC REGRESSION IN FORMATIVE EFFECTIVE VARIABLES AND PREVENTIVE MEASURES

Kandukuru[1]Jagan Mohan Reddy *[1] Asst professor, M.Durga[2] Asst Professor & V.Seerisha[3] Asst Professor

Dept. Of Civil Engineering, Noida International University- U.P., INDIA

ABSTRACT

This research was conducted to determine the important influential variables upon the deaths from road traffic accidents and effect of each of those upon the studied phenomenon through applying logistic regression model. The maximum likelihood method was used to estimate parameters to determine the explanatory variables effect. Wald test was used to determine the significance of the explanatory variables. The data set used in this research consists of a sample of (212) observations and was obtained from the records of the directorate traffic- Garmian. The accident victims is response variable in this study and it is a dichotomous variable with two categories. The study led to a number of conclusions, among them; logistic regression models fit such data, three explanatory variables were found most significantly associated to accident victims response variable namely; high speed, car type, and location. Road accidents are one of the main causes of deaths worldwide. About half a million people are killed in road related crashes every year throughout the world. The probability of an accident occurring is influenced by numerous factors like roadway geometric characteristics, vehicle characteristics, pavement conditions and weather conditions each of these factors contribute its own share towards occurrence of accidents. This paper discusses the influence of various factors on accident caution based on statistical package Regression Analysis collected from the most accident prone stretch, Ayalurmetta to Thammarajupalli (30KM) in Andhra Pradesh on NH18 and from the results of the analysis, it can be concluded that this National Highway section needs improvement from safety point of view. A large number of accidents have been occurring over such a small section of 15 km length. Proper traffic guidance and control system to guide road users ensuring safe movement of vehicles has been recommended and some of the facilities such as pedestrian crossings and median openings, acceleration and deceleration lanes were re-designed in order to improve the safety of the road and minimize the accidents.

Keywords: Traffic accident, logistic regression model, maximum likelihood estimation, Wald's test.

I. INTRODUCTION

The problem of deaths and injury as a result of road accidents is now acknowledged to be a global phenomenon with authorities in virtually all countries of the world concerned about the growth in the number of people killed and seriously injured on the road. The word report on road traffic accident prevention has indicated the worldwide, an estimated 1.2 million people died in road traffic accident each year and as many as 50 million are being injured [3][6]. The logistic growth function was first proposed as a tool for use in demographic studies by Verhulst (1838, 1845) and was given its present name by reed and Berkson (1929). The function was also applied as a growth model in biology by Pearl and Reed (1924) [7]. Logistic regression is firstly developed by statistician.

D. R. Cox in 1958 as a statistical method, and after that it is used widely in many fields, including the medical and social sciences [12]. Logistic regression is used for prediction by fitting data to the logistic curve. It requires the fitted model to be compatible with the data. In logistic regression, the variables are binary or multinomial. Gordon (1974) pointed out that logistic regression models have plays a major role in biological and medical applications where cross- classified tables with large numbers of cells are typically replaced by a logistic or log- linear relationship among the variables, thus obviating the need for the table[14]. Logistic regression was first proposed in the 1970s as an alternative technique to overcome limitations of ordinary least square regression in handling dichotomous outcomes. It became available in statistical packages in the early 1980s [10]. For logistic regression, least squares estimation is not capable of producing minimum variance unbiased estimators for the actual parameters. In its place, maximum likelihood estimation is used to solve for the parameters that best fit the data [15].

An analytical approach for LQR design for improving damping performance of multi-machine power system

Sreenivas Uravakonda[1], Vijaya Kumar Mallapu[2], Venkateswara Reddy Annapu Reddy[3]
[1]Department of Electrical and Electronics Engineering, Faculty of Engineering, Srinivasa Ramanujan Institute of Technology, Rotarypuram, Jawaharlal Nehru Technological University, Anantapur, India
[2]Department of Electrical and Electronics Engineering, Faculty of Engineering, Jawaharlal Nehru Technological University, Anantapur, India
[3]Department of Electrical and Electronics Engineering, Faculty of Engineering, Sai Rajeswari Institute of Technology, Proddatur, Jawaharlal Nehru Technological University, Anantapur, India

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ABSTRACT

In a multi-machine environment, the inter-area low-frequency oscillations induced due to small perturbation(s) has a significant adverse effect on the maximum limit of power transfer capacity of power system. Conventionally, to address this issue, power systems were equipped with lead-lag power system stabilizers (CPSS) for damping oscillations of low-frequency. In recent years the research was directed towards optimal control theory to design an optimal linear-quadratic-regultor (LQR) for stabilizing power system against the small perturbation(s). The optimal control theory provides a systematic way to design an optimal LQR with sufficient stability margins. Hence, LQR provides an improved level of performance than CPSS over broad-range of operating conditions. The process of designing of optimal LQR involves optimization of associated state (Q) and control (R) weights. This paper presents an analytical approach (AA) to design an optimal LQR by deriving algebraic equations for evaluating optimal elements for weight matrix 'Q'. The performance of the proposed LQR is studied on an IEEE test system comprising 4-generators and 10-busbars.

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Corresponding Author:

Sreenivas Uravakonda
Department of Electrical and Electronics Engineering, Faculty of Engineering
Srinivasa Ramanujan Institute of Technology, Rotarypuram, Jawaharlal Nehru Technological University
Anantapur, Ananthapuramu, Andhra Pradesh, India
Email: uravakonda.sreenivas@gmail.com

1. INTRODUCTION

To enhance the damping performance of an electrical power system against small disturbance(s), an excitation-based power system stabilizer (CPSS) is extensively used around the world. Although the CPSSs have been used widely for satisfactorily damping local-mode low-frequency oscillations, the outcome of CPSS may not be the best possible because of the intuitive nature of the tuning process and restrictive assumptions made. Later, the research was directed towards optimal control theory to develop an optimal state-variable feedback gain controller i.e. linear-quadratic-regultor (LQR) for stabilizing power systems against small perturbation(s). Consequently, reports [1]-[10] have appeared in the literature concerning the application of optimal LQR for stabilizing power systems.

In the referred papers [1]-[10], the design of LQR is based on the following sequential process: i) The control (R) and state (Q) weights are chosen as diagonal matrices; ii) The state weighing matrix Q is assigned numerical values arbitrarily by an iterative procedure; iii) Optimal LQR is determined; and