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Development of a Mathematical Model using Correlation Regression Analysis on Traffic Management at Major Junctions in City

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Abstract:*This paper presents development of mathematical model and traffic management for critical junctions in city. In this research correlation and regression model are developed by knowing the factors causing traffic congestion. Initially, traffic at a junction during peak hours is counted and the factors causing congestion are found out. All the factors are rated on a scale of 1-6. These factors are then rated by the effect they do on congestion. Then, with the help of SPSS Software by IBM Correlation and Regression models are developed by taking these rating as input.The correlation coefficient gives the relation between the combination of factors affecting congestion.The regression coefficients by regression model, gives us the equation by which congestion value at any junction having same factors can be calculated.We have also suggested some remedial measures to reduce traffic congestion at these junctions.*

Keywords:*Correlation, Regression, Traffic congestion, Mathematical model*

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I. Introduction

Representation of traffic flows is an essential adjunct to both urban and non-urban planning. Beingimportant working tools for governments and consultants, traffic models have received a great deal ofattention from academic and other analysts. Traffic flow may be treated as a fluid, without considering theindividual elements, or individual vehicles may be modelled. It is necessary for some junctions to realise, design, implement and use traffic control system.In order to determine a viable model of calculus for traffic cycle, intersection geometry, traffic volumes and arrival models must be taken into consideration.

The term correlation refers to the relation between elements while the term regression is used for formulating an equation.

1.1 Nature of problem

The first task in modelling traffic on a networkis to identify the reasonable routes, which do not backtrack, between each origin anddestination and to identify the shortest (in terms of travel time). To develop a mathematical model on traffic management for major junctions in a city or the smooth traffic flow in the city.

II. Methodology

2.1 Mathematical model

A mathematical model is a description of a system using mathematical concepts andlanguage. The process of developing a mathematical model is termed as MathematicalModelling. A mathematical model may help to explain a system and study the effects of different components, and to make predictions about behaviour Mathematical models can take many forums, including dynamic systems, statistical
model, differential equations, or theoretic models.

- Correlation model
- Regression model

2.2Correlation and Regression model

- Simple regression is used to examine the relationship between one dependant and one independent variable.
- After performing an analysis, the regression statistics can be used to predict the dependant variable when the independent variable is known.

III. Analysis using Correlation and Regression

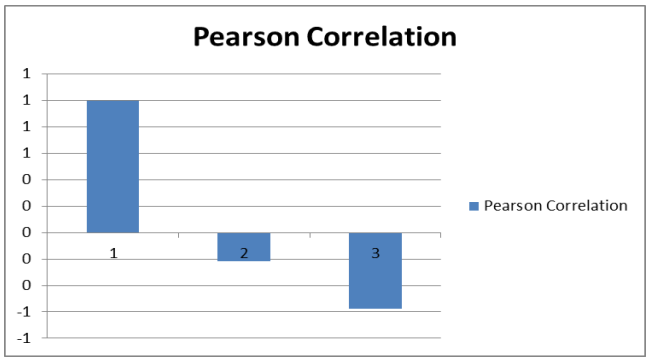
In this section of the paper we use as explanatory bivariate correlation and linear method regression analysis to analyze correlations between variables. This can be done by knowing the ratings and then using bivariate correlation analysis in SPSS software. We have shown linear regression analysis table as a sample reading.

Abbreviations:- CON- Traffic congestion, WOR- Width of Road, Parking- Illegal Parking

FACTORS CAUSING TRAFFIC CONGESTION	
LIST OF FACTORS	JUNCTION
Width of Roads	3
Illegal parking	2.5

3.1 Bivariate Correlation

		9CON	1WOR	2Parking
9CON	Pearson Correlation	1	-0.217	-0.577
	Sig. (2-tailed)		0.861	0.609
	N	3	3	3
1WOR	Pearson Correlation	-0.217	1	0.923
	Sig. (2-tailed)	0.861		0.252
	N	3	3	3
2Parking	Pearson Correlation	-0.577	0.923	1
	Sig. (2-tailed)	0.609	0.252	
	N	3	3	3



Graph-Correlation If Congestion is constant

Similarly one can proceed with various graphs and can find the correlation between 'n' number of factors.

3.2 Linear Regression

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.514	0.000			
	1WOR	0.514	0.000	2.118		
	2Parking	-0.743	0.000	-2.531		
a. Dependent Variable: CON						

	1WOR	2Parking
R1	0.514	
R2		-0.743

Y = C1X1 + C2X2
Y = 0.514X1 - 0.743X2
Y = (0.514*3)-(0.743*2.5)
X1= Rating of factor-Width of roads
X2= Rating of factor- Illegal parking

Considering the rating according to the judgemental basis from person to person, you can find out the dependent variable 'Y'.

IV. Conclusion

4.1 Conclusion on Correlation analysis

Based on values of correlation coefficients negative (-ve) values ofcoefficient indicate indirect effect on dependent variable (which is congestion). Thenegative (-ve) value means inverse relation with dependent variable.

Similarly positive (+ve) sign of coefficient of correlation for any variable indicates directrelationship with depending variable.

4.2 Conclusion on Regression analysis

The ratings given based on scale of 1 to 6 are inserted in the equation and value of "Y" can be directly obtained for any junction with same parameters.

4.3 Generalised conclusion

The value ofdependent variable, which is the deciding factor for suggesting remedial measures to reduce problem.

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