Volume 3, Issue 3, March-2016, pp. 143-148 ISSN (O): 2349-7084

International Journal of Computer Engineering In Research Trends

Available online at: www.ijcert.org

Weighing Parameters and Analysis of Congestion using Markov Chain Model

[1]Nimma Mukesh Raghavendra,[2]Avinash Poojari

[1,2]M-tech in Urban Transportation, *Jawaharlal Nehru Technological University (Autonomous)*

mukeshjntuh@gmail.com,avinashPoojari123@gmail.com

Abstract: Markov chain (discrete-time Markov chain named after Andrey Markov, is a random process that undergoes transitions from one state to another on a state space. It must possess a property that is usually characterized as "memorylessness": the probability distribution of the next state depends only on the current state and not on the sequence of events that preceded it. This specific kind of "memorylessness" is called the Markov property. Here the parameters are land use, road inventory, traffic characteristic and pedestrian. These parameters are enhancing the travel time of the road user because of not reaching the standards. These parameters helps to identify the gap .Linear equation helps to quantile measure of delay and encounter by meeting the needs of the user by standards to provide LOS A.

Keywords: - Delay free, Pollution Free, LOS A.

1. GENERAL

Road user is likely to use the roads which are less in travel time on even though it is lengthy road. In india, Especially, Hyderabad the roads look like chopped from a node to node. At here author has taken four study areas i.e., Ameerpet, Begumpat, Nampally, liberty. It describes road network dynamics starting from a strong mathematical background based on Markov chain theory. This paper further exploits the same Markov chain framework to derive new tools to support and improve road transport. Smart routing of traffic is seen as a major enabler of reduced carbon transport, reduced congestion, and as a tool to increase the range of electric vehicles. It enables a more efficient use of the road network, and it can be used proactively to avoid pollution peaks in certain urban areas. Nowadays a lot of road information is collected in large databases like arc gis and google to encounter the congestion growth. This paper weighs the road geometrics and land use which are primary Cause for congestion growth in order to provide LOS A for better enhancement of free flow.

2. OBJECTIVES

- Weighing parameters individually.
- Identifying the malfunction.
- Identifying the probability of road user's interest.
- Quantifiable measure of congestion growth
- Identify the malfunctions of the road which is causing congestion delay and bottle necks.
- Identifying land use of the study areas.
- Finding the gap between observed and recommendation.

3. STUDY AREAS

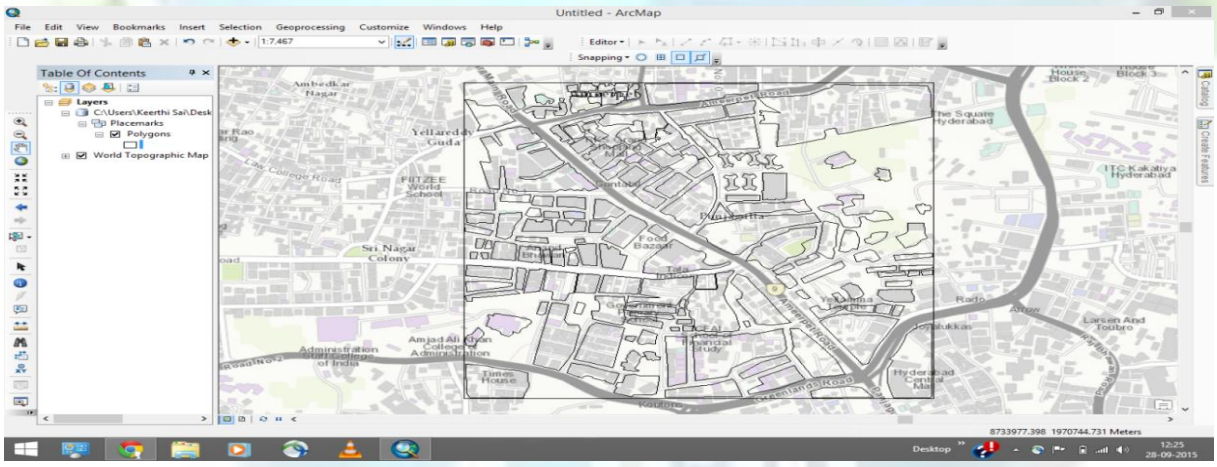
In urban areas the congestions are observed mainly in arterial roads, which are also known as express ways and highways. The land use areas selected are Nampally, Begumpet, Himayat nagar, Ameerpet. The selected arterial roads areThe reason for choosing these arterial roads is of the stretches are lying in national highway. They are ameerpet, nampally .Their respective land use is changed over space and carries heavy traffic and public transits.The himayat nagar road is selected for the reason it is slightly different from the national highway and it carries more number of private modes and the intensity of public transit is less.

4. METHODOLOGY

Markov chain model helps us to identify the probability of getting chance from one state to anthor state. Due to the surroundings conditions and narrow space, some spots look like bottle neck approach. This will influence the road user to avoid that state. For that author has taken 4 study areas and collected road geometrics, volume, pedestrian cross walk and land use. these parameters are given in markov chain model and identified probability and influence from one state to all state from each and every parameter. And these values are fitted in to matrix cells and iterated number of times up to it gains equilibrium stage. And these values given in to linear equation so that we can able to measure the congestion and delay growth over the corridors.

5. ANALYSIS

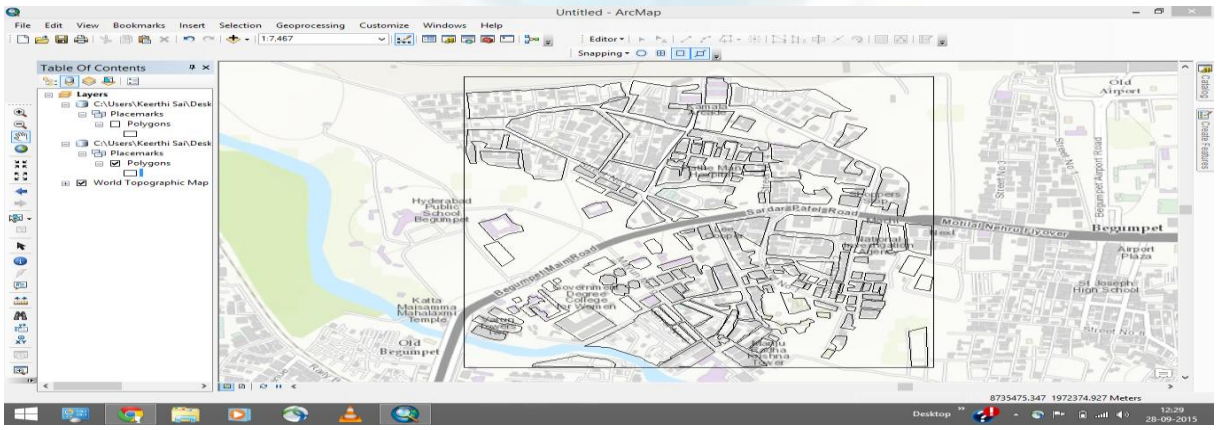
i. AMEERPET



LAND USE :- 56%

Figure 1 :- IDENTIFYING THE LAND USE IN AMEERPET USING ARC-GIS DIGITIZATION.

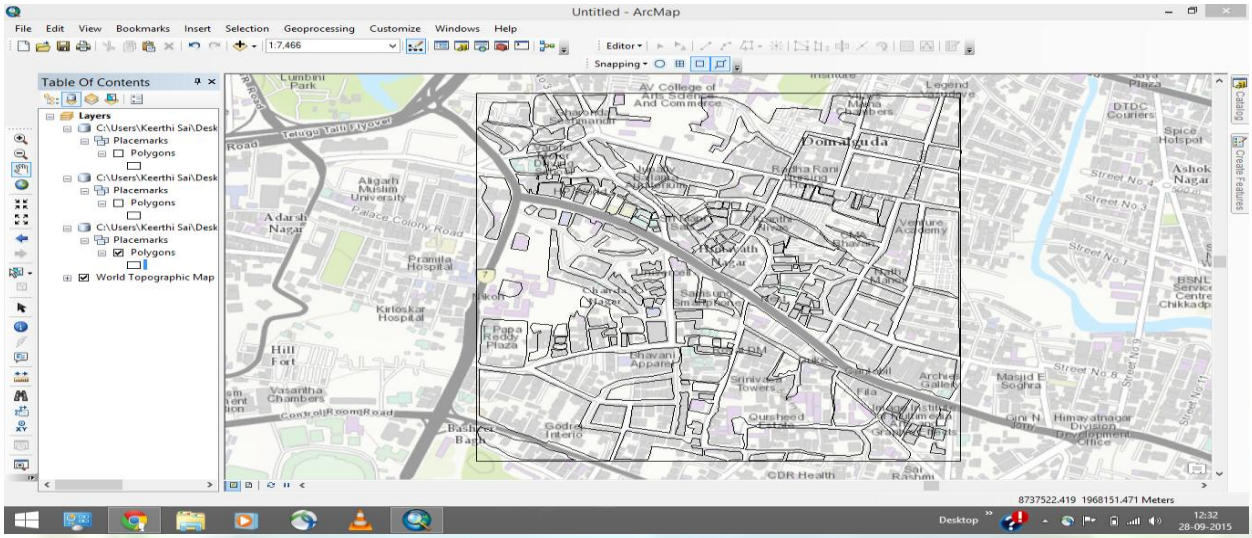
ii. BEGUMPET



LAND USE: 42.14%

Figure 2:- IDENTIFYING THE LAND USE IN BEGUMPET USING ARC-GIS DIGITIZATION.

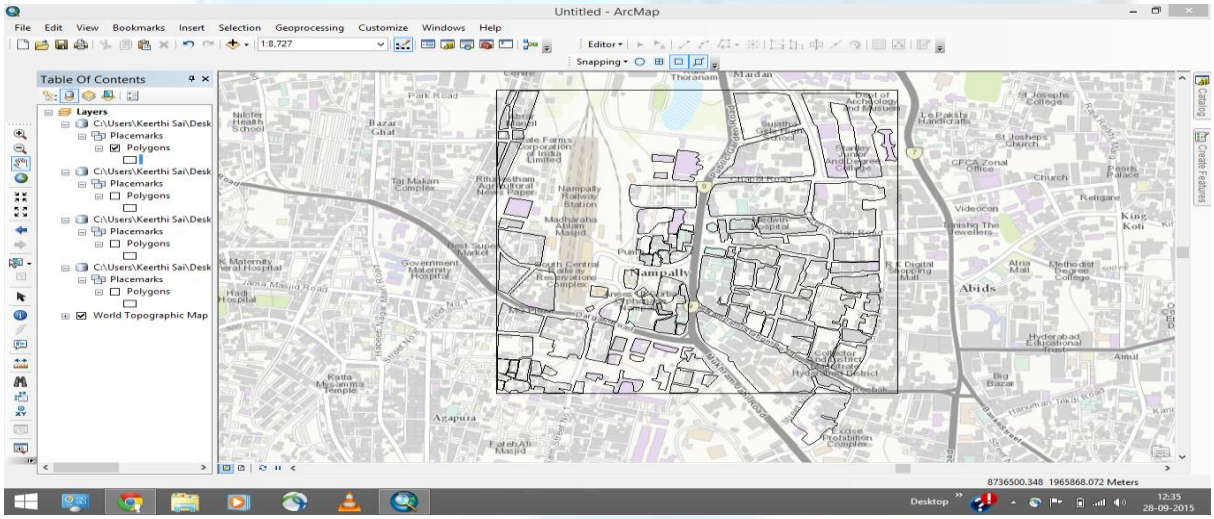
iii. HIMAYATH NAGAR



LAND USE: 61.96%

Figure 3:- IDENTIFYING THE LAND USE IN HIMAYATH NAGAR USING ARC-GIS DIGITIZATION.

iv. NAMPALLY



LAND USE: 48.46%

Figure 4:- IDENTIFYING THE LAND USE IN NAMPALLY USING ARC GIS DIGITIZATION.

5.1 IDENTIFYING THE GAP

Gap was identified by the observing reality (in-situ) to the standard.

Considered parameters are 1) land use

2) Road geometrics

3) Volume

4) Pedestrian

i) Ameerpet

IN-SITU	INSITU/IRC	IRC
52.06	0.52	100
41.832	0.76	55
6330	0.879	7200
2.936	0.734	4

TABLE 1:- IDENTIFYING THE GAP BETWEEN PARAMETERS BY IN-SITU/IRC

ii) Nampally

IN-SITU	INSITU/IRC	IRC
48.46	0.48	100
30.86	0.561	55
8808	1.22	7200
5.28	1.38	4

TABLE 2:- IDENTIFYING THE GAP BETWEEN PARAMETERS BY IN-SITU/IRC

iii) Begumept

IN-SITU	INSITU/IRC	IRC
61.96	0.61	100
28.65	0.52	55
7140	0.991	7200
3.672	0.918	4

TABLE 3:- IDENTIFYING THE GAP BETWEEN PARAMETERS BY IN-SITU/IRC

iv) Himayth nagar

IN-SITU	INSITU/IRC	IRC
42.14	0.42	100
40.136	0.72	55
10980	1.52	7200
6.1	1.525	4

TABLE 4:- IDENTIFYING THE GAP BETWEEN PARAMETERS BY IN-SITU/IRC

5.2 Markov chain Probability

5.2.1 Transitional probability of parameters in Ameerpet

0	4/8	1/8	3/8
4/8	0	1/8	3/8
1/3	1/3	0	1/3
3/8	4/8	1/8	0

Table 5:- Probability at the very beginning

0.28	0.31	0.1	0.26
0.28	0.31	0.1	0.26
0.28	0.31	0.1	0.26
0.28	0.31	0.1	0.26

Table 5.1. Results after 20 iterations

5.2.2 Transitional probability of parameters in Begumpet

1/8	0	2/8	5/8
2/8	0	2/8	4/8
2/8	0	2/8	4/8
1/8	0	2/8	5/8

Table 6:- Probability at beginning

0.15625	0	0.25	0.59375
0.15625	0	0.25	0.59375
0.15625	0	0.25	0.59375
0.15625	0	0.25	0.59375

Table 6.1:- Results after 2 iteration

5.2.3 Transitional probability of parameters in Nampally

2/8	0	2/8	4/8
3/8	0	2/8	3/8
3/8	0	2/8	3/8
1/8	0	1/8	6/8

Table 6:- Results at the very beginning

0.1914	0	0.1702	0.6382
0.1914	0	0.1702	0.6382
0.1914	0	0.1702	0.6382
0.1914	0	0.1702	0.6382

Table 6.1:-Results after 11 iterations

5.2.4 Transitional probability of parameters in Himayath Nagar

2/8	0	2/8	4/8
2/8	1/8	2/8	3/8
2/8	1/8	2/8	3/8
2/8	1/8	2/8	3/8

Table 7:- Results at the very beginning

0.25	0.09375	0.25	0.40625
0.25	0.09375	0.25	0.40625
0.25	0.09375	0.25	0.40625
0.25	0.09375	0.25	0.40625

Table 7.1:-Results after 2 iterations

6. LINEAR EQUATION

A **linear equation** is an algebraic equation in which each term is either a constant or the product of a constant and (the first power of) a single variable. Here the linear equation helps us to identify the congestion growth over the corridors. So that we can able to plan the corridor development based on these values. Here the considered parameters are infrastructure for each road, road characteristics, supportive infrastructure and pedestrian area.

- $Y = -550x_0 + 455x_1 + 203x_2 + 263x_3$
- $76 = a_0*0.28 + a_1*0.31 + a_2*0.1 + a_3*0.26$
- $97.5 = a_0*0.1914 + a_1*0 + a_2*0.1702 + a_3 0.6382$
- $72 = a_0*0.15625 + a_1*0 + a_2*0.25 + a_3*0.59375$
- $63.1 = a_0*0.25 + a_1*0.09375 + a_2*0.25 + a_3*0.40625$
- $84 = a_0*0.0.2210 + a_1*0.1119 + a_2*0.19255 + a_3*0.47455$

In x we can put the gap i.e., the reality/IRC(recommended).so that we can able to identify the congestion growth over the four corridors

7. CONCLUSION

The study of congestion study is directed towards the quality of road parameters in the prospect of road user using markov chain probabilistic model and the delays are calculated using the linear equation modeling by using the factors like markovian probability values like traffic characteristics, land use, road geometrics, and pedestrian facility.

- The ratio of volume and capacity is more than the limit. The relation between these two factors is not symmetric hence the demand is more from the road users than the supply required.
- Relation between the road geometric factors is poor with each other. When all the infrastructure factors are good with each other in terms of quality and quantity the road user will decide to choose any factor. But to lack of

that relation the impact is taken completely by carriage way.

- Heavy frontage shopping malls. The residential buildings are observed in sub arterial and collector roads. The land use in the arterial roads is mainly used by commercial complexes. This commercial land use is attracting more trips and population. Due to this the on road parking policies are increasing.
- Poor public transport facilities. During peak hours the public transport vehicle are seen overloaded i.e. carrying people more than its capacity. Due to which many of the transit users shift their mode to private transportation. The public transit users wait for the buses on the carriage way which is creating bottle neck effect.

REFERENCES

1) Constantinos Antoniou .et.al (2007) "Traffic state prediction using Markov chain models" Proceedings of the European Control Conference 2007,Kos, Greece, July 2-5, 2007
2) Ortiz-Garcia, J. J., S. B. Costello, and M. S. Snaith. Derivation of Transition Probability Matrices for Pavement Deterioration Modeling. Journal of Transportation Engineering, Vol. 132, No. 2, pp. 141-161, February 1, 2006.
3) Scherer, W. T., and D. M. Glagola. Markovian models for bridge maintenance management. Journal of Transportation Engineering, Vol. 120, No. 1, pp. 37-51, January/February, 1994.
4) Geroliminis N., Skabardonis A., 2005, "Prediction of arrival profiles and queue lengths along signalized arterials using a Markov decision process" Transportation Research Record, 1934, 116-124.
5) O.T. Olaleye .et.al (2009) "A Markov Chain Approach to the Dynamics of Vehicular Traffic Characteristics in Abeokuta Metropolis" Research Journals of Applied Sciences, Engineering and Technology 1(3): 160-166, 2009 ISSN: 2040-7467.
6) A Text Book on MARKOV CHAINS and DECISION PROCESSES for ENGINEERS and MANAGERS by Theodore J. Sheskin.
7) Whittaker, J., Garside, S., and Lindveld, K. (1997). "Tracking and predicting a network traffic process." Int. J. Forecast., 13(1), 51–61.
8) Yu, G., Hu, J. M., Zhang, C. S., Zhuang, L. K., and Song, J. Y. (2003)."Short term traffic flow forecasting based on Markov chain model."Proc., IEEE Intelligent Vehicles Symp., Columbus, OH, 208–212.
9) Medhi, J. (2003) Stochastic Models in Queueing Theory. 2nd Edition, Esevier Inc., Berlin.

