MULTIMODAL TRANSPORTATION SYSTEM WITH ARC-GIS

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ABSTRACT

People move within an urban usually happens from origin to destination. For that reason, when studying, transportation system which has many modes of public transport but one should look to it as multimodal transportation system with relations and dynamics between its components. In order to do any study related to transportation a model showing the multimodal system is needs. The research is to develop an ArcGIS data model for a multimodal transportation system combining each mode in transport network planning. For that reason, when studying, analyzing transportation systems one should not consider each mode of transport separately but one should look to it as multimodal transportation system with relations and dynamics between its components. Now what we have done in this paper is that we have used the Arc GIS to create a multimodal transportation system. With this information we can find the exact location of any destination.

Keywords: *Arc GIS, Multimodal transport, Geometry of Surface, traffic volume flow, GIS, etc.*

1. INTRODUCTION

The multimodal transportation is a kind of transportation within the city passenger move from start to end, also called multimodal transport, it has more than two modes of transportation in start to end journey. Multimodal transport is often used together for various transportation modes. A goal of new multimodal passenger transport is to reduce major traffic from the roads and increase use of public transport. To help the traveler various multimodal journey planners such software has been use to help travelers to think and schedule their trip. .Multimodal transport concentrates on type of Road, Rail & Metro which high-speed options (i.e. city bus, auto rickshaw, or tricycle) are used at the start or end of the movement.[1] Trains offer early transit from a rural into an urban area, where peoples can use a way to complete their trip. Most transportation modes have always been used multi transport; for example, people have used road or urban railway to an airport or inter-regional railway station.

2. LITERATURE SURVEY

A study refers to design multi-modes of the transport system which is also used to investigate the aftermath of multimodal travelling for the design of multimodal transport networks. It should have good multimodal

transport system requires the best transport modal or transport networks; which can help for finding the routes to reach the destination. A separate entity is used for each mode route in which modes are physically separated from each other. This concept of ArcGIS have been used for the city having bus, train, cycling and walking mode in find a route over a multi transport network using more than two modes of combinations that we can reduce the cost of move [3]. Fixed-schedule and demand-responsive transport modes which is to be used a traveling worker or traveling person to give an information system which is based on minimum cost related to time and other constraints. The main planning procedures being a high-level request send to the system procedure to handle such multi transport journeys [4]. A study deals with to design multimodal transport which deals with investigated the consequence of multimodal travelling for the design of multimodal transport networks. It should have good multimodal transport system requires the best transport modal or transport networks; which can sort out the routes which are to be utilize to reach the destination.

This concept applied in Arc GIS has been used for Enshede city having bus, train, cycling and walking mode in find a route over a multi transport network using more than two modes of combinations that we can reduce the cost of move [3]. Both fixed-schedule and demand-responsive transport modes into a traveler information system based on "least possible cost" subject to time window and other constraints. The main planning procedures being a high-level request send to the system procedure to handle such multi transport journeys

3. STUDY AREA:

Nagpur is the largest city of the India in state of Maharashtra after Mumbai and Pune. It is the 13th largest urban city in India and the largest city in Vidharbha Region.

Area: 217.6 km^2

Population: 2.052 million (2001)

The latitude of Nagpur, India is 21.146633, and the longitude is 79.088860.

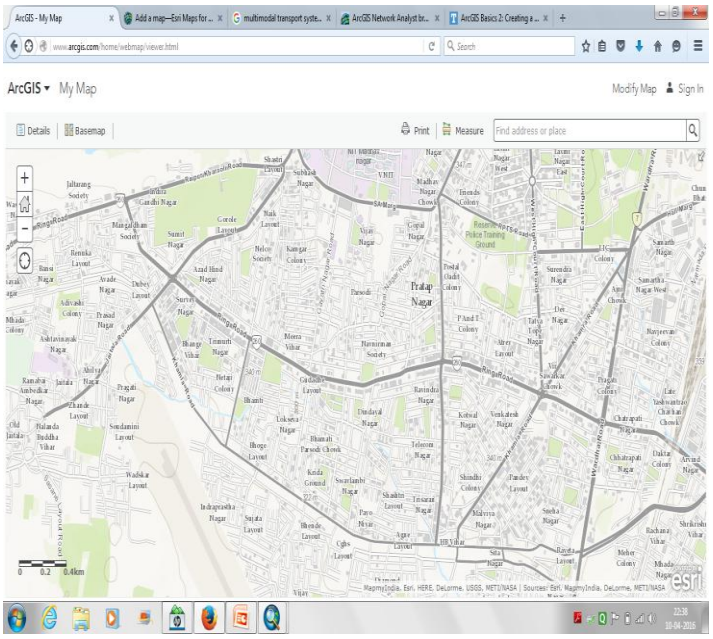

Fig-1: Study Area

3.1 Peak hour volume

Peak Hour Factor:

PHF = Peak hour volume/ (6*Peak fifteen minute volume)

Table 1: Flow of vehicles during morning hours per 10 min

From	To	Flow of Vehicles / 10 min
5:00	5:10	130
5:10	5:20	123
5:20	5:30	117
5:30	5:40	116
5:40	5:50	126
5:50	6:00	113
6:00	6:10	103
6:10	6:20	105
6:20	6:30	113
6:30	6:40	110
6:40	6:50	116
6:50	6:00	109

3.2 Traffic Flow Data

Table 2: Flow of traffic during evening hours per 10 min

From	To	Flow of Vehicles / 10 min
9:00	9:10	112
9:10	9:20	145
9:20	9:30	121
9:30	9:40	115
9:40	9:50	123
9:50	10:00	122
10:00	10:10	136
10:10	10:20	130
10:20	10:30	124
10:30	10:40	122
10:40	10:50	124
10:50	11:00	124

3.3 Vehicle Speed Data

Table 3: Vehicles Mean Speed values using speedometer

Sr. No.	Intersections	Delay calculated By HCM 2000 (Veh/Sec)	Delay calculated By TSIS (Veh/Sec)	Delay calculated by HCS (Veh/Sec)
1	Chatrapati sq.	41.3	40.1	42.6
2	Aath Rasta sq.	40.6	39.2	41.8
3	Pratap nagar sq.	22.6	17.8	24.5
4	Padoole sq.	29.2	20.4	30.4
5	Shambhaji sq.	47.6	46.9	49.6
6	Trimurti sq.	39.5	38.8	37.8
7	Shri Mangalmurtisq.	38.4	38.6	39.5

3.4 Signal Timings & Delay

Table- 4 Variation of control delay for morning peak hour of different intersection (9.00am-11.00am)

Places	Car	3 wheeler	2 wheeler	LCV	HCV
From Chatrapati sq.	16.32	12.67	14.67	10.00	8.40
From Orange City	25.74	18.25	30.27	14.88	10.09
From Pratap Nagar	36.11	30.68	40.75	18.50	14.88
From padoole Sq.	26.67	13.98	22.12	12.57	8.38
From Shambhaji Sq.	28.11	18.77	39.52	15.67	15.66
From Trimurty Sq.	37.41	28.77	41.9	19.57	12.66
From Shri Mangal Murty Sq.	38.11	29.52	36.97	15.7	9.55
Hingna T-Point	19.93	16.4	24.97	9.68	6.12
Mean speed u_t	28.55	21.13	31.40	14.57	10.72

3.6 Fuel Consumption

Fuel consumption is measured in lit/In this we have to calculate the below mention parameters to calculate the fuel consumption.

Delay $d = \frac{c(1-\lambda^2)}{2(1-\lambda X)} + \frac{X^2}{2q(1-X)} - 0.65(\frac{c}{q^2})X^{(2+5\lambda)}$

Stops $p_s = \frac{rs}{c(s-v)}$

Various formulas for calculating delay due to Excess fuel consumption:

Excess fuel consumption is computed from the percentage of stops as follows $E_s = \alpha \, v \, p_s$

Excess fuel consumption due to delay, E_d, is $E_d = \beta \, v \, d/3600$

Consumption of excess fuel $E = E_s + E_d$

Fuel consumption Data

Table5: fuel consumption per vehicle in traffic

Intersections	Fuel Consumptions (liter/hr)/per vehicle			
	Two Wheeler	Four Wheeler	LMV	HMV
Hingna T-point	3×10^{-3}	10×10^{-3}	13×10^{-3}	14×10^{-3}
Shree Mangalmurti Sq.	4×10^{-3}	12×10^{-3}	15×10^{-3}	17×10^{-3}
Trimurtee Sq.	5×10^{-3}	15×10^{-3}	19×10^{-3}	21×10^{-3}
Shambhaji Sq.	4×10^{-3}	14×10^{-3}	18×10^{-3}	20×10^{-3}
Padoole Sq.	4×10^{-3}	12×10^{-3}	15×10^{-3}	17×10^{-3}
Pratap nagar Sq.	5×10^{-3}	16×10^{-3}	19×10^{-3}	22×10^{-3}
Aath Rasta Sq.	6×10^{-3}	0.020	0.025	0.028
Chatrapati sq.	4×10^{-3}	0.013	0.016	0.019

4. METHOD USED

The (GIS) Geographic information system is used for to show in maps. With the help of these map we can show the below services.

4.1 Handiest facility:

Handiest facility deals with the facilities closest in the route. It's a service which provides the data regarding the nearest facilities available.

4.2 Service area:

The facility provided by the service area parameter provides the data of the particular area which we have to pass through. It gives the proper direction according to route and destination.

4.3 Traffic:

Traffic volume is an important parameter considered in measuring the volumetric data of traffic. It is useful in arc GIS system to give proper direction calculating the traffic data.

4.4 Location Allocation

- Determine the best location for a facility, based on demand conditions
- Choose from many different analysis types
- Limit the capacity of facilities
- Analyze for different times of day

4.5 Routes:

From Chatrapati sq. to Hingna T-point

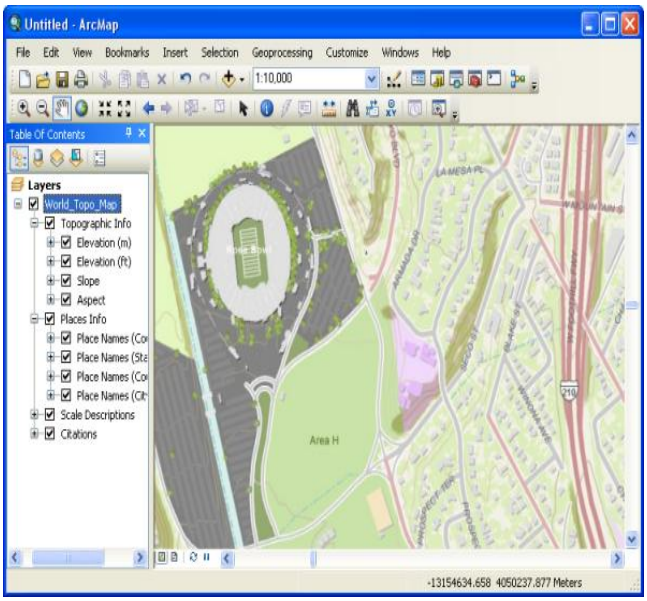

Fig-2 Showing Location

5. CONCLUSION

1. In actual practice, several modes of other combination may be used depends upon the routes geometry, trans-shipment points and the availability, of different modes of transport. New infrastructural developments are being proposed the seamless flow of traffic. As these projects have become reality so the flow of traffic moves smoothly.

2. Multimodal transport officer should have the knowledge and skill to organize the transportation of goods through different modes of transport. He should be aware of what is happening in the areas of technological development, political stability of countries, congestion of routes or mergers of operators. The Multimodal transport officer should have this

information because he arranges with the trucking company, railways, shipping lines and other transport operators to transport the goods from one place to another within the shortest time which may not necessary be the most direct. Since the function of the MTO arises out of the needs of the shipper, he must be able to offer a service which covers a wide geographical area.

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