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ИССЛЕДОВАНИЕ ВРЕМЕНИ ЗАДЕРЖКИ В ТРАНСПОРТНОЙ СИСТЕМЕ ГОРОДА ТЕГЕРАН (НА ПРИМЕРЕ ПРЕДЛОЖЕННЫХ МОДЕЛЕЙ)

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Ключевые слова: время ожидания транспорта, система транзита, город Тегеран, модели.

Аннотация. Из-за задержки автобусов, следующих в Тегеран из сельской местности, снижается коэффициент полезного действия системы общественного транспорта. В данной статье сделана попытка выявления основных причин указанной проблемы. Для каждого автобусного маршрута (всего 12) была составлена выборка. Были выявлены условия функционирования общественного транспорта, также и для частных транспортных средств на тех же самых автобусных линиях, в частности, было определено распределение бюджета времени, в том числе такие показатели, как время и место задержки транспорта, время ожидания, зарегистрированное и проверенное хронометрами. Программное обеспечение было на основе методик EMME/2 и SPSS, были предложены две новых модели относительно времени остановок на стоянках различных автобусных маршрутов в Тегеране, чтобы уменьшить время ожидания транспорта пассажирами.

Introduction:

Transportation is one of the main problems of the recent century mainly related to the rural societies all over the world.

In this reason, providing a move detailed plans along with closer control and supervision of vehicle transit in rural area are regarded as one of the most important objective of transportation and civil engineering sciences. Such an important issue has been considered in Iranian metropolitan cities such as Tehran, as one of the largest and highly populated capitals of Asia countries. Huge terrific jam in Tehran has been a complicated problem related to many infra structures both relate to rural transportation system and its management.

Project description:

Because of significant delay time of rural public buses in Tehran, there is usually lower trend for using public transportation systems. In order to define this problem this, article is focused on the rural bus line systems of Tehran. The reasons behind this decision are related to the follow-

ing fact.

A) People prefer to use their own vehicles.

B) There is a significant delay time in rural bus transportation system.

C) Citizens of Tehran try to have a low cost trip in the city.

D) The rural bus system is not suitable for the elderly and handicapped.

It should be stated that, the main plan for deceasing the trip time and delay time in Tehran public transportation system is mainly related to the physical and traffic plans.

Physical plans includes those such as increasing rural transportation facilities such as buses, freeways, high wages for decreasing the delay time and increasing transportation velocity. Traffic related plans involve those such as the empowerment of the management system, providing suitable guiding data base for drivers, etc.

In this study a mediator software has been connected to EMME/2 and SPSS and two novel models have been suggested regarding the delay time, at different bus station in Tehran city , in order to minimizing such delay time.

Methodology.

This study is focused on the models of calculation of the delay time in Tehran transit system through defining the main causes of this delay.

In this study, five major bus lines in the city were selected in a period of three months. After a general review of all bus lines in Tehran city, six most important lines were selected and in order to achieve a 95% confidence rate of the analysis procedure.

For each bus line, twelve sampling and tracking procedure were carried out for the public buses and this process was also repeated for those private vehicles in the same bus line.

Variables such as the trip time and delay time have been considered. Regarding to the delay time, the amount of delay time, site of delay, waiting time recorded and monitored by chronometers.

For each line, a surveying group was assigned in which the member go each group was equal to the number of passenger doors. These groups of surveyors, selected one of the buses of the line randomly and filled out the checklists.

When a bus arrived at the station, and its door opened, the sampling member, recorded the time needed for opening the door and then reordered the number of passengers got on the bus through that door.

After leaving the station, the number of passengers remained at the station was calculated and recorded.

Different delay times have been monitored as follows:

1. Delay time for waiting for the buses till their departure.
2. Delay time due to stopping at the station.
3. Delay time due to terrific congestion
4. Delay time due to interference
5. Delay time due to the terrific light.
6. Delay time due to pedestrians.
7. Miscellaneous delay time

Results were analyzed and average levels were found for each route, motion velocity, and trip velocity and significant results were plotted in tables and diagrams.

A comparison was made between private cars and buses. At the second step, among 223 active bus lines Tehran, 24 lines (ten percent sample) were selected.

A summary of analyzed data has been provided in this study.

Based on the following equation:

$$LF = \frac{\sum t_{s,V_S}}{t.Cap}$$

In which:

LF= load factor

Ts= the time of bus transit from one station (s) to the nest one

T = total bus transit time in the whole bus line

Vs= the number of remained passengers in each bus after leaving the bus station

Cap= the bus capacity

Regarding the stop time, two models of buses (Benz 355 and Benz 457) had the lowest rate (32 seconds) and long vehicle buses and duplicated buses had the highest rates (46 seconds). But regarding to the get on Time and get off time.

Benz 457 had the highest rate (7 seconds) and long vehicle buses had the lowest rate (417 seconds):

Table 1 of this study is related to the data regarding the transit time. The transit time in different lines is ranged from 10 to 25 K/h (mean; 15k/h). The average LF is ranged from 0.30 to 0.65 (mean; 0.45).

The average stop time in one station is ranged from 25 to 66 seconds (mean: 37 seconds). The average gets on and get off time is ranged from 4.1 s to 7.8 s (mean: 5.9 s). Finally the stop time of each bus at the final station is ranged between 321 s to 985 s (mean: 600 s). The stop time at the final bus station in the morning peak hour is at its lowest rate (7.5 minutes). The average LF at this time is at its highest rate (0.58 minutes). Finally the business velocity at the afternoon peak hour is at its lowest rate (13 k/h).

Table 1: Data related to the bus lines

Here two proposed models were suggested by the researcher , one the as non cumulative and the other as the cumulative models.

Non cumulative model (Station)

Finally the following *Non cumulative model* was used for stopping time with the following results.

DWT= a1 B1 +(a1*IB1+a2(2/ND)05*0B2)

(1+a4*LFB4)

In this model,

DWT: The stopping time at the station (second)

L: Number of passengers who got on the bus at the station.

O: Number of passengers who got off the bus at the station.

LF: Number of passengers in the bus divided by its capacity.

ND: Number of passengers doors.

B1: 1 if L* O>O otherwise O

B2: 1 if L* O>O otherwise O , al is the models parameter

Average get on & get of time for 1 passenger (s)	Average stop time at station	Business velocity	Average LF	Total get on passengers	Stopping time at the end point(s)	Total transit time (s)	Stopping time at station (s)	Transit time (s)	Number of station	Path line (km)	Number of line
5.7	31	18	0.38	79	504	1634	453	1241	15	8.3	6-7
5.7	40	16	0.58	101	456	2026	576	1450	15	8.3	7-8
6.1	33	14	0.40	80	782	1858	283	1375	15	8.4	8-9
6.3	32	15	0.38	75	694	2014	273	1541	15	8.1	9-10
6.0	36		0.44	96	694	2184	581	1603	16	9.2	10-12
5.9	43	14	0.47	107	695	2042	627	1314	14	8.0	14-15
6.0	40	14	0.46	99	683	2102	892	1510	15	8.3	15-16
5.9	41	13	0.48	103	590	2353	605	1747	15	8.2	16-17
5.7	38	13	0.47	94	673	2281	530	1751	14	8.1	17-19
5.9	37	15	0.45	93	641	2062	547	1515	15	8.3	**20-18**

NS: Number of passengers in one line A1: the model parameter

The following tables provide the move detailed results

Accumulative model:

Another model for this study is as follows:

Accumulative model

DWT=10*NS+a1*L*(2/ND)0.5

In which:

DWT: The stopping time at the station(second)

L: number of passengers who got on the bus at the station.

ND: Number of passengers doors.

Table2: results of stopping time based on accumulative model.

Conclusion:

1. The trip velocity by the private vehicle is %75 move than the bus at zero velocity.

2. The trip velocity by the private vehicle is %16 move than the bus at transit speed.

3. The trip time by the private vehicle is %43 lower than the bus at the zero time.

4. The delay time at the cross road for the private vehicle is %73.5 and for the bus is %15.8.

5. The waiting time for the getting the bus is %43 of the total delay time.

6. The delay time at the station is %35.8 of the total delay time for the bus.(Average time : 375)

7. About %78.8 of total delay time for the buses is

Model						Type of the bus
Performance 3	Performance 2		Performance 1			
R2	R3	α1	R2	α1	α0	
0.93	0.93	3.97	0.93	3.99	9.91	Benz305
0.93	0.93	4.97	0.93	5.56	6.09	Ikarus260
0.81	0.81	3.75	0.81	3.96	8.44	Volvo
0.90	0.90	4.22	0.90	4.31	9.32	Vural
0.86	0.86	4.95	0.86	5.19	8.64	Benz 302
0.65	0.65	4.43	0.65	3.89	14.69	Ikarus380
0.90	0.90	4.62	0.90	4.87	7.45	Two stori Q
0.86	0.86	4.56	0.87	4.57	9.97	All

related to the waiting time for departure at the station.

8. The delay time caused but the interference for the private vehicles is %38 more than the bus.

9. The lost time for the private vehicles is %3.4 more than the bus.

10. Age delay time for the traffic light for the bus is %10 less than the private vehicle.

11. Delay time caused by the road passenger for the bus and private vehicles are less or equal.

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A STUDY OF DELAY TIME OF TRANSIT SYSTEM IN TEHRAN CITY (A CASE STUDY OF PROPOSED MODELS IN)

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Keywords: delay time, transit system, Tehran city, models.

Annotation: Because of significant delay time of rural public buses in Tehran, there is usually lower trend for using public transportation systems. In order to define this problem, this article is focused on the rural bus line systems of Tehran. For each bus line, twelve sampling and tracking procedure were carried out for the public buses and this process was also repeated for those private vehicles in the same bus line variables such as the trip time and delay time have been considered. Regarding to the delay time, the amount of delay time, site of delay, waiting time recorded and monitored by chronometers. In this study a mediator software has been connected to EMME/2 and SPSS and two novel models have been suggested regarding the delay time ,at different bus station in Tehran city , in order to minimizing such delay time .