

Evaluation of the performance of intelligent vehicles and their role in controlling and reducing urban traffic in North Khorasan Province

Mojtaba Arabi, Payam
Porkar Rezeiye, M.H.
Ahmadzadegan

Abstract

Nowadays, one of the problems of human life is population congestion and the lack of ability to meet their needs. One of the important infrastructures affected by this issue is the transportation infrastructure. Moreover, increasing transportation facilities through conventional methods, due to the need for macro investment and much time, cannot be nowadays considered as a proper and practical strategy. Thus, in recent years, the tendency to use the mechanisms to employ new technologies, the optimal use of available resources, the use of modern technologies in automobiles in most countries have been considered as the best solution for metropolitan traffic managers. One of the newest and most effective traffic management solutions deriving from information technology is the idea of using intelligent vehicles, which can lead to a non-traffic city, mobility in the community, and providing better services to citizens. After examining the need for modern technologies in the transportation area, this paper defines intelligent systems, performance, types of services, and modern technologies in intelligent vehicles. Then, it will refer to measures required in planning and establishing ITS and the localization of this system in each region.

Keywords: intelligent vehicle, urban traffic, intelligent transportation, intelligent street

Introduction

Intra-city transportation includes a system, which involves transporting and displacing the passenger from one point to another point in one city of country (Alawi, 1997). Traffic is a phenomenon caused by the displacement of humans, animals, goods and vehicles from one point to another. Traffic is created due to the lack of necessary coherence between the implementation of regulations, the proper engineering and management, and the adequate training of people, forming a triangle called as "Triple Principles" (Mokhtari Malekabadi, 2009). In the traffic management system, the goal is not just the movement of vehicles, but the optimization of the flow with a minimum delay of travel time. Traffic management can significantly reduce the pollution level of each vehicle, since traffic

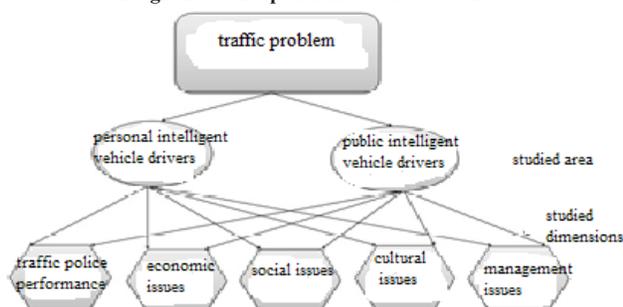
management policies are highly environment-oriented. According to a study conducted over a 14-year period from 1994 to 2007, more than 250000 people died due to driving accidents and about three billion people were injured. Restrictions in urban traffic management, guiding the vehicles in suburban routes and the costs of these problems are a major challenge. It seems that communication and information technology as a proper strategy called as intelligent vehicle communications technology to resolve this problem. The use of communication technology and information in transportation requires creation of a communication bed consisting of electronic communication equipment within the vehicle and communication equipment besides the vehicle traffic routes, which should be implemented through the public telecommunications network. Thus, the main issue of this research is to identify the methods for determining the optimal model to control and reduce the urban traffic by intelligent vehicles.

Review of literature

Given the novelty of intelligent transportation systems, various definitions have been proposed for it around the world. Intelligent Transportation System (ITS) is the use of Information and Communication Technology (CT) to improve the performance of the transportation system. "The term "ITS" refers to a set of tools, facilities, and specializations, such as traffic engineering, software and hardware and telecommunication technologies, which are employed in a coordinated and integrated way to improve the efficiency and safety of the transportation system.» In his study entitled "The Effect of Intelligent Transportation Systems of ITC in Traffic of Isfahan," Abol-Hassanpour (2007) stated that with increasing population, the economic growth of the community and the increase of urban travels and the increase of vehicle ownership, we nowadays face with more traffic problems, especially in the big cities of the country. In addition, Vensel and Kruse on the costing the traffic congestion referred to the amount of time lost by people in traffic and stated that transportation model, despite the dynamical nature, is predictable. Longold et al (2007) in their study on the role of small roads and traffic deaths considered the environmental im-

pacts and traffic volume on ecosystem change inevitable. In his study on determining a traffic management decision-making system for a major road, Chen (2007) developed an evaluation system to support the highway design process and select traffic control strategies for increasing the health and optimization of traffic operations for designers. In his study on re-evaluation of the transportation management organization, Ferguson (2004) reviewed the results of the studies conducted on eight national transportation management organizations (TAM) between 1989 and 2003 using the meta-analytical techniques. In a study conducted at the University of Bangladesh on the formation of a developing metropolitan urban transportation system in the absence of proper management designs, Hossein (2003) introduces the city of Dhaka and states that in the development of urban transportation in Dhaka, the city faces with traffic problems and people suffer from overcrowding and subsequent heavy traffic, resulted in air pollution.

Diagram 1 conceptual model of research



Methodology

The present study was conducted to evaluate and identify intelligent solutions to solve traffic problems in North Khorasan province. The statistical population of this study included all drivers of private and public vehicles in North Khorasan province. Stratified sampling method was used to select the research sample. The data collection tools included interview and questionnaire. All social, economic, cultural, and executive issues of the citizens and the geographical location of the research have a significant role in creating the traffic problem, so that people have high tendency to have private vehicle. With making public vehicles intelligent and improving the quality of services provided for customers and encouraging citizens to use the public vehicles rather than personal vehicles at the city level, we can reduce the problem of urban traffic and energy loss and accidents. In this research, the following hypotheses are examined:

The first hypothesis: management and executive issues: Satisfaction with traffic management, the existence of a heavy machine in the city, the lack of proper stations, lack of proper management of traffic, the presence of unauthorized vehicles in the city, the lack of U-turns with proper distance, widening the street, the presence of speed bumpers, the use of monitoring system, lack of fuel position, petrol quota, petrol rationing, lack of parking, lack of travel camps, lack of cursor guide panels.

The second hypothesis: cultural issues: job satisfaction, observing others' rights, the impact of driving skills and culture, lack of respect for driving regulations, the use of single-seat vehicles, drivers' participation in traffic council meetings and the use of electronic services.

The third hypothesis: demographic and social issues: the population of manpower, the existence of offices and banks, the existence of multiple schools and higher education centers and the presence of Imam Reza Hospital in the city.

The fourth hypothesis: economic issues: the economic effects of commercial centers and the providing the bank vehicle loans.

The fifth hypothesis: the performance of traffic police: increasing the driving penalties, connecting intersections and crossroads and traffic lights can be useful.

Results

The first hypothesis

«The problem of urban traffic in North Khorasan is due to the lack of use of intelligent vehicles and the lack of proper urban management.»

Table 1: Urban traffic with lack of using intelligent vehicles and lack of proper urban management

Variables studies	Correlation coefficient	p-value
lack of using intelligent vehicles and lack of proper urban management urban traffic	0.386	0.000

According to table (1), the p-value of the test is equal to (0.000), which is less than (0.05). The results show that this correlation is 0.386, which is significant at the level of 0.99

The second hypothesis

«The urban traffic problem in North Khorasan is due to lack of using intelligent vehicles and cultural issues.»

Table 2: Urban traffic with lack of using intelligent vehicles and cultural issues

Variables studied	Correlation coefficient	p-value
lack of using intelligent vehicles and cultural issues urban traffic	0.238	0.000

According to table (2), the p-value of the test is equal to (0.000), which is less than (0.05). The results show that this correlation is 0.23, which is significant at the level of 0.99

The third hypothesis

«The urban traffic problem in North Khorasan is due to lack of using intelligent vehicles and demographic and social issues.»

Table 3: Urban traffic with lack of using intelligent vehicles and demographic and social issues

Variables studied	Correlation coefficient	p-value
lack of using intelligent vehicles and demographic and social issues urban traffic	0.379	0.000

According to table (3), the p-value of the test is equal to (0.000), which is less than (0.05). The results show that this correlation is 0.379, which is significant at the level of 0.99

The fourth hypothesis

«The urban traffic problem in North Khorasan is due to lack of using intelligent vehicles and economic issues.»

Table 4: Urban traffic with lack of using intelligent vehicles and economic issues

Variables studied	Correlation coefficient	p-value
lack of using intelligent vehicles and economic issues urban traffic	0.255	0.000

According to table (4), the p-value of the test is equal to (0.000), which is less than (0.05). The results show that this correlation is 0.255 which is significant at the level of 0.99

The fifth hypothesis

«The urban traffic problem in North Khorasan is due to lack of using intelligent vehicles and traffic police performance.»

Table 5: Urban traffic with lack of using intelligent vehicles and traffic police performance

Variables studied	Correlation coefficient	p-value
lack of using intelligent vehicles and traffic police performance urban traffic	0.270	0.000

According to table (5), the p-value of the test is equal to (0.000), which is less than (0.05). The results show that this correlation is 0.270 which is significant at the level of 0.99

Discussion and conclusion

One of the modern technologies, introduced for transportation and traffic management is the intelligent systems of transportation. It is one of the most modern techniques in the world used to improve the problems of transportation and urban traffic. If intelligent transportation systems are used properly, it would play a significant role in urban management and the establishment of an electronic municipality directly and indirectly. As noted in this study, while intelligent services cover a wide range of applications, some parts of the services are prioritized in the given region depending on different cultural, social, economic, and climatic needs of each country and region. Therefore, it is necessary to study the intelligent systems from different dimensions in different countries in order to optimize the use of these services and develop and implement a comprehensive plan in the stages of determining the strategies and orientations as well as stages of implementing the intelligent projects appropriate to regional conditions. Given the impact of culture, demographic and social factors, economic factors and the use of intelligent vehicles on controlling traffic, authorities can reduce the traffic, reduce the social complications of urban traffic, reduce economic complications, and reduce the use of fossil fuels such as petrol by enhancing the culture of using intelligent vehicles.

References

Alavi, SA (1997). Organization of Traffic Management in Urban Communication Systems, Master Thesis, Tehran: Tarbiat Modares University.

Mokhtari Malek Abadi, R (2009). An Analysis of Parking Use Planning in Isfahan City Using Practical Plans of Regional Planning. Quarterly Journal of Urban and Regional Studies and Research. Volume 1, Issue 3. Pp. 115-134

Abol-Hasanpour, A (2008). Investigating the Effect of Intelligent Transportation Systems on Reducing the Traffic in Isfahan. Quarterly Journal of Traffic Management Studies. Volume 3, Issue 8, pp. 97-121.

Woensel, V. and Cruz, .F.R.B (2008). A Stochastic Approach to Traffic Congestion costs. Computers & Operations Research, No:36, pp: 1739 – 1731.

Van Langevelde, F et al.(2007).Traffic Mortality and The Role of Minor Roads.

Chen, y.(2007). A Highway Work Zone Design and Traffic Management Decision System. Adissertation submitted in partial fulfillment of the requirement for the degree of doctor of philosophy(civil and Environmental engineering) at the university of wisconsin-madison.

Ferguson. E, (2004). Transportation Management Associations: A Reappraisal American University of Sharjah. Journal of Public Transportation.

Hossain. M, (2003). Shaping up of Urban Transport System of a Developing Metropolis in Absence of Proper Management Setup”the case of Dhaka. Journal of Civil Engineering.