



## WEB BASED EXPERT SYSTEMS for Optimizing of Traffic Road in Developing Countries

Abduraouf. B. Z. Awien<sup>1\*</sup>, S I A Ali<sup>2</sup>, Fathi Elharare Elhaniash<sup>3</sup>

<sup>1</sup>Department of Civil Engineering Higher Institute of Science and Technology Zahra Libya

<sup>2</sup>Department of Civil and construction Engineering A Sharqiyah University, Ibra, Oman

<sup>3</sup>Department of Civil Engineering Higher Institute of Architecture and Technology Zawia Libya

\*E-mail: alshetwi1978@gmail.com

تاريخ الاستلام: 2026/01/11 - تاريخ المراجعة: 2026/02/06 - تاريخ القبول: 2026/02/18 - تاريخ النشر: 2026/03/17

### Abstract

Libya is one of the rich developing countries out of oil revenues. The discovery of oil contributed to a dramatic change and a burden on all public utilities and facilities, especially the transportation system. Increased traffic congestion, road accidents on intercity highways, and environment pollution have been the negative impacts. The time is ripe for a policy improve intercity public transport. This study aims to focus on some of those issues like rise in private vehicle ownerships, traffic congestion, and demand of more public transport, parking, road safety and air pollution. All of these factors are dependent on each other. So, rectifying one by one will alleviate the major concerns of traffic congestion and other environmental hazards. When each of these factors is addressed the effective contribution can make successful urban development. As traffic grows around the world, congestion becomes more widespread and occurs significantly longer during weekdays. As such congestion and traffic-related pollution are increasingly becoming major issues in cities. The increasing reliance on private transportation, in particular private cars, has created considerable pressure on the road network which consequently has contributed to the problems of traffic congestion. Providing more road spaces to keep pace with traffic demand is not the answer. It would be far too expensive and socially disruptive, and would exacerbate the long term problem which was initially trying to be tackled.

Keywords: traffic road; expert systems; Public Transportation;

### ملخص البحث

تُعدّ ليبيا من الدول النامية الغنية بفضل عائدات النفط. وقد ساهم اكتشاف النفط في تغيير جذري وفرض عبئاً على جميع المرافق والخدمات العامة، ولا سيما نظام النقل. ومن بين الآثار السلبية لذلك: ازدياد الازدحام المروري، وحوادث الطرق على الطرق السريعة بين المدن، وتلوث البيئة. لقد

حان الوقت لوضع سياسة تُحسّن النقل العام بين المدن. تهدف هذه الدراسة إلى التركيز على بعض هذه القضايا، مثل ازدياد ملكية السيارات الخاصة، والازدحام المروري، والطلب المتزايد على وسائل النقل العام، ومواقف السيارات، والسلامة المرورية، وتلوث الهواء. جميع هذه العوامل مترابطة، لذا فإن معالجتها واحدة تلو الأخرى سيُخفف من المخاوف الرئيسية المتعلقة بالازدحام المروري والمخاطر البيئية الأخرى. وعند معالجة كل عامل من هذه العوامل، يُمكن تحقيق تنمية حضرية ناجحة. مع ازدياد حركة المرور حول العالم، أصبح الازدحام أكثر انتشارًا ويستمر لفترات أطول خلال أيام الأسبوع. ونتيجة لذلك، أصبح الازدحام والتلوث الناتج عن حركة المرور من القضايا الرئيسية في المدن. وقد أدى الاعتماد المتزايد على وسائل النقل الخاصة، وخاصة السيارات الخاصة، إلى ضغط كبير على شبكة الطرق، مما ساهم بدوره في تفاقم مشكلة الازدحام المروري. إن توفير مساحات إضافية للطرق لمواكبة الطلب المتزايد على حركة المرور ليس هو الحل. سيكون ذلك مكلفاً للغاية وسيؤدي إلى اضطرابات اجتماعية، وسيفاقم المشكلة المزمنة التي كان يُسعى في البداية إلى حلها.

الكلمات المفتاحية: المواصلات العامة ; أنظمة الخبراء; طريق المرور.

## 1- Introduction

And suffer many of the world's cities with heavy transport problems, mainly due to increases in variables such as the size of the population, and levels of motorization and the size of the city, and income levels, and commercial and industrial activities. The rate at which the transfer of increased demand in developing countries , and especially in the major cities , and often exceeded improvements in capacity and overwhelmed on the road Institutions responsible for transport . urban transport many problems and severe: They include traffic congestion, road accidents and environmental impacts effects such as air, noise and inadequate public transport , and the proliferation of secret transfer , the situation deteriorating road network . They occur in approximately every city, even though by varying degree of risk. Measuring congestion can significantly affect policy decisions and planning. Often involve transportation planning decisions tradeoff between reducing congestion and other objectives such as affordability, safety and environmental protection. Can exaggerate the costs of traffic congestion skew decisions in ways that reduce the efficiency of the public transport system. Therefore, the purpose of this research is to develop advisory system for urban transport demand management and to determine the most suitable transportation demand management strategies that could implemented effectively.

## 2- Application of Expert System in Traffic Road

There are various Computer-based systems for improving road traffic are technologies that leverage data processing, sensors, communication, and artificial intelligence to manage and optimize the flow of vehicles on roads. These systems aim to reduce congestion, enhance safety, and improve environmental sustainability. Among in traffic road engineering, congestion, enhance safety, improve environmental sustainability.

### **2.1 Traffic Management Systems (TMS)**

Intelligent traffic management system (ITMS) is used to manage traffic on road networks. Managing traffic helps to focus on environmental impacts as well as emergency situations. However, the ITMS system has many challenges in analysing scenes of complex traffic. New technologies such as computer vision (CV) and artificial intelligence (AI) are being used to solve these challenges. As a result, these technologies have made a distinct identity in the surveillance industry, particularly when it comes to keeping a constant eye on traffic scenes. There are many vehicle attributes and existing approaches that are being used in the development of ITMS, along with imaging technologies (Nigam, N., Singh, D. P., & Choudhary, J. 2023).

### **2.2 Real-Time Traffic Monitoring**

These applications can report important information, such as traffic flow or traffic information, and travel time in a distributed traffic control system. According to (Kherraki, A., & El Ouazzani, R.2022), and with regard to object localization, the authors proposed an approach to find an instance of a vehicle by estimating its position with ratio and size, which is widely used for vehicle tracking

### **2.3 Advanced Traveller Information Systems (ATIS)**

AI should continue to be utilized to advance safety systems in transportation. Enhanced object detection and recognition algorithms, coupled with AI-powered collision avoidance systems, can improve vehicle and pedestrian safety (Bharadiya, J. P.2023) Additionally, AI can assist in identifying potential maintenance issues in vehicles and infrastructure, allowing for proactive maintenance and minimizing the risk of accidents caused by mechanical failures.

### **2.4 Incident Detection and Management**

Machine learning models are used to detect and respond to traffic incidents, such as accidents caused by road closures. In real time, facts from web cameras and sensors inside models can identify unusual patterns that indicate an incident (Refaat, H. E., & Mead, M. A. 2019) once AI systems can notify relevant authorities and provide alternative routing suggestions to mitigate the impact on the complete rush-hour traffic stream.

### **2.5 Connected Vehicle Systems**

Transportation Systems (ITS) is one of the potential solutions that addresses the issues of traffic congestion, safety and emission. connected vehicle system is one of such ITS which can potentially minimize the risk of accidents and increasing traffic throughput. However, connected vehicular networks are vulnerable to packet dropping (Savaia, G., Abdollahi Biron, Z., & Pisu, P. 2017, October).

## **2.6 Public Transportation Integration**

This is cited, in the vast majority of cases, as the most important intervention/measure required to promote micro mobility and public transport integration. The provision and availability of infrastructure that ensures a safe and efficient use of micro-vehicles should therefore be a priority for municipalities and city officials (Grosshuesch, K. 2019). Mention the importance of improving road conditions and connections of cycling lanes, to reduce the risk of collisions with other road users, and to improve the user experience of micro mobility.

## **2.7 Autonomous Vehicles and Platooning**

Traffic bottlenecks may occur due to the nonlinear and complex behaviour of the vehicles. Each vehicle has individual behaviour that depends on the driver operating the vehicle. The development of autonomous vehicles has ironically reduced the errors caused by the driver's behaviour (Yang, J., & Coughlin, J. F. 2014).

## **2.8 Intelligent Traffic Management Systems (ITMS)**

AI-powered intelligent traffic signal control systems utilize reinforcement learning techniques to manage signal timing. For easily interacting with the traffic environment, learn optimal policies that minimize congestion and maximize traffic throughput with reinforcement learning (Elsharkawey, M. A., & Refaat, H. E. 2018), (Barzegaran, M., & Pop, P. 2021). The agent can adjust signal phases based on real-time traffic density, reducing idle times and improving the flow of vehicles through intersections.

## **2.9 Geographic Information Systems (GIS)**

(Ahmadi, F. F., & Ebadi, H. 2010) prepared spatial data for Geographic Information System (GIS) simultaneously during feature digitizing process from photogrammetric models reduced data editing phases after feature digitizing process. Therefore, the problems, caused by separating spatial data production process from preparation of this data were overcome as far as possible. To achieve this purpose, speciality and expertise required for spatial data structuring and preparation for GIS should be available in an interface system which established a direct connection between photogrammetric and GIS systems. When a user digitized a feature from a photogrammetric model, the decision-making process about the method of editing, structuring, layering, and storing of the feature in GIS database, could be carried out by such an interface system. Thus, according to the capabilities of expert systems for modelling the knowledge and deduction methods of experts, generating an expert interface system between photogrammetric and GIS systems, offered a suitable solution for this integration. The capabilities of expert systems for intelligent spatial data structuring and

preparation simultaneously during feature digitizing process from photogrammetric models, were also investigated.

**2.10 Traffic Road System (TRSys)**

TRSys uses a web-based expert system implemented with PHP to provide recommendations for traffic network optimization. It incorporates a knowledge base drawn from traffic laws, standards, and expert opinions. The system is designed to help engineers, consultants, decision-makers, and students identify traffic problems and suggest suitable solutions (Alshetwi, A. B., Rahmat, R. A. A. O., Borhan, M. N., Ismael, S., Ali, A., Irtema, H. I. M., & Alfakhria, A. Y. 2018).

**3- Comparison Among the Based Systems**

Table 1.1 summaries the expert systems in the field of traffic engineering. Expert systems were designed to manage pavements. Expert system were des eloped to manage traffic flow and improve road safety on urban roads. Expert systems were developed for operating traffic. Furthermore, systems were designed for solving geometric design problems and also running public buses as follows:

Table 1.1 Expert system in the field of traffic engineering

Reference	Name	Domain	Development methodology
Malasheskie (1986)	STAMPP	Pavement management	mainframe
Zozaya-Gorostiza&Hendrickson (1987)	TRALI	Traffic light signalling and operation	Expert system programming
Ross et al. (1990)	PARES	pavement management	AASHTO
Christory&Laye (1991)	SEVADER	highway network	ESCOP
Choi (1993)	TransDASS	Transportation planning	FORTTRAN
Decabooter et al. (1994)	PMDSS	-	GIS software
Suttayamully (2002)	Expert System For Work Zone Traffic Management	-	-
(Ewadh 2001)	RRSAES	Traffic safety	Visual Basic
Wen (2008)	DATLCES	Traffic light signalling and operation	Java expert system
Srinivasan et al. (2008)	USLIMITS2	Management & traffic safety	
Ismail et al. (2009)	Micro PAVER	pavement management	mainframe
Deprizon et al. (2009)	ES-DFMP	pavement management	Kappa-PC
Ismail et al. (2009)	ES-APAM		Kappa-PC ES Shell

De Guzman&Sigua (2009)	ESII	Traffic safety	MySQL & PHP
Mansyur et al. (2011)	E-ASSIST	Transportation demand management	Kappa-PC
Syamsunur et al. (2011)	ES-HGDesign	Geometric design	Kappa-PC
Mosa (2013)	COPRBU	Public transportation operation	Visual Basic
Ladin (2014)	SP-SPEDA	development of expert systems for sustainable urban transport strategy	Visual Basic
Falamarzi et al. (2014)	CALMSYS	Web-based advisory expert system to implement traffic calming strategies	Visual Basic.Net
Alshetwi et al. (2018)	TRSys	Traffic Road System	PHP

#### 4- Limitations of the Existing Systems for Traffic Road

The design the design and development of each current system is applicable to a specific area under some prearranged climatic conditions, as well as distress and maintenance types. However, the current systems for Traffic road the following list summarises the restriction involved in the present system including the weaknesses noted in the databases and the progress environment. Here are the main limitations of existing traffic road systems especially in developing:

##### 1. Static Traffic Control

Many systems use fixed-time signals that don't adapt to real traffic conditions.

Leads to long waits even when roads are empty.

##### 2. Poor Real-Time Data Use

Lack of sensors, cameras, or IoT devices.

Decisions are made without live traffic information.

##### 3. Infrastructure Constraints

Narrow roads, poor signage, and lack of smart intersections.

Hard to upgrade old road networks.

##### 4. High Cost of Smart Systems

Advanced systems need big investments.

Many cities can't afford AI-based or sensor-heavy solutions.

### 5. Weak Enforcement

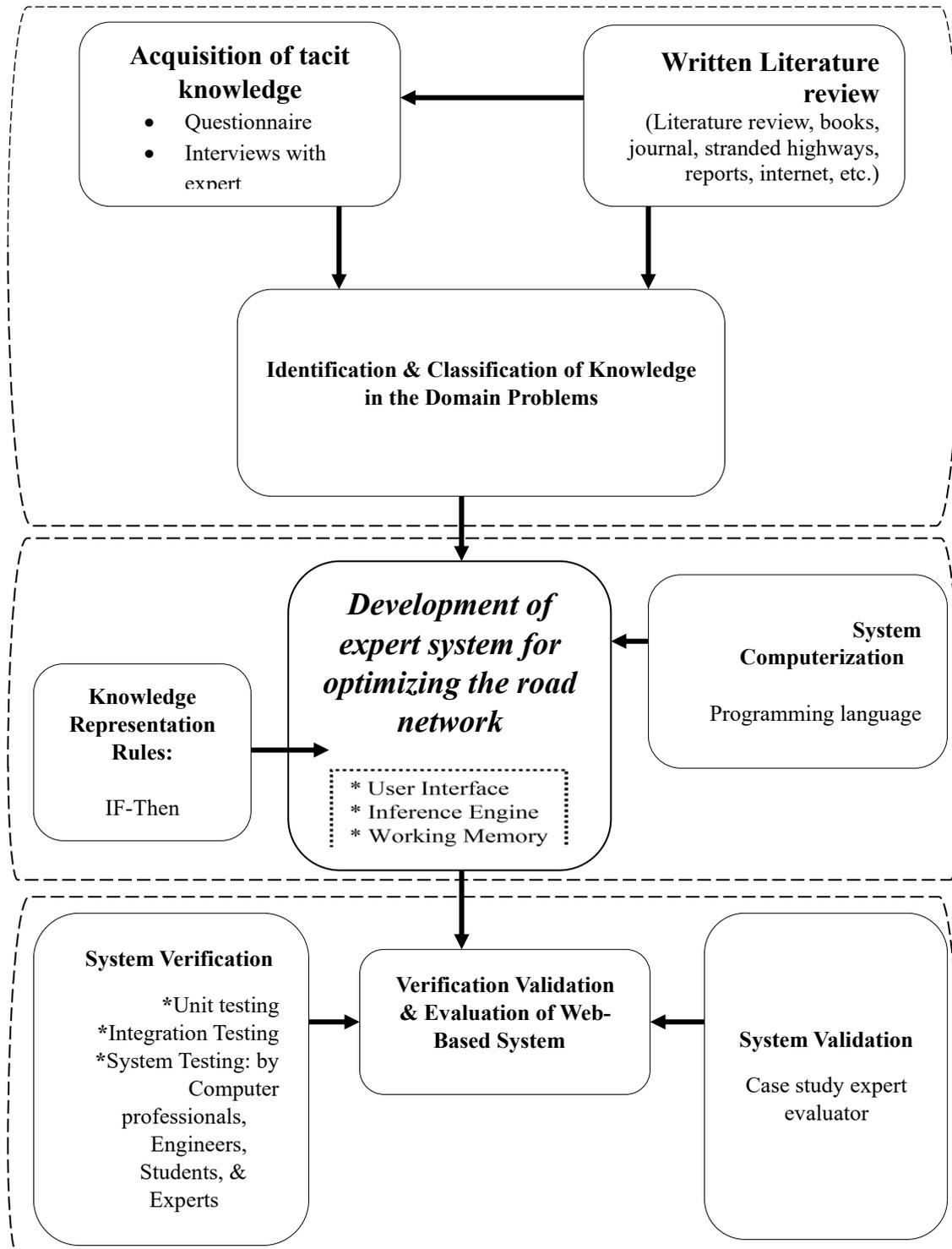
Traffic rules aren't always followed or enforced.

#### 5- Web Based Information System Construction

The primary objective of this research is to strengthen a methodology and software of the model, which mixes the use of cognitive approach and analysis summaries multi likely specifications in a bendy and transparent process to atlases the optimizing the a road network in setting up nations. The progress of this method in a couple of levels, which started the undertaking of examining and were adopted by way of the acquisition of knowledge, and develop a model.

Has been developed Traffic Roads System to help the amateur engineers approach to manage the transition problems. A variety of issues involving unsanitary stipulations that have an impact on transport in urban areas. These issues can arise in all constituents of congestion, pollution, noise and irregular Anal. Will diagnose many of the disorders in the course of visually. Nonetheless, which you can you will be identified with more than a few problems with the final verification or months may just appear a one-time mode. may just run with the aid of professional's subject to urge the immediate strategies, since it presents the user with its factors and preventive measures options, so the effects of this defect. Methodology want to boost is in four phases: First, verify the demand on the system by means of literature review and verification of this market by means of the model. 2nd, ascertain the scope of the problems via the acquisition of knowledge from the literature is written human experiences via interviews and design. This part entails in addition to those sectors of the issues classification help the common denominators, so the approval of the specialized discipline. Third, building system through automation clarification and confidentiality of data abuse fourth, verification and validation, and analysis of neat system through intensive testing.

Abilities-based informed methods, or comfortably informed systems, use human capabilities to remedy problems that generally would require human intelligence. These proficient techniques characterize the skills competencies as heuristic ideas inside the laptop. These rules may also be called upon when needed to explain issues. Defined an expert system as a computer program that behaves like a human expert in some useful ways (Winston, P. H., & Prendergast, K. A. (Eds.).1984). The principal purpose of knowledgeable techniques research is to make advantage to be had to choice makers who want solutions rapidly.



## 6- Conclusion and Suggestion

The paper reviewed the expansion and possibilities of expert system in traffic road. It found that the expert systems are able to provide some important benefits over conservative computerized models. Expert systems can solve issues efficiently as they include wide-ranging expert knowledge and human intellectual that are too intricate to be represented and implemented analytically. Reviews on appropriate publication has demonstrated that despite the fact that the expert system most of them tend to be concentrated on traffic road, using an approach that integrates human expert knowledge and analytical techniques with a user-friendly personal computer program. However, there is a lack of total expert systems improved for traffic road in Developing Countries. This is due to the lack of agreement reached amongst experts and the insufficient number of procedures and tools which concern with the knowledge domain. Thus, a research on the possible application of a web based expert system optimizing of Traffic Road in Developing Countries maintenance and an effective decision making technique is very much required.

## References

- (1) Nigam, N., Singh, D. P., & Choudhary, J. (2023). A review of different components of the intelligent traffic management system (ITMS). *Symmetry*, 15(3), 583.
- (2) Kherraki, A., & El Ouazzani, R. (2022). Deep convolutional neural networks architecture for an efficient emergency vehicle classification in real-time traffic monitoring. *IAES International Journal of Artificial Intelligence*, 11(1), 110.
- (3) Bharadiya, J. P. (2023). Artificial intelligence in transportation systems a critical review. *American Journal of Computing and Engineering*, 6(1), 35-45.
- (4) Refaat, H. E., & Mead, M. A. (2019). DLBS: decentralize load-balance scheduling algorithm for real-time IoT services in mist computing. *International Journal of Advanced Computer Science and Applications*, 10(9).
- (5) Savaia, G., Abdollahi Biron, Z., & Pisu, P. (2017, October). A receding horizon switching control resilient to communication failures for connected vehicles. In *Dynamic Systems and Control Conference* (Vol. 58271, p. V001T45A009). American Society of Mechanical Engineers.
- (6) Grosshuesch, K. (2019). Solving the first mile/last mile problem: Electric scooters and dockless bicycles are positioned to provide relief to commuters struggling with a daily commute. *Wm. & Mary Envtl. L. & Pol'y Rev.*, 44, 847.

- (7) Yang, J., & Coughlin, J. F. (2014). In-vehicle technology for self-driving cars: Advantages and challenges for aging drivers. *International Journal of Automotive Technology*, 15(2), 333-340. 7
- (8) Elsharkawey, M. A., & Refaat, H. E. (2018). MLrts: multi-level real-time scheduling algorithm for load balancing in fog computing environment. *International Journal of Modern Education and Computer Science*, 11(2), 1.
- (9) Barzegaran, M., & Pop, P. (2021). Communication scheduling for control performance in TSN-based fog computing platforms. *IEEE Access*, 9, 50782-50797.
- (10) Ahmadi, F. F., & Ebadi, H. (2010). Design and implementation of an expert interface system for integration of photogrammetric and Geographic Information Systems for intelligent preparation and structuring of spatial data. *Expert Systems with Applications*, 37(12), 8006-8013.
- (11) Alshetwi, A. B., Rahmat, R. A. A. O., Borhan, M. N., Ismael, S., Ali, A., Irtema, H. I. M., & Alfakhria, A. Y. (2018). Web-Based Expert System for Optimizing of Traffic Road in Developing Countries. *International Journal of Engineering & Technology*, 7(2.29), 876-881.
- (12) Winston, P. H., & Prendergast, K. A. (Eds.). (1984). *The AI business: Commercial uses of artificial intelligence*. Massachusetts Institute of Technology.