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Research paper

Web-Based Knowledge Evolution for Thinking Green Transportation Using Expert Systems

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Abstract

In many developing nations, it is difficult for development planners and novice engineers to determine the point of transportation service and usability based only on the master plan of the city. On the other hand, nowadays managers in the organizations use computerized support for making decisions on a day-to-day basis. The experts are capable of identifying problems easily and finding solutions fast but novice engineers are unable to do so. This expert system is designed to fulfill the gap that exist between the urban design experts and user who wish to use Green transportation system namely students, decision makers and engineers. Verification, process validation and comparison of the system with similar systems showed that the system is reliable and practical. In order to create the expert system, sources related to Expert system concerning transportation have been studied and interviews with experts have been conducted. The proposed expert system is developed using Visual Studio as the building tool and SQL as the query tool. The knowledge base of thinking green transportation [T Green T] includes three modules and each module may contain a number of sub-modules, parameters, strategies, and criteria. The system incorporate rules and images for various types of measurements. Lastly, several recommendations for maintaining and improving the system are suggested. The development's suitability can be characterized using websites of other modes of transportation such as bicycles and pedestrian traffic.

Keywords: *Web-based knowledge; green transportation; expert system*

1. Introduction

Urban transportation should have the ability to cope with dense areas while shifting people and goods. Density generates issues for urban transportation due to crowding and the cost of offering infrastructure in built-up areas. It generates specific benefits due to economies of scale as certain transportation activities are cost effective when carried out in large volumes. These traits means that two of the most important phenomenon in urban transportation are traffic congestion and mass transit [1]. In some cases the environmental effect of a specific mode of transportation can even be identified. The discrete-choice model which is based on these data can predict and test how and the travelling time taken, cost and passenger characteristics influence the miscellany of specific transportation modes [2]. When global ecological problems arise and were discussed since the 1960s, the focus was on the number of people and their possible negative impact on earth. Ehrlich and his team members noted that in technological or agricultural society [eminent from a collector's society] individuals can impact an environment negatively in the process of survival[3]. By having clear planning strategies cities can be planned at individual scales allowing both high-quality convenience and a superior environment. The purpose is not to forbid the usage of cars as this will be difficult to achieve and will be viewed as against the idea of freedom and choice. The intention is to design cities with such superiority and at an appropriate scale that people will not see the need of having a car [4]. There is a marked growth in the use of private automobiles today. The ownership of private vehicles is one of the important factors affecting the generation of daily trips. It contributes to traffic congestion on urban roads and is the cause of many road accidents. In most countries, the per capita share of private vehicle ownership has increased. Private vehicle ownership is one of the indicators used in estimating future urban transport demand. In Europe, on the other hand, one can finish a day's work in Geneva, Switzerland and arrive in central Paris, France in less than two hours and get off the train at the doorstep of the place of destination which is a hotel, company etc. This is because most European cities are dependent on a model rail network that connects all European city centers [5]. Energy consumption is a necessity of socio-economic development. Transportation which is the sector that consumes the most energy constitutes one of the major challenges facing sustainable development because it is the source of pollution that is harmful to both the environment [globally, regionally and locally] and to human health. This predicament has long puzzled countries across the globe [6].

2. Literature Review

Improving specialist system is meant to prepare the youthful experts to actualize portability administration methodologies with a specific end goal that impacts a movement from latent to dynamic

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transport decision namely cycling and strolling [7]. CALMSYS is an Expert system created to help beginner transportation engineers to manage activity wellbeing issues in private neighborhoods and private gatherer lanes. In CALMSYS, activity wellbeing issues have been isolated into diverse classifications and end clients are empowered to locate their own issues. Accordingly, the system will give significant counselling. CALMSYS is intended to cover arrangements and suggestions which can be connected to diminishing the negative effects of mechanized vehicles whereby many a time mischance focuses and trip generator regions [8]. Highway construction faces complex issues which are influenced by various variables where the arrangement is unimaginable without expert help. Diagnosing such development issues and proposing the most suitable cost proficient arrangements requires huge building skills which would not be accessible in all development destinations because of insufficient asset and remote areas. Using ES-CCPRHP will help diagnose the issues and advise suitable cost [9]. One of the procedures included in learning obtaining of Green transport methodologies is to catch the perspectives of transportation specialists with regards to the most suitable techniques to be used when changing from regular transport to Green transport by selecting one that matches the issue a client is experiencing in existing circumstance but keeping in mind the objective to see the full target of thinking of green transportation [T Green T].

3. Module of Knowledge Acquisition for the Expert System

Based on the survey and the knowledge acquired from the local authority expert domain the main problems and the role of the local government in reducing greenhouse gas emissions has been identified. The important parameters are obtained from seven experts. The best parameters are selected by the experts from among dozens of suggested strategies for the implementation of the T Green T modules. Moreover, the interviews with domain knowledge experts helped to establish the priorities of the categories, parameters and modules to be used in the formulation of the T Green T system. There are twelve main transportation parameters to be utilized in developing the T Green T expert system. The final knowledge-based modules of T Green T include two systems and strategies. Each system may contain a number of categories, parameters and modules.

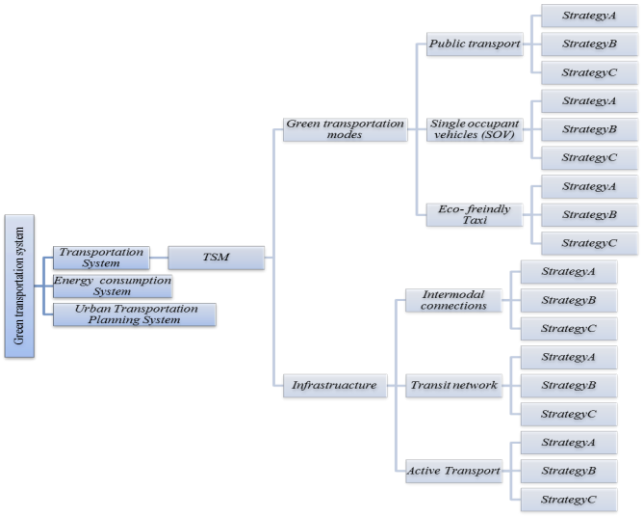


Fig. 1A: Classification of Transportation System

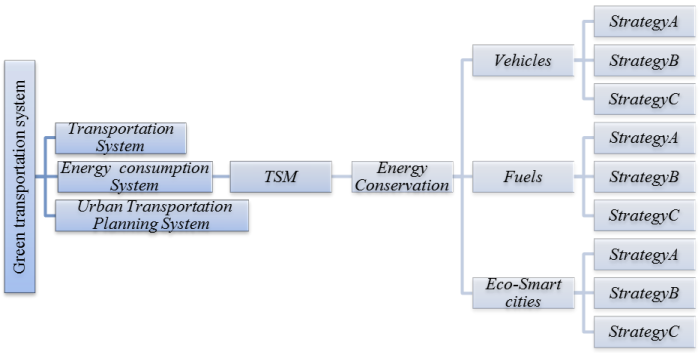


Fig. 1B: Classification of Energy Consumption System

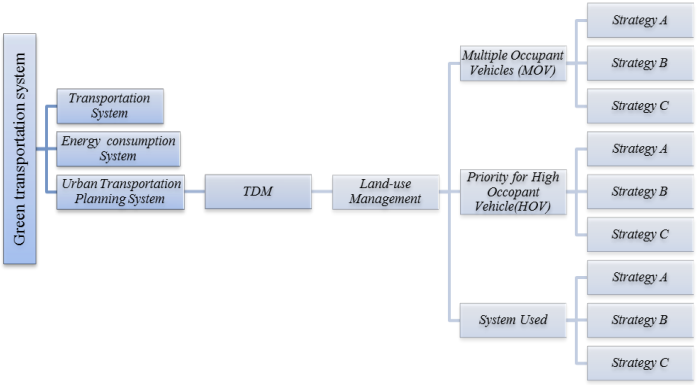


Fig. 1C: Classification of Urban Transportation Planning System

4. Dissociation

To store and keep expert knowledge in the knowledge base, the data must be transformed into symbols, conditional statements, logical expressions, logical operations, and logical variables that are recognizable and applicable to computer systems. In the present study, Microsoft Visual Studio and ASP.NET are used to construct the proposed expert system. The knowledge base in the prototype system is represented in the form of production rules. Rules are considered as a suitable form of knowledge representation, and Microsoft Visual Studio and ASP.NET are well-known applications for developing rule-based systems. Hence, for this rule-based expert system, a forward chaining inference engine is used rather than a backward chaining process. In a forward chaining inference engine, the process begins with the facts stored in the knowledge base. IF-THEN statements are commonly used and are useful constructs for building rule-based expert systems. In this form, IF represents a condition and THEN represents a determination. Rules can be aggregated by employing connection terms, including OR, AND, and ELSE to shape combined rules or composite rules.

5. Result

5.1. Transportation System

Transportation supply management [TSM] strategies are able to maintain or improve safety for all users, defer the necessity for major infrastructure investments, offer the best workable level of service, and minimize the effect of transportation activities on community livability. If the end users are looking for Green transportation modes, intermodal connection and infrastructure strategies, they can chose one or more from the strategy on the list as shown in figure 3. It will help them to obtain models for each strategy like public transportation, eco-friendly taxi, single occupant vehicles, intermodal connections, transit network and non-motorize network.

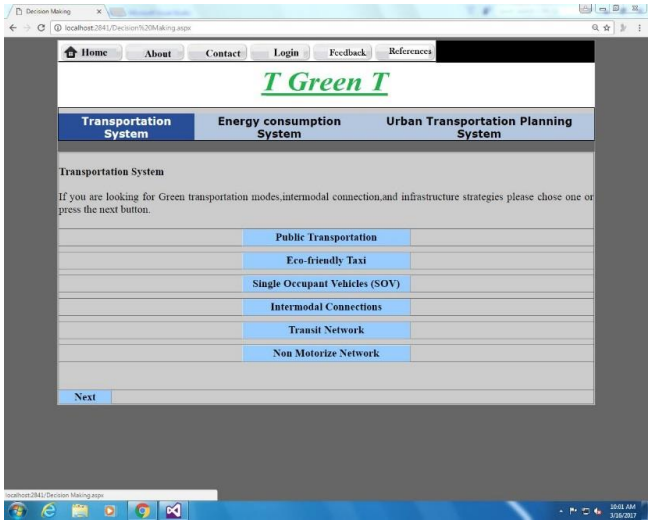


Fig. 2: Transportation System page

5.2. Energy Consumption System

The energy consumption system will also come under the transportation supply management. Furthermore, the end users can look for vehicles, fuels, eco-smart cities and solar cities when they chose one or more items from the strategy on the list as shown in figure 4 below. It will help them to get models for each strategy.

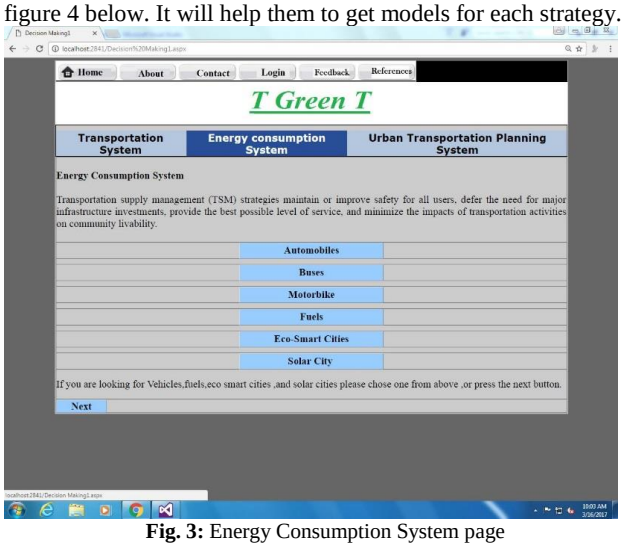


Fig. 3: Energy Consumption System page

5.3. Urban Transportation planning system

Transportation Demand Management [TDM] strategies include a variety of measures to reduce individual transport and change transport demand types. If the end users are looking for TDM strategies they can chose one or more from the strategy on the list as shown in figure 5 below. It will help them to get models for each strategy such as multiple occupant vehicles [MOV], priority for [HOV] and system used.

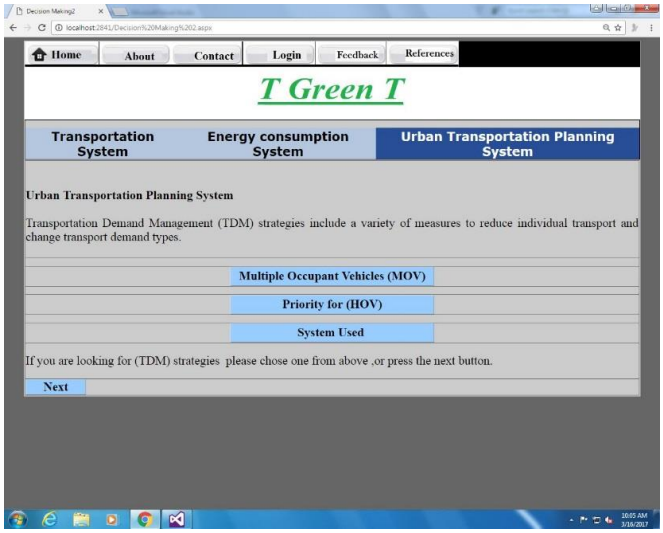


Fig. 4: Urban Transportation Planning system page

6. Conclusion

At present, transportation and road networks constitute a significant part in any city area and vital facilities. Moreover, they are the lifelines that provide the cities with the means for living. This study explored the concept of using a web knowledge-based expert system to provide advice, strategies and design inputs for the development of a green transportation plan and conducted a successful trial in developed cities. The expert system is intended to assist novice engineers and relatively new professionals in making decisions before they decide to apply green transportation strategies in their transportation systems. The solution is a result obtained from different documents which are published for green transportation modes and focus on green transportation strategies. As regards to environmental conservation, business effectiveness, public health and increasing the capacity of roads to levels that can sustain the expected growth in traffic, the current methods of traffic management have proven to be unsustainable. The advice and strategies obtained from the expert system can be employed to aid novice engineers in the application of a green transportation plan without referring to transportation experts.

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