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A Model for Intelligent Tourism Guide System

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Abstract: This study presents a proposed framework model for intelligent tourism guiding system as a knowledge-based system. The model based on the philosophical view of the human behavior as tourism guide. The proposed model mimic the human tourism guide, through building relationships between knowledge based-system with the role of tourist-guide, as a means to provide a professional service for any visitor which best meet his needs and desire of gaining sufficient information and objective understanding of the places visited together with better value and satisfaction of his tour. The proposed model consists of five modules, which are user interface, inference engine, knowledge base, dynamic database and the facilities of GIS and XRM application. These modules are complementary in their intended functions of the local, regional and international guides. The proposed intelligent tourism guiding system can be used by most of the mobile telephone companies as a service available for their customers.

Key words: Artificial intelligence, cognitive science, knowledge-based system, tourism, XRM

INTRODUCTION

For the past 10 years tourism achieved considerable growth and its role in the world economy has increased. It's often called economic and social phenomenon of 20th century in the scientific and popular literature. However, The world tourism organization defines as the activities of persons traveling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business and other purposes not related to the exercise of an activity remunerated from within the place visited (Risi, 2010). This definition leads us to examine the importance of the tourist-guide as they act as a representative of their country and plays a decisive role in the tourists' experience of a tour. In this context, World Federation of Tourist Guide Association WFTGA has defines Tourist guide as: A person who guides visitors in the language of their choice and interprets the cultural and natural heritage of an area which person normally possesses an area-specific qualification usually issued and/or recognized by the appropriate authority (Yenen, 2005). Apparently, the tourist guider's main role is to escort groups or individual visitors from abroad or from the guider's own country around monuments, sites and museums of a city or region interpreting in a clear and entertaining way to inform the visitor about the cultural and national heritage and environment. Furthermore, The tourist guide must be qualified in various ways: particularly in linguist competence and in terms of a wide general knowledge

with specific reference to the history, geography, art, architecture, economics, politics, religion and sociology of the area of qualification.

Being a tour guide is not easy task these days: tourists are often experienced travelers and are becoming more and more demanding. As new origin and destination areas are opening up, the task of the Tour Guide in building bridges between cultures is assuming more importance every day (Alhroot and Al-Alak, 2009). However, these raise the essentialist of creating and improving intelligent guiding-tourism system, which focuses on the quality of the visitor's experience them when using the system and to overcome many of the limitations of the traditional information and navigation tools available to city visitors. For instance, group-based tours are inherently inflexible with fixed starting times and fixed durations and (like most guidebooks) are constrained by the need to satisfy the interests of the majority rather than the specific interests of individuals. Scenarios of human behavior are used in order to illustrate the normal running of the system, although it can also be useful to develop some scenarios that indicate what is expected to happen when something goes wrong. As scenarios are developed, it becomes evident where there is a need for information from the environment (i.e. percepts) and where actions are required. Also, as scenarios are developed, it is common to identify additional goals that are needed (Padgham and Winikoff, 2002). Cheverst *et al.* (2000) they said it should be possible, in the near future, to enable visitors to download

software onto their own device (with built-in Bluetooth support) in order to enable access to context-aware information and services.

Werthner (2004) said that travel and tourism is the leading application field in the b2c e-commerce, it represents nearly 50% of the total b2c turnover.

But usually the travelers need access to information whenever and wherever they want, making tourism a perfect application field for mobile computing. Latest generations of mobile devices and wireless networks offer new opportunities, but mobile devices still suffer from restrictions compared to web based systems. So many researchers have been concentrating in the development of system and (Parajuli *et al.*, 2005) they said Intelligent Tourist Aid (iAiD) is an innovative idea that acts as an intelligent guide to a tourist wherever he may go. A tourist will bear a handheld device (his own cell phone or a PDA) which will communicate with strategically placed intelligent agents, which in turn will provide the tourist with information relevant to his location and his area of interest. Therefore, the use of centralized server communicates with all the distributed agents and controls the overall operation of the system through the implementation of intelligent guide system.

The field Geographical Information System (GIS) is rapidly expanding specially in the development of applications that manage and use geographic information in combination with other media (Fajuyigbe *et al.*, 2007). Therefore, it is very important in the tourism industry to get digital basic map, digital files for analyzing and mapping, digital files for mobile mapping and modeling, digital multimedia (Jovanovic and Njegus, 2008).

THE CATEGORIES OF TOUR GUIDES

It is essential, before mentioning the categories of tour guides to differentiate between some concepts, since the titles are different in term of definitions and roles, but they are often wrongly used interchangeably. The European Committee for Standardization (ECN) (CEN, 2009) defines Tour Manager as A Person who manages an itinerary on behalf of the tour operator ensuring the program is carried out as described in the tour operator's literature and sold to the traveler/consumer and who gives local practical information. There are three main categories of Tour-Guides and the titles are different, these are:

- **Local-guide:** Those who work at a particular site
- **Regional-guide:** Those who work in a region
- **National-guide:** Those who work nationally

The internet now makes it possible for the public to schedule their trips. While there are still many travel agents, incentives once offered by airlines, hotels and car rental companies make the occupation less profitable? Today's travel agents often book long or complicated trips, while the weekend getaway or quick business travel is scheduled individually on-line. Tourist's guides are often the only group at a destination with whom tourists interact for a considerable amount of time (Salazar, 2005). They must be aware about their long-term impact of the tour they led and the destination they present, instead of providing short-term enjoyment. Since through their narratives, presentation and interpretation they create sense of place and strengthen or weaken a destination's image. Wang *et al.* (2004) and John and Wong (2001) agreed that the success of the tourism industry very much depends on the performance of tour guides in each destination. In addition, they asserted that the tour guides are one of the key front-line players in tourism industry, who have the ability to transform the tourists' visit from a tour into an experience and, who provide the moment of truth for tourists (Kiper and Arslan, 2007). Therefore, the proposed system will be as tour manager and also covers all the functions of the three types of guides mentioned above concentrating on the functions of local guide.

SCENARIOS OF HUMAN BEHAVIOR

Most of the tourism organizations are employed people as tour's guide and as mentions in the previous section there are three types of tourism guides, but the most importance tour's guide is the local guide. Therefore, the scenario of human behavior as a local tour's guide can be extracted from his characteristics. This type of guide usually employed from the region and has the following characteristics:

- Has the loyalty and love the region and his job as guide and some time don't care to work volunteer
- Very well knows the historical region
- Some time knows many languages either spoken or body languages
- Knows many stories related with the region
- Helpful and has good common sense
- Respective person in the region

Therefore, in order to implement the proposed intelligent tourism guide, it is necessary to gather the knowledge from such peoples, so the most important phase is the knowledge acquisition and elicitation of knowledge. There are many methods used for knowledge acquisition and elicitation but the most importance and

suitable one for this system is the interviewing. In order to get good knowledge and adequate, those local tour's guides should be given support.

ARCHITECTURE OF INTELLIGENT TOURISM GUIDE SYSTEM

Most people know the term artificial intelligence concerning about how to build intelligent machine. This machine should have certain capabilities such as: behaves like a human being, smart, problem solver of unstructured and complex problems as human does, understands languages, learner and able to reason and analyze data and information and so on. Therefore, must design a machine behaves as human beings; this means that the machine must do all the activities that human does during his life, such as expert system where a trial is made to embody experts knowledge in certain domain in a computer program for carrying out some task, vision for dealing with three dimensions world represented together with the intend and the expectation in the scene, speech to replace the keyboards for dealing with computerized Natural Language Processing System (either written or speaking), perception, recognition, analysis, deduction, induction and so on (Jackson, 1999). This machine is smart; this term usually has many meanings in the English language; so, the meaning is concerned with Intelligent Machine to be smart, psychologically, smart means everything gives pleasure and happiness to humans, through the facilities available in all sort of multimedia equipments. Also, this machine is problem solver of unstructured and complex problems; in this context human usually solve algorithmic and non algorithmic problems and most problems are non algorithmic, therefore must be consider methodologies for representing the non algorithmic problems in a form that enable people to develop a problem solving methods. This capability is the most important and most of the pioneers of AI, are concentrating on them (Barr *et al.*, 1990; Winston, 1992; Boden, 1996; Luger, 1999).

So, the architecture of intelligent tourism guides system, as shown in Fig. 1, is a mimic of the functional model of human system, which has been presented by Owaied and Mahmoud (2007).

User interface: The user interface simulates the communications facilities available to be used for interaction with the proposed intelligent tourism guide system. This means an information processing system of one of (vision, speech, hearing, touching, tasting) or specified protocol many be used to connect the proposed system to another computerized system.

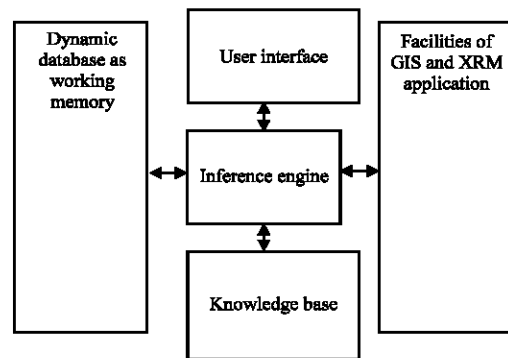


Fig. 1: Architecture of intelligent tourism guiding system

Usually the chosen method or methods to interact with the system will be based on format used for the representation of knowledge base in the knowledge base system. So, the formats used in the proposed system will be a hybrid scheme of rule base and case base (Owaied and Qasem, 2008).

Knowledge base: The knowledge base represents the repository of knowledge for specific and narrow domain for the knowledge based system. The design and implementation of any knowledge base system usually depend on the representation forms used for the knowledge. There are many forms used for knowledge representation by human and usually combination of them, but the already used are limited such as rule base, semantic nets, frame, logic forms and case base. So, the most important part of knowledge based system is the knowledge base and the power of any knowledge based system and expert system inherently in the adequate and integration of knowledge representation forms used for the particular domain (Chan *et al.*, 2000). In this sense, the most important phase in building knowledge based system is building the knowledge base; this process is part of knowledge engineering which is an important field at present century. In reality, human experts have common sense, deduction and analogical reasoning facilities. These three facilities are not included in one knowledge representation scheme, since the logical deduction in the rule base, analogical reasoning in the case base and the common sense can be applied using blackboard. Therefore, the proposed scheme is the mixing of the rule-base and the Case-based forms using blackboard in order to include the three facilities in one scheme (Owaied and Qasem, 2010). This Scheme will be facilitate applying more than one problem solving methods and search techniques during the design of inference engine for the proposed intelligent tourism guide. This view is based on the philosophy of human memory organization and utilizing for solving problems.

Table 1: Presents layout of a rule in the table

Col-1	Col-2	Col-3	Col-4	Col-5	Col-6
A	C1	C2	C3	C4	C5

Since, human represent his knowledge in more than one form in order to be more efficient to solving a problem, also it's found that for any domain the knowledge can't be in one form (Owaied *et al.*, 2009).

The relational database has been used to represent the rule as table. The rules will be stored in a table format with the maximum of number of column are k, for example if k = 6, then (Col-1, Col-2 ... Col-6), as shown in Table 1. The first column represents the left-hand-side of the rule, which is the conclusion of a rule usually called action (A) and from column-2 to column-6 are used to represent the conditions of the rule (C1, C2... C5), so this rule will be as Horn clause presented as:

$$A \leftarrow C1, C2, C3, C4, C5$$

In this view assume that any rule has maximum conditions are 5, but if a rule has more conditions, then the sixth column will be sub-action which has the reset of the conditions and so on. In this case the representation of knowledge is procedural representation not declarative representation.

Facilities of GIS and XRM application: GIS is used to display and analyses spatial data which are linked to databases. This connection between spatial data and databases is the driving force behind the working of a GIS. Therefore, any map may be drawn from the database and the data can be referenced from the map. So, when the database is updated, the associated map also gets updated.

In the case of application of GIS in tourism, the GIS database includes a wide variety of information including geographic, social, political, environmental and demographic data. The use of GIS will provide the intelligent tourism guiding system the following facilities (Turk and Gumusay, 2010).

- Determination of important and necessary places for tourism
- Determination of historical and tourist places
- Determination of the best suitable hotel
- Determination of the optimum plan for sightseeing places
- Determination of the shortest distance between the selected places

Also, Jovanovic and Njegus (2008) said that GIS provide:

- A digital map base for printed maps
- Digital files for Internet mapping
- Digital files for mobile mapping
- Attractions map
- Website with interactive mapping

The XRM, eXtended Relationship Management or Anything Relationship Management, is a strategy that takes Customer Relationship Management (CRM) one step further, focusing on managing all relationships-not just those with customers. The X in XRM stands for All. XRM provide a comprehensive, unified system for all aspects of business. The XRM encompasses applications and business practices that go beyond traditional CRM functionality. The X stands for a variety of applications that are tightly integrated and are used to manage internal and external transactional relationships. Therefore, the XRM is a strategically an approach to understanding what makes a business thrive, what information needs to be tracked, by whom and how it needs to be displayed and leveraged to facilitate better decisions making. Using the XRM do not have to make important trade-offs between buying packaged or building specialized line-of-business applications, because XRM offers an end-to-end, line-of-business applications development platform that combines the best of both worlds. In this context we believe that the XRM enables organizations to build any number of end-to-end line-of-business applications rapidly and cost-effectively. The XRM allows organizations to build many applications on a single platform with shared resources and infrastructure through the platform capabilities which allowed the organizations requirements quickly deliver multiple customized line-of-business applications while taking advantage of shared infrastructure and resources (Why XRM, 2010).

Dynamic database: This part usually is empty at the first but during the execution of the system this will be a collection of the assertions and data. The assertions are generated from the processes of the cooperation between the knowledge base and the interaction between the users with the system. The data provided by the facilities of GIS through the XRM application in order to be used by the problem solving method which is part of the inference engine. Therefore, the dynamic database can be regarded as working memory. Since, the GIS technology is a computer based data collection, storage and analysis tool that combine's previously unrelated information into easily understood maps according to the user requirements. The GIS can perform complicated analytical functions and present the results visually as maps, tables

or graphs, allowing the inference engine to visually see all these types of media before processing them and then select the best course of action according to the user requirements.

Inference engine: The inference engine was playing the most important role in the construction of functional model of human system as mentioned by Owaied and Mahmoud (2007). But its implementation depends on the format of knowledge in the knowledge base of the knowledge-based system. Therefore, the implementation of the inference engine will be regarded as a combination of problem solving method, reasoning agent and search technique.

Unfortunately, it is difficult to implement general problem solving method for any field, or a general search technique for any field also. The reasoning agent is responsible to accept sophisticated queries concerning general knowledge to deduct specific knowledge in order to use by the problem solving method and the searching technique. The power of the solver reasoning agent can be increased by implementing a larger number of solvers and by enhancing their capabilities to solve complex tasks. The use of case base format will be facilitates the analogical reasoning and the use of rule base format will facilitates the deduction during the process of solving a problem. The uses of dynamic memory together with analogical reasoning will a simulation of the common sense of human beings. Therefore, the inference engine is a simulation of human behavior for solving a problem using the activities of deduction, analogical reasoning and common sense (Owaied and Qasem, 2010). The dynamic database will be used by the heuristic search technique in the inference engine as heuristic information to retrieve the appropriate knowledge from the knowledge base, which is either case or rule. If it is case the action of the case will be taken, but if it is rule then the rule will be apply and finally a conclusion will be given. The problem solving method used in this project is the problem reduction method and solves the problem using one of the ten facilities provided by the GIS and XRM accordingly.

CONCLUSION

Since, the use of knowledge-based systems and expert systems are dedicated in certain fields of application such as, Medical, Engineering, Control, Robots and Manufacturing. In this study, conclude that, the cooperation between the knowledge-based system with the facilities provided by the application of GIS

and XRM. This integration will enhance the use of information technology in many fields, such as Tourism, Business, Media Art and other fields.

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