

Design and Development of MDOE for Virtual Tourism Management for Elderly People



Dr Thangaraj M , Gomathi K.S.

Abstract: The unstoppable growth of the internet as a communication tool for travel and tourism poses greater challenges to tourism industries. Virtual tours have turned out to be an effective tool in engaging the customers with the Tourism companies. For older adults who wish to travel despite their age and disability, the real world becomes very wide and stifling. But they may be able to escape from this isolation to the degree through virtual reality. Technology has largely shaped the way tourism projects are marketed in the contemporary industry. The direct and lasting impact of the unprecedented growth of technology, particularly in the tourism industry is strongly felt in the Virtual Reality technology which provides extraordinary opportunities. The recent developments in information and communication technologies (ICTs) have transformed tourism rapidly, with impacts on all areas in Tourist's demand for Tourism management. Though aging process has adversely affected the physical health of senior citizen it can not little be their spirit and wish to travel to see places of interest. Health issues may also become a factor that arises during the trip they plan. Old people may be affected by environmental changes, climatic changes and changes in food, a factor that tourism providers should keep in mind while planning a tour. A virtual tour is a simulation of an existing location, usually composed of a sequence of videos, static images, sound effects, music, narration, and text. This paper presents Multi Disciplinary Ontology Engine (MDOE) which has been designed for elderly people in the way they wish to enjoy the travel experience. This paper specially focuses on how the virtual tour fulfills the desires of the senior citizens with various algorithms and satisfies them in the way they expect.

Keywords: Elderly people, Travel, Ontology, Virtual Tourism, Virtual Reality

I. INTRODUCTION

Virtual Reality technology provides extraordinary opportunities. The direct and lasting impact of the unprecedented growth of technology particularly in the tourism industry is very much obtainable. To put in a nutshell, internet has emerged as an and span able and integral part of tourism industry for gathering travel related information and more number of tourism businesses and organizations have begun to shift to online to serve the needy.

Revised Manuscript Received on 30 July 2019.

* Correspondence Author

Dr.MThangaraj*, Professor & Head, Department of Computer Science, School of Information Technology, Madurai Kamaraj University, India.

K. S. Gomathi, Department of Computer Science, Madurai Gandhi NMR Subbaraman college for women , Affiliated to Madurai Kamaraj University, Madurai, TN, India..

© The Authors. Published by Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP). This is an [open access](#) article under the CC-BY-NC-ND license <http://creativecommons.org/licenses/by-nc-nd/4.0/>

For older adults who wish to travel despite their age and disability, the real world becomes very wide and stifling. Health issues may also become a factor that arises during the trip they plan. Old people may be affected by environmental changes, climatic changes and changes in food, a factor that tourism providers should keep in mind while planning a tour. It is common for elderly travelers to take traditional food rather than shifting to new kinds such as fast foods, to avoid possible effects of diet change or to maintain the health condition. The pace and scope of a tour especially for travelers of the aged group needs careful consideration. Many travelers want to see as much as possible in their scheduled time, but the pace required may not be suitable for them as well. The aim of this work is to design an Ontology engine that consists of four ontologies which serve the elderly travelers to fulfill their desire of enjoying the virtual tourism and one ontology to get the user details. The wishes and interests of the elderly people fall into four classes. Some would like to know the history of a particular place in the text based format. Those who would like to enrich the historical and geographical knowledge of a place enrich their thirst of knowledge by reading the related text books; Some others are satisfied by just viewing the pictorial scenery and monuments of the places of their choices while some others require audio visual format to have a thorough understanding and knowledge of that place. Some would wish to experience the 3D simulation actively. A digital display device worn over the head can make viewing of 3D computer images possible and leads the user to semi-immersion or total immersion in a virtual environment. Immersion denotes the level at which someone engaged in a virtual environment senses the real world outside of it.

Some are in a position to visit places selectively yet, either because of their budget, or time constraint, or their physical conditions they are unable to be out for a long time. Some may not like to go somewhere where they have to wait in a long queue, or, site seeing at a hills, which they find it difficult to climb, or even in an open space, the weather condition of which may not suit them. So, instead of following the regular visits every tourist plans to see, these people, can have a brief reading over the various sites, they are about to see, and they can find the possibility of their ability and affordability to visit the place, or calculate how long it will take for them to visit the place. Text based, guidance is an apt way for such kind of people. Some would like to view pictures of a particular place part by part. Guiding the tourist, through photographs, is indeed a challenging task. Some may not have the patience to go through the complete text. Some of the travellers' may have a glance of the site they wish to include in their travel plan.



Design and Development of MDOE for Virtual Tourism Management for Elderly People

For them, any detail of the place doesn't matter. They have in their mind the view of the site, the beauty of the location and the beauty of the place which they want to be reproduce in photos. Travel photography has become an interesting new field, and a lot of travel photographers, register their photos of the different experiences they had at the places, their new angle of study about that place, a bird's eye view, a panoramic view, few candid shots, may interest many travelers to choose the place. Those who wish to have a vacation trip, with a motive to capture a lot of memorable places, will have an urge to have a view on the places they wish to choose. This type of photographs, will help them to decide on their vacation. Some would like to see videos of the particular place with some audio content which explains things clearly. Just like a travel guide, a complete video is created in a model of sight and sound format. The video covers the nook and corner of the place, while a background voice, keeps on explaining things, like the history of the place, or the heredity it represents, the value of the place, the period of construction, or the reason behind the idea to build such monuments. Red Fort in Delhi, The TajMahal in Agra, TheThirumalaiNaicker Palace in Madurai are the best examples of this kind. The video will give them a live experience, and may create an interest on the viewer to visit such a place, with a prior knowledge about it. The video may also include, the charges for various activities, or security measures, the enquiry section, the time it may take to complete seeing the place and all these can be personally visualized and decided. Some would like to experience the 3D simulation actively. A digital display device worn over the head helps such people as it leads the user to semi-immersion or total immersion in a virtual environment. Virtual Reality (VR) technology offers opportunities for a widespread consumption of VR tourism content. It also presents challenges to better understand the effectiveness of VR experience in inducing more favourable attitude towards tourism destinations and shaping intentions to visit. Planning and management, marketing, entertainment, education, accessibility and heritage preservation are the major areas of tourism in which VR may prove particularly valuable. There are three key points considered as the success of Virtual Tourism. First, the feeling of being in the virtual environment increases enjoyment of VR experiences. Second, the heightened feeling of being there results in stronger liking and preference in the destination. Third, positive attitude change leads to a higher level of visitation intention. Tourism practitioners should endeavor to develop useful and easy-to-use 3D platforms that facilitate trip planning. By enhancing the experiences in 3D tourism sites, customers are more likely to develop destination brand awareness. The MDOE system is designed to serve the elderly people to fulfill their thirst of acquiring travelling experience in the mode they wish to enjoy. The elderly people would like to experience the virtual tourism in any of the above mentioned modes. The VirtualTourist Ontology and InfoProvider ontology are the two major ontologies which act as client and the server respectively. The rest of the paper is organized as follows. Section 2 devoted to the related work. In Section 3, we describe architecture of the proposed MDOE system, Section 4 provides our system performance evaluation results. Finally in Section 5, we conclude the paper along with our thoughts

for further work.

II. RELATED WORK

This paper[1] describes a study of the development of a hierarchical ontology for producing and maintaining personalized profiles to improve the experience of visitors to virtualart galleries and museums. It then follows a basic Ontology Engineering approach to define classes for a cultural heritage virtual tour and to produce a Visitor Profile Ontology that is hierarchical and has static and dynamic elements. It concludes by suggesting ways in which the ontology may be automated to provide a richer, more immersive personalized visitor experience. With the recent advances in Internet and mobile technologies and infrastructures, there are increasing demands for ubiquitous access to tourist information systems for service coordination and integration. However, disparate tourist information and service resources such as airlines, hotels, tour operators, etc., make it difficult for tourist to use them effectively when planning their trips .Motivated by the emerging technologies of multi-agent information system (MAIS) and its ability to aid Internet and mobile users, together with semantic Web that can effectively organize information and service resources. In this paper^[6], a virtual travel agent system (VTAS), has been proposed which is built upon these technologies. In this paper[5], a scalable, flexible, and intelligent MAIS architecture for VTAS has been formulated with agent clusters based on a case study of a large service-oriented travel agency. Agent clusters may comprise several types of agents to achieve the goals of the major processes of a tourist's trip. How agents can make use of ontology from the semantic web that help tourists better plan, understand, and specify their requirements are well shown in thispaper. Virtual Reality (VR) has experienced a significant upswing of interest from researchers and businesses generally but also specifically from the tourism sector. However, qualitative research on tourists' experience of VR applications is scarce. Therefore, this study^[5] aims to explore tourists' experience of VR using the Lake District as a case study. 35 VR experiments and interviews with tourists were conducted and analyzed using thematic analysis. Findings showed a positive attitude towards the use of VR in the tourism context as tourists were fully immersed in the experience which appeared to influence their behavioral intention to visit the destination in the future. Tourism destinations are always seeking new and innovative ways to better market tourism offerings and increase tourism revenues. The paper ^[3] highlighted a future tourism marketing trend through the use of virtual environments (VE) backed by Distributed Ledger Technologies (DLT's) such as Block chain. VE is the umbrella term referring to virtual reality (VR), augmented reality (AR) and mixed reality (MR), also known as merged reality. Thevirtual reality market is said to be the next frontier in digital marketing and in recent years the tourism industry has slowly taken advantage of developments in the virtual space.



On the other hand, DLT's such as Block chain technology is bound to revolutionize and disrupt various business sectors such as the financial and supply chain management sectors, among many. The analysis suggest that VR based tourism utilizing DLT's can positively impact the tourism industry and provide a means for additional revenue. The work presented in [2] checks the travel motivation of Chinese outbound tourists at the levels of attributes, consequences and values based on means-end chain (MEC) theory and its associated laddering technique. Six major travel motivation chains were analyzed out of them two were given more important.. The two major travel motivation chains are a) respondents visit destinations that are familiar or have a 'better environment' because they want to feel 'the nature beauty ' and 'pleasure' and b) respondents want to visit various kinds of destinations, because they wish to gain experiences and knowledge. The research findings contribute to the travel motivation literature by identifying directed, hierarchically organized motivation structures with interconnected levels of attributes, consequences and values.

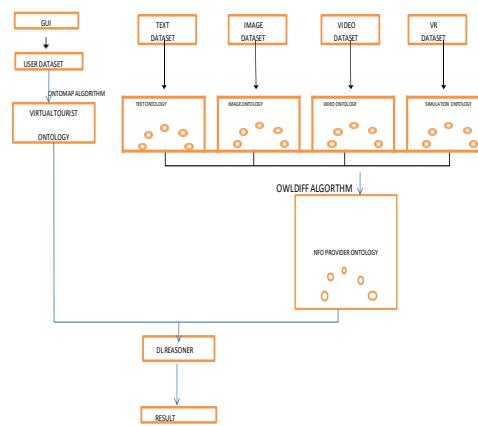
III . PROPOSED WORK

The name of the system which has been designed for Virtual tourism management is Multi Disciplinary Ontology Engine for Virtual Tourism. Basically the system consists of five ontologies. One is the VirtualTouristOntology(Client) which consists of the user (tourist) details and hence called client ontology. There exists one more ontology in the system which is termed as Info Provider ontology which is considered as the server ontology. The Info Provider ontology is obtained through ontology Integration of various system generated ontologies such as text ontology, audio ontology, video ontology and simulation ontology. The user is a senior citizen one who likes to travel virtually in any one of the above categories and therefore contacts this system for getting the virtual tour plan. The user needs to provide information such as the personal details, Tour Budget, preferred tour locations, Preferred mode to enjoy virtual Tour plan inGUI environment and all the values are mapped into ontology which is named as **Virtual Touristontology**.

Info Provider ontology generation can be done by integrating Four major ontologies mapped from various tourism websites namely text ontology, audio ontology , video ontology and simulation ontology. Each of which is created with the appropriate data they need and finally all these four ontologies are integrated to create Info ProviderOntology.

Figure 1 shows the architecture of the proposed work. It can be implemented in three phases such as Input Phase, Integration Phase and Execution Phase.

Figure 1 Architecture of proposed system



A. Input Phase:

The Senior Citizen data set related to Tour budget, preferred location , View Mode are obtained and stored in XL file and saved as virtualtourist.xls . The XL file contains the number of instances. VirtualTourist.json contains the mapping rules. Mapping rules are applied to the dataset contained in the VirtualTourist.xls and the axioms are generated and the same is imported to the owl file VT.owl. Thus OntoMap algorithm [4] is used to map the XL data into VirtualTourist Ontology.

B. Integration Phase:

Integration is a process of Integrating various ontologies syntactically and semantically using some ontology integration Algorithms. Four ontologies are taken based on the needs of virtual Tourists whose budget and time allow them to choose four Experience modes . To learn historical things related to the particular preferred location , Some wish to see the pictures that present a pictorial history and specialty of preferred locations. They may enjoy learning things through Pictures. Some tourists wish to view the videos of their preferred locations as well as they wish to hear about their preferred places. They also wish to hear voice messages while watching that. Some kind of users wish to experience the 3D simulation effect and they wish to thoroughly experience the reality with VR technology. For every kind of the preferred view mode, four separate ontologies are created namely text ontology, image ontology, video ontology and simulation ontology. The challenge lies on the Integration of all such Ontologies. To integrate the ontologies and make a unified ontology, some kind of algorithm is required. In the proposed work, the algorithm used to integrate ontologies is OwlDiff[4].

C. Execution Phase

Execution is a process of applying Description Logic query on the Integrated ontology based on users requests and evaluate the required view mode plan. DL Query is applied to evaluate tourist's preferences given in VirtualTourist ontology against tour plan information provided by the Info Provider Ontology.

Design and Development of MDOE for Virtual Tourism Management for Elderly People

The result of this phase is the virtual tour provided by the engine to the virtual user.

Sample DL query is given as follows

```
(VT-budget value 1200) or (virtual tour-budget value 1200) and (VT-viewloc value "Tajmahal"^^string) or (virtual tour-viewloc value "Tajmahal"^^string) and (VT-viewmode value "video"^^string) or (virtualtour-view mode value "video" string)
```

IV. PERFORMANCE ANALYSIS

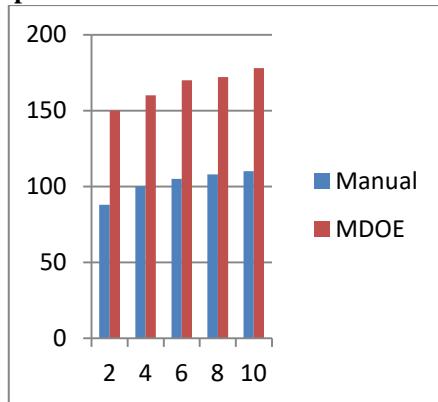
The performance analysis can be done with various experiments and explained with the resultant graphs as follows.

This new model has been implemented using Java 6.0, Net Beans 8 and Protege5.0 in Intel(R) Core(TM)with windows 10. The dataset used to test the performance of the architecture is taken from the various agent based virtual tourism websites.

Experiment 1: Satisfaction degree

The following graph in Figure 2 shows the satisfaction degree of the users based on the number of user requesting Parameters while using Proposed MDOE Virtual System and while planning manual Tour.

Figure 2: Satisfaction degree based on number of user request parameters



X-Axis shows the User Requesting Parameters ranging from 2 to 10 and Y-Axis represents the satisfaction degree in percentage ranging from 0% to 200%

User Requesting Parameters	Manual	MDOE
2	88	150
4	100	160
6	105	170
8	108	172
10	110	178

The outcome of the graph shows that the user finds 80% of more improvement in satisfaction while enjoying MDOE Virtual tour plan

Experiment 2: Time Effective

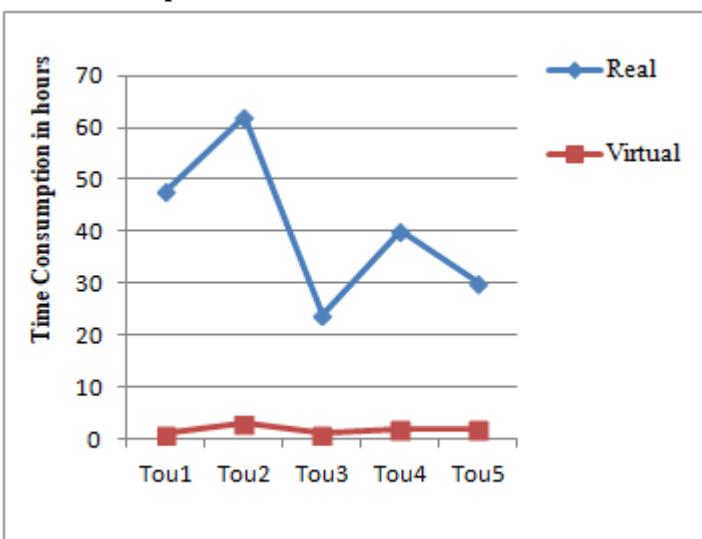


Figure 3 : Time Effective

Figure 3 explains the Time saving level of both real tour and Virtual tour. X axis shows the Tourists who experienced both real time tour and virtual tour and Y axis denotes the hours taken to experience both the tours ranging from 0 to 100 hours. It is inferred that Virtual tour proves 90% of improvement in time saving while compared to real tour

Experiment 3: Cost Effective

Tourists	Real	Virtual
Tou1	48	1
Tou2	62	3
Tou3	24	1
Tou4	40	2
Tou5	30	2

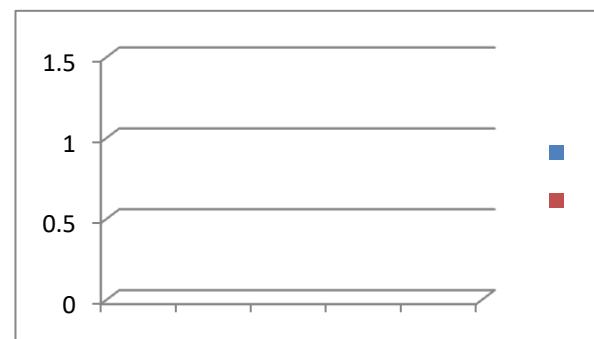


Figure 4 Cost level by five Elderly Tourists

Tourists	Manual Tour	MDOE Virtual Tour
Tourist1	80	15
Tourist2	85	15
Tourist3	75	10
Tourist4	90	20
Tourist5	90	15

Figure 4 shows that the cost consumption level of five elderly tourists who enjoyed the manual tour and MDOE Virtual Tour. X-Axis denotes the five tourists and Y axis represents the cost consumption level in percentage ranging from 0 to 100%. The outcome of the graph shows that there is 80% of improvement in cost saving in MDOE Virtual tour when compared to the real time tour.

V. CONCLUSION

The semantic web has been considered very important for virtual tour planning. The ontologies developed in this research especially the integrated ontology by combining four ontologies such as Text ontology, image ontology, video ontology and simulation ontology can help the elderly people enjoying the virtual tourism environment effectively. Mainly the approach used in this application recommends personalized suggestions for virtual tourism lovers especially elderly people who can not travel as the age fact.. This paper focuses on how MDOE provides virtual tour plans to the elder ones in the way they need. According to this kind of tourism, appropriate needs of the elderly tourists will be fulfilled by providing the necessary things such as i) text based ii)Image based iii)Video based iv)simulation based tourism experience that gives them entire satisfaction. The comparative study has been taken in various ways and it has been proved that MDOE serves Elderly people with the satisfactory virtual tour plans. In future, Artificial Intelligence technology can be combined with virtual tourism and the system can be made further more efficient and effective.

REFERENCES

1. Alan Eardley Denny Ashe Bobbie Fletcher ."An Ontology Engineering Approach to User Profiling for Virtual Tours of Museums and Galleries",Research Gate June 2016
2. Jiang, S., Scott, N. & Ding, P. "Using means-end chain theory to explore travel motivation: An examination of Chinese outbound tourists",Sage Journals, May 2014
3. Mac Mofoeng ,T.K.Matima "Future Tourism Trends: Virtual Reality based Tourism utilizing distributed Ledger Technologies ", Research Gate July 2018
4. Thangaraj M. GomathiK.S,Gnanambal S. " Design and Development of Multi Disciplinary Ontology Engine for Integrated Tourism Management", International Journal of Scientific Research in Computer Science Applications and Management Studies,Volume 8, Issue2, March 2019
5. Timothy Jung et al, "Tourists' Experience of Virtual Reality Applications "IEEE International Conference on Consumer Electronics", At Las Vegas, Jan 2017
6. Yves T.F.Yueh et al "A Virtual Travel Agent System for M-Tourism with Semantic Web Service Based Design and Implementation" IEEE, Canada21st International Conference on Advanced Information Networking and Applications (AINA '07), Canada 21-23 May 2007

AUTHORS PROFILE



Dr.MThangaraj, Professor & Head, Department of Computer Science, School of Information Technology, Madurai Kamaraj University, India.M.Thangaraj received his post-graduate degree in Computer Science from Alagappa University, Karaikudi, M.Tech. degree in Computer Science from Pondicherry University and Ph.D. degree in Computer Science from MaduraiKamaraj University, Madurai, TN, South India in 2006. He is now the Professor and Head of Computer Science Department at Madurai Kamaraj University, Madurai,Tamil Nadu. He is an active researcher in Big Data Analytics, SocialMedia Analytics ,Semantic Web, Digital Image Processing, Wireless Sensor Networks and has published more than100 papers in National and International Journals and Conference Proceedings thangarajmku@gmail.com



K. S. Gomathi, Principal & Head, Department of Computer Science, Madurai Gandhi NMR Subbaraman college for women , Affiliated to Madurai Kamaraj University, Madurai, TN, India.. K. S. Gomathi received her post-graduate degree in Computer Applications from Madurai Kamaraj University , Madurai in 2009 and M.Phil. degree in Computer Sciencefrom PRIST University, Tanjore in 2011 and Pursuing Ph.D. degree in Computer Science fromMadurai Kamaraj University, Madurai, TN, She is now an active researcher in Semantic Web and has published three papers in UGC approved International Journals . gomathi.kb@gmail.com