e-Tourism: Governmental Planning and Management Mechanism

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Abstract. This article proposes the development of a virtual application as a planning and government management tool, focused on the digitization of objects, monuments-buildings, and real environments using 2D and 3D virtualization techniques. The application considers two modes of use: PLANNER for use by managers and planners of offices and technical units linked to tourism; and TOURIST created for travelers, hikers or tourists in general. The first allows recreating new scenes incorporating objects that make it attractive to the tourist recourse, and thus achieve a projected image of the vision of development proposed by the planner; and the second designed to recreate touristic environments and program circuits, provoking a tourist avatar through HTC VIVE, Oculus Rift and GearVR Headsets to make the application available to the largest market segment of virtual reality viewers. In addition, the app allows the interaction of several users in the same scenario to exchange information and experiences of the place.

Keywords: Audiovisual stimulation · Wearable devices · Virtual reality Unity3D

1 Introduction

The universality of the use of Information and Communication Technologies (ICT) has allowed countries to develop their interconnection capacity, increasingly effective in times and distances in order to achieve speed of communication, information transfer and technological evolution. Through the use of the internet and other computer networks, it has been possible to generate greater and better communication flows in society, spreading, virtual communities that are formed, organized and promoted through online services, which according to Howard Rheinhold, in his book "The virtual community", are a society without borders, which are structured by social and relational aggregations in cyberspace around common interests, forming computer networks of communication [1–5].

The incorporation of technology and internet services in the tourism business have meant the characterization of e-Tourism, defined as a virtual society of travel agents and tourism managers that, through the use of ICTs, supported by the use of Internet

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and other networks, mainly social, allow interactions in multiple destinations and users, often in real time, to show the city's attractions or attractions as well as all the services that make up the tourist offer of the destination. Tourism destinations today must provide technological tools capable of offering interactive and dynamic information, especially when the evolution of mobile devices has caused a change in the way in which tourists interact and obtain information [6–9].

This reality leads to projecting new ways of planning and activating a tourist destination, since the intensive and widespread use of ICTs are increasingly necessary in the management of a company and destination. Virtual Reality (VR) and Augmented Reality (AR) begins to appear as an alternative technology for tourism because it allows the interaction of the subject with the physical and real world around super-virtual objects. With VR you can recreate natural environments and show cultural manifestations of a destination, expanding the real world scene, projecting its history, culture and showing complementary information through the RA; achieving the virtualization of spaces to promote tourism, according to the vision of the tourism manager and planner, as well as the characteristics of the tourist [10–12].

For this reason, the VR and AR is taking part in the actions and dynamics of the tourist destinations of a country, even more so when several cities are already incorporating digital information in the attraction sites so that they serve as support for the tourist during their journey and visit. This current situation means that tourism planning requires technological systems and tools that help to project tourist destinations and promote the characteristics of attraction and recreation of a city, region or country, so that through these projected environments make decisions related to the management of the destination; In addition, nowadays, technological services and facilities must be provided to help carry out activities at the visit site and give support to tourists during their stay [13, 14].

Therefore, this research proposes the development of a VR/AR APP for the virtualization of spaces with attraction and projection towards tourism, to be used in the planning and management of destination cities and natural areas for tourist visits. These trends pose a challenge: the incorporation of ICT in the planning and management processes of a tourist destination as well as in the design of products related to the VR and AR: Tourist Destinations 3.0 that will be deployed through a generated system by a computer and a technological application of multiple users and destinations, with the purpose of facilitating the design and formulation of new projects as part of the planning and management processes of a tourism space. In addition to promoting tourism products by immersing the tourist in fully recreated spaces of a destination, creating a "tourist avatar" with sensations and surrounding experiences around virtual scenes and computer applications [15–17].

This article is divided into 4 Sections: 1. Introduction, where ICTs are contextualized and the e-tourism approach, presenting the research problem; 2. Description of the System, which describes the operation of the application; 3. Results, where the experimental performance of the VR application oriented to the virtualization of tourist environments is presented; and 4. Conclusions of the investigation.

2 System Description

In the tourism industry, the idea of visiting destinations through virtual worlds is being promoted, where tourists are brought closer to the reality of their visit, by combining virtual information with real data, provoking an innovative experience with your mobile device; with which, a competitive advantage is generated, by managing your time and your visit program according to your needs and desires, moving away from the concept handled until today by tourist packages, since the use of ICT in tourism is leading to the trips are more individualized with more personalized experiences.

For this reason, this article refers to the development of an application in VR oriented to management of the tourist space as well as an aid for the tourist in the programming of circuits and travel itineraries. This section describes the operation structure of the VR application, using blocks: graphic composition SCENE VR, behavior coding of the SCRIPTS app and INPUTS/OUTPUT hardware, according to the graphic reference indicated in Fig. 1.

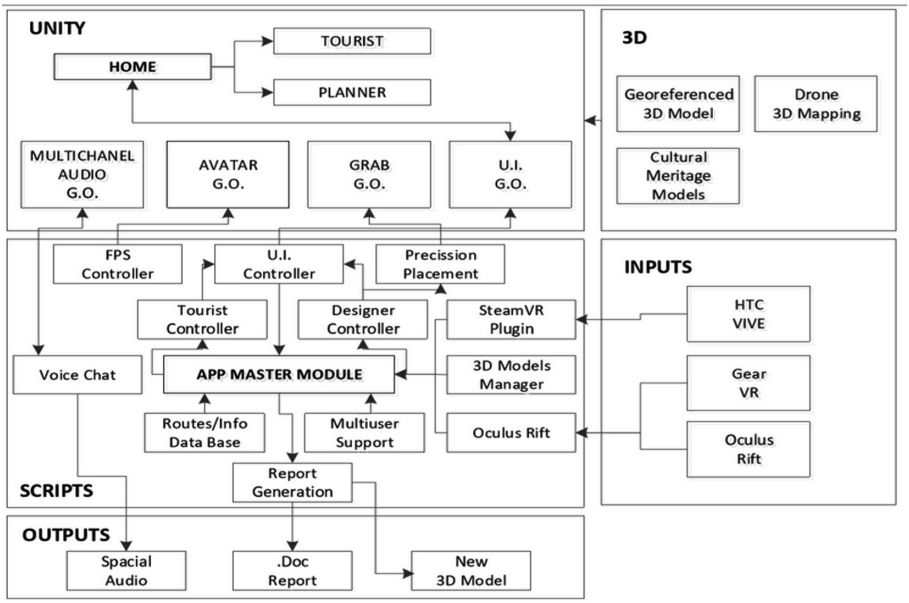


Fig. 1. Application operating diagram

The virtual development is carried out in the SCENE VR block, where the resources obtained in the 3D resources block are located and which are represented by generic blocks called Game Objects (G.O.). The main scenes are generated from a HOME module from which two components of execution and use of the application are deployed: PLANNER and TOURIST, which will allow to observe virtualized 3D scenes of the site and tourist resources. The resources used are grouped into generic G.O. modules: MULTICHANEL AUDIO, AVATAR, GRAB, UI, which allow the

user different ways of interacting with the environment such as recreating sound effects from the real world, manipulating objects through a virtual avatar, navigating by the available options of each environment, etc.

The programming of the interaction of the VR application is implemented in the control modules and execution of activities in the SCRIPTS block. The main module of the blocks is the Master Module app, which manages the resources and functions of the application through auxiliary modules that perform specific tasks. The SteamVR Plugin and Oculus Library modules manage the data generated by the user using HTC VIVE, Oculus Rift and GearVR devices. The behavior of each scene is given by the modules of Tourist and Designer Controller, the first one allows recreating visitor environments and programming tourist circuits through the consumption of information from the Routes/InfoDataBase module; and the second module modifies the virtualized environment by incorporating 3D objects into the scene, the result of editing the scene is stored in the Report Generator module.

The user is represented in the virtual environment by means of a customized avatar to navigate through the FPS Controller module; interact/visualize graphic and audible information through the module U.I. Controller; Place objects from 3D Models Manager to the environment that can be modified using the Precision Placement module, as appropriate for the chosen scene. Multiuser and Voice Chat modules interact with each other to create social rooms as a meeting point for several users to interact with the environment, and with each other. The modules share data of transform, animation and voice of each client with the host of the system in real time.

In the INPUTS block you can find the devices to access the virtual reality environments, each device has its advantages in each scene presented in the following way: HTC VIVE and Oculus Rift are focused on the Planner scene due to their large workspace and the fine tracking of the controls, while GearVR is ideal for the Tourist scene due to the mobility and ease of acquisition of the device that matches the segment of users you want to reach. Finally, in the OUTPUTS block, the spatial audio module is shown as a response to the user's interaction with other users and the environment, a textual response module and its graphic representation of the changes made to the environment through the 3D New Model.

3 Experimental Results

This section presents the experimental performance of the application of VR oriented to the virtualization of environments and tourist attractions of a city in order to be used as a tool for planning digital cities and government management, specifically the offices and units responsible for the actions of tourism in a city, region and country. For the present test of application and visualization of results, some tourist attraction sites of the city of Baños de Agua Santa in the Province of Tungurahua, a Priority Destination for the development of tourism in Ecuador, have been digitized.

In the technical section, the virtual reality headset is used: HTC VIVE & Oculus Rift (tethered) and GearVR (mobile). The gathering of information for the construction, projection and recreation of virtual tourist environments is done with the inventories of tourist attractions in the country, because they constitute an official register with

specific information that allow the selection of attractiveness based on their hierarchy (importance of visit), category, type and subtype. Information that feeds the database of the present application. When the app is run for the first time, a welcome screen is displayed and it lands on a home screen where you can see the usage modes: Tourist and Planner, Fig. 2.

Fig. 2. Screenshot of the app developed

Both to enter the Tourist and Planner mode the user is indicated that it is necessary to log in by filling out a basic information form to start the session in the multi-user server, see Fig. 3.

By choosing the Tourist mode the user can navigate within the reconstructed 3D environment of the tourist place by means of a preloaded touristic circuit. The circuit shows the user the stops of the so-called "The route of the waterfalls", in which each point of interest shows information (directions, signage of trails), animations and sounds (waterfalls, the wind blowing through the branches of the trees, local fauna, etc.). The lighting and effects of the environment are affected by the current time of the tourist place and its weather forecast in real time. The conjunction of these variables makes the visit become a unique and different experience in each execution (dynamic environment) see Fig. 4.

Immediately the user is at the starting point of the tourist circuit. An information balloon serves as a guide for the user throughout the tour (as a tutorial) to avoid disorientation and ignorance of the next step to follow, see Fig. 5. If the user wishes, he can deactivate the balloon of indications and perform an autonomous tour through the circuit.

While the user is doing the tour, he can relate to other tourists who are using the app in real time by using gestures with the headset controllers (HTC VIVE and GearVR).

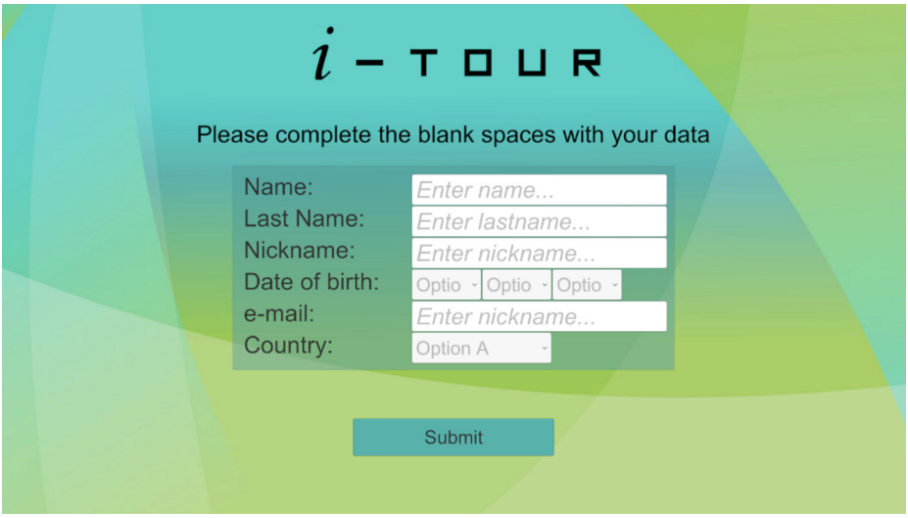
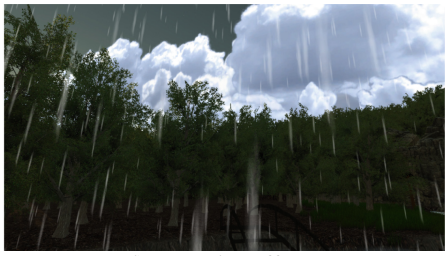


Fig. 3. Login form data

a) Information and signaling

b) Waterfalls and fauna of the place

c) Environmental lighting



d) Weather effects

Fig. 4. Graphics functionalities of the tourist scene

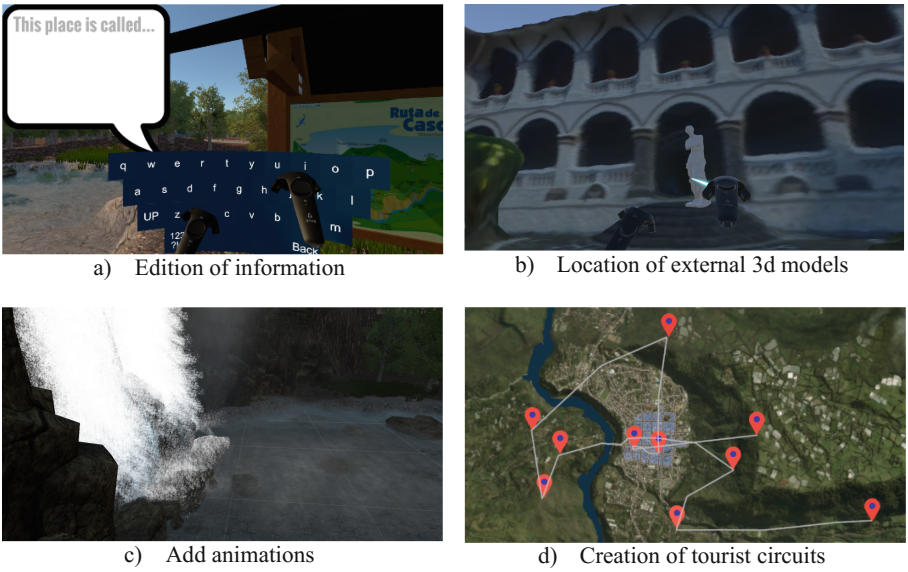
The system also allows to listen and speak to all the users who are near the sender of the message and see the nickname and origin of each connected tourist. See Fig. 6.

The Planner mode allows the user to edit the surface-graphic features of the digitized environment. Inside the virtual reality environment, the user has tools to add:

Fig. 5. Information balloon in the tourist scene

Fig. 6. Multi-user view in the tourist mode

information, external 3D models, animations and new touristic circuits, see Fig. 7. These tools are available from the user interface and accessed through the device's Controllers.



a) Edition of information

b) Location of external 3d models

c) Add animations

d) Creation of tourist circuits

Fig. 7. Planner mode editing tools

4 Conclusions

In this article, a virtual reality application was developed in order to manage and plan tourist destinations; the development of the application considers general virtual environments that allow the interaction and immersion of multiple users either to obtain tourist information and formulate new projects as part of the planning and management processes of a tourist area. The results presented show the correct performance of the developed application, in which multiple users can interact with each other, virtual environment and the tools to edit it.

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