Mobility platform for video content with Augmented Reality

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Abstract— **Augmented reality is to include multimedia elements in real images captured from the real world. Nowadays mobile devices allow visualizing of high quality multimedia elements and processing video, images and information like a personal computer. The inclusion of augmented reality applications in the mobile devices is growing but so far it has not been massively exploded. Developing games is one of the major applications of this technology. Gymkhanas, guided tours or treasure hunts are funny games that can be improved by the application of AR. However there are not tools that allow the final users for developing their own games. This paper presents an ongoing work that aims to develop an online framework for creating augmented reality games for mobile devices which allows the user for creating their own games sharing them with other people. The application of this tool will not be only focused to gaming: training programs, fire prevention or guided tours could be developed in an easy way.**

Keywords- Augmented Reality, Developing Tool, Mobile Devices, Games

I. INTRODUCTION

The Augmented Reality (AR) technologies are being integrated gradually into mobile devices, enabling the creation of increasingly sophisticated games and other useful applications for day to day. From the point of view of video games different proposals aimed at introducing real game virtual items has been developed. However, the authors didn't find an approach that allows the user to define their own game, in their environment and their own goals, and simultaneously seek interaction with users of different devices.

In addition, consumers of digital media content in the form of games are usually accustomed to playing on scenarios and pre-defined objectives. AR allows the use of related real spaces for users to define different stages of a game. Although there are games that take advantage of these real spaces, there is not a tool that facilitates the user to create their own game without having deep technical knowledge. The approach of this technology to the user opens the ability to benefit from the advantages of AR in everyday situations, either as a game or, as already mentioned, for the definition of simulation and guides. Besides the creation of an online tool enables collaboration of multiple users from different locations and facilitates the publication and access to content through a web server. On the other hand, a tool for development this type of games will to facilitate to companies the creation of content for mobile devices and the possibility of quick development of AR-based games.

II. LITERATURE REVIEW

Augmented reality consists of expanding the reality captured by image information generated by computer. The areas of application of this technology are very different but the content creation tools for these technologies are usually single-user desktop applications.

Originally virtual reality was used as a technique for rehabilitation in different areas. Thus, Wilson and others assert that the main benefits of applying these techniques involve the ability to create activities in a simulator, without the limitations imposed by their disability, to allow the people with disabilities to perform them safely [2]. For example, such exercises can be simulated in a kitchen without the dangers associated with it (fire, etc.). There have been various approaches to therapy based on virtual reality, e.g. Jack et al. propose a virtual reality system in which the patient can perform the exercises from two gloves that allow interaction with the system [3].

Furthermore, AR presents a promising future, being an emerging technology with interesting potential applications in many domains. Among them, the entertainment, and more specifically the videogame, takes an important place. This alternative is conceived as computer software created for entertainment in general and based on the interaction between one or more persons with an electronic device that runs the game. The video game market is one of the emerging sectors of the communications industry and entertainment, exceeding its sales to the cinema in some countries [4]. Taking these data into account it is understandable that companies are betting in a clear way for AR in this field, since this technology offers very attractive possibilities for end users

Despite the global crisis the fall in sales in Spain is below than the rest of Europe [4]. In this sense in recent years, AR has made its way into the game technology, thanks in large part to the great evolution of gaming

technology and the great competition among the companies. The inclusion of reality factor in the computer image makes the exercise gain in credibility for the end user compared to the previous solutions based solely on virtual reality. Today there are increasing examples of commercial video games based on this technology. Global dimension companies such as Sony Computer Entertainment with Invizimals [1] have made contributions to this technology for different consoles platforms. Other attractive AR solution developed for mobile devices is Can You See Me Now? of Blast Theory [6]. This is an online game of persecution on real streets of different cities based on locations obtained from GPS devices. Another important project was the Project ARQuake [7], adaptation of the popular video game to be played in real locations. Even newly emerging platforms such as Android or iPhone begin to take advantage of AR to provide the end user a different experience and advantageous. An example is Wikitude World Browser which allows from an Android device plan trips and find content of interest about the user's environment through information from Wikipedia and Qype [8]. Finally, Augmentizer for iPhone provides information of reality through labels that identify points of interest (POI) via the mobile phone [9].

Regarding the generation of AR-based effects, there are several tools that will facilitate the creation of applications and tools with these features. With these toolkits, developers will be able to comprehensively implement AR experiences, from initial concept or idea to final product delivery. Atomic [10] is a tool that allows you to define patterns that will be recognized from the image of a webcam to be replaced by virtual images. Similar tools asDart [11] or BuildAR [12] or programming libraries like OSGART [13] facilitate the creation of AR-based effects that can be integrated in other projects and applications, enabling integration of software architectures under the same solution. However, none of these tools allows online development with the collaboration of multiple users.

With respect to existing devices, an essential component of AR is the camera. Currently, over 30% of the installed PC has a webcam. In 2008, the web camera market was valued at 1,500 million euros, and forecasts for 2015 are to achieve a growth of over 2,500 million. Laptops manufactured in recent years, incorporated in most cases a web camera. Moreover, all 3G-based mobile phones have video cameras. The latest generation of consoles (Xbox 360 with Kinect, Play Station 3 with the move motion controller, Wii ...) allows the acquisition and use of webcams. The new generation of consoles, including portable (e.g. Nintendo 3DS, PSPgo, PSP-3000, and iPhone4 and Sony Ericsson Xperia Play), also included standard video cameras. The functionality and the use of these webcams is very limited, sticking exclusively to the videoconference and to take pictures, but the number of webcams installed is very significant, with expected growth in coming years. This is a great opportunity for the application of AR to enhance the appearance of new applications and services based on these devices, since this technology is based precisely on the capture and image processing for generating real-time image synthesis seamlessly integrated with reality.

III. PROPOSED SOLUTION

A. *INTRODUCTION*

The aim of this research is to develop an online platform to for creating AR games which requires the interaction between mobile devices. It is a complex system that requires the development of complex components that must be integrated together.

AR is to introduce virtual reality elements into real-world images, providing additional information. This technology has been applied in the video-games area offering advanced video-games. The evolution of mobile devices has opened a new world of possibilities in the creation of AR applications: from guides of museums to driving assistants. The bandwidth of mobile communications to the Internet grows with the technology of the new devices, allowing the reception of data in reasonable time and providing with more possibilities of communication and processing. However, the technologies of the mobile devices are heterogeneous and most of the developments are device dependents.

The development of the components required for the execution of games in mobile devices is direct consequence of the requirement of probe that the proposed development framework works properly.

The proposed technology will allow users without technical knowledge for the development of personalized games. The games developed are not restricted to leisure aims: it can also be used as professional training in role-playing or simulation (especially simulation of situations of risk), or as an assistant for mobility. Thus a simulation of the evacuation of a building in a fire emergency could be defined. Each player with a mobile device with a camera could visualize the images of the place in which the game is played. From the central server, each player would receive the information about virtual obstacles or hints about the best way to go.

Achieving the aims of this research implies the validation of the idea of an operative framework as is, as well as the establishment of the basis for the development of a generic technology for defining AR video-games that allows the integration of several players with different devices in the same activity guided by the rules of the game. It allows the user for taking part in a real-time collective game without technological restrictions.

B. *FRAMEWORK ARCHITECTURE*

This project is based on creating a platform for developing and publishing online games based on AR. The aim of the game defined could be different than

recreational purposes: as mentioned, it can be used for simulation exercises or tests emulating risk situations difficult to obtain in the real world.

As shown in the literature review, there are games based on the movement in a defined environment. However, these games are invariables, meaning that either the goals or the field must always be the same. While there have been found development frameworks for AR, they are not intended for non-technical users or developments in an online platform where multiple developers can participate. The other feature of the game is that a director, in real-time, is interacting with the players to lead the achievement of the objectives of the game.

The main components of this framework are depicted in Figure 1. The main feature of the games is that they will be directed from a central computer via a game server component from which the information is sent to various players involved in the game. Players, with heterogeneous mobile technology, will capture images of where they are. Through cameras that incorporate such devices. The elements that are defined for the game, and other elements the director of game want to send, will be included in these images by means of the mobile client component.
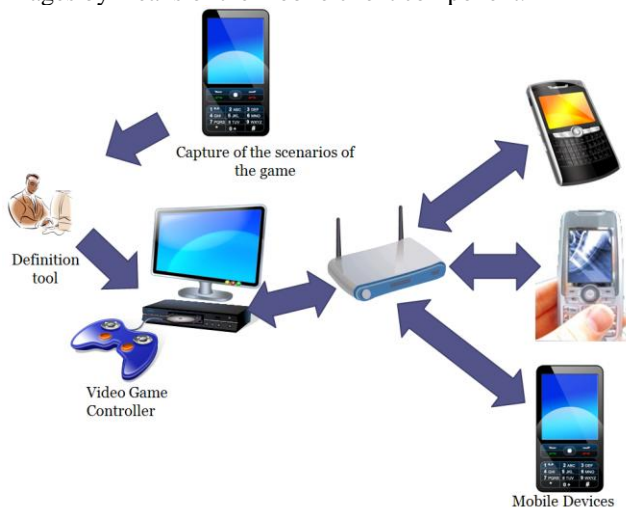

Figure 1.   General architecture: components of the complex system.

The demonstration of the validity of the proposed framework will be made on a game server component, which will include an element of control for the game director, and a client component of the game for Android platforms. Figure 2. depicts the sequence of game definition from a set of base components.

The development framework will be based on a Model Driven Architecture (MDA). The foundation of this architecture lies in the definition of the games in a device-independent way, so that performance on specific devices will be based on the interpretation of the generic definition of the game. It will allow the execution of games in several existing platforms as well as future platforms, by means of specific components for each architecture. Furthermore,

modelling each game in a device-independent way facilitates the creation of different generic components that can be used for different games on different platforms. It will also ease the process of setting up each game without device-dependent considerations.
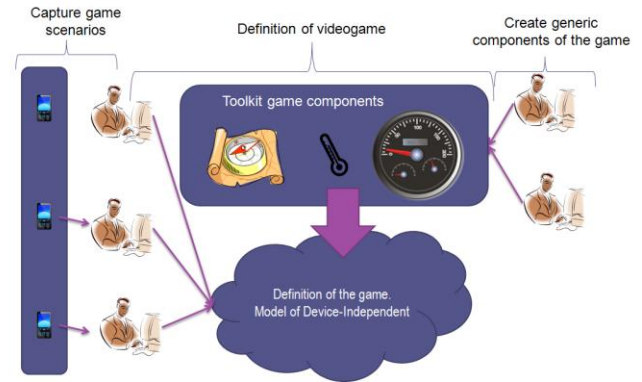

Figure 2.   Process for defining the game (device-independent)

C. OPERATION STEPS

1. The first step is to define the scenario in which the game will take place. Since the game can be defined in the place that the user decides, it is necessary to establish a set references that can be used later to define virtual elements on them.

2. After obtaining the images and / or geographic positions in which the elements of the game will be introduced, the user will enter this information on the game development tool. With this tool, the user defines different virtual items to be entered into the game and which ones are the goals of the game (get to a certain point, find a certain number of elements, etc.).

3. Once the game has been defined, the execution module will register the devices that will participate in the game and establish the communication between them. The defined game is loaded in the game control server. Each device read the model by means of the execution component. This component adapts the independent model to the specific device in which it will be executed. From that moment, the devices will send their GPS position and will receive the elements defined based on their position.

4. The master of the game, from the control tool, could monitories the position of the players.

5. In real time, the master of the game can sent messages and other non previously defined elements to the players. In this way the game is more dynamic and can be adapted by the master to unexpected situations.

The communication between devices is done through a network connection, either wireless or mobile phone connections, depending on the characteristics of the device. Initially there are no restrictions, except that

technical analysis or further field tests determine significant constraints on the connection requirements.

IV. CONCLUSIONS

This paper has introduced the work in progress on a novel framework for developing games based on mobile technologies and AR. The impact of the proposed framework in the market is twofold: on the one hand it can become a professional development tool for providers of mobile services; on the other hand a restricted version aimed at home users can created their own games.

Moreover, the component for defining the games will bring the creation of AR-based content to users without much knowledge of computers, so they can create their own games in the environment they prefer without having deep knowledge about 3D technology, AR and, of course, without any programming.

The nature of this research is clearly horizontal because this technology is not only focused on games based on AR but also it can be applied as discussed to create simulations that allow training evacuation plans, defining guided tours including POI information, or including advertising elements. In short, the platform opens a new world of possibilities for creating AR content and for its distribution in mobile devices with heterogeneous technologies.

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