Athens Institute for Education and Research
ATINER

ATINER's Conference Paper Series
EDU2017-2407

Virtual Reality Head-Mounted Display Used In Online & Distance Education

Michele Domenico Todino
PhD student
University of Salerno
Italy

Stefano Di Tore
Researcher
University of Salerno
Italy

Giuseppe De Simone
Researcher
University of Salerno
Italy

Maurizio Sibilio
Full Professor
University of Salerno
Italy

An Introduction to
ATINER's Conference Paper Series

This paper should be cited as follows:

Todino M.D., Di Tore S., De Simone G., and Sibilio M. (2018). **"Virtual Reality Head-Mounted Display Used In Online & Distance Education",** Athens: ATINER'S Conference Paper Series, No: **EDU2017-2407.**

Virtual Reality Head-Mounted Display Used In Online & Distance Education

Michele Domenico Todino
Stefano Di Tore
Giuseppe De Simone
Maurizio Sibilio

Abstract

In recent years, online education has become an enhancement to traditional methods, allowing people to learn at a distance. Internet web applications, 3D digital environments and virtual reality devices give new opportunities in teaching-learning processes. Starting from this consideration, the Department of Humanities, Philosophy and Education of the University of Salerno and The Virtual Archaeological Museum of Herculaneum signed a scientific cooperation agreement oriented to develop and implement methods, tools and inclusive educational technologies. In particular, virtual reality spaces have been designed to create educational settings in line with the Universal Design for Learning approach. Using the Unity3D game development platform and state-of-the-art graphics, which are comparable to contemporary video games, a 3D model of Villa of the Papyri in Herculaneum was recreated. The next phases of the project include the development of an edugame in this 3D model, which can be used in online and distance modes. Through virtual reality and head-mounted display (Oculus©) device, students will be able to learn history, philosophy and architecture of ancient Romans. In addition, having the ability to download or play this online edugame, students have the opportunity to learn at a distance, visit places far away in space and in history, which may now have disappeared. Besides, students can use these virtual reality media anytime anywhere, with the convenience and cost effectiveness of distance learning.

Introduction

In recent years, online education has become an enhancement to traditional methods, allowing people to learn at a distance. Internet web applications, 3D digital environments and virtual reality devices give new opportunities in teaching-learning processes.

Computer science and technology in the new millennium, compared to the period between 1960 and 1990, have been left the idea to create artificial intelligence systems to reproduce the human mind, through models that simplify our cerebral system (Rossi, 2011), they are concerned, instead, to implement expert systems that are "Smart" machine- human interface. It is interesting to focus on Learning World, through virtual reality systems, where Intelligent Tutoring System (ITS) lead students in educational experiences.

This line of research can bring out a strong synergy between technologies used in education and artificial intelligence research (Rossi, 2011), through video games, that allow students to learn information, called edugames. Starting from this consideration, the Department of Humanities, Philosophy and Education of the University of Salerno and The Virtual Archaeological Museum of Herculaneum signed a scientific cooperation agreement oriented to develop and implement methods, tools and inclusive educational technologies. In particular, virtual reality spaces have been designed to create educational settings in line with the Universal Design for learning approach (Aiello, Di Gennaro, Palumbo, Zollo, Sibilio, 2014). Using the Unity3D game development platform and state-of-the-art graphics, which are comparable to contemporary video games, a 3D model of Villa of the Papyri in Herculaneum was recreated. The next phases of the project include the development of an edugame in this 3D model, which can be used in online and distance modes. Through virtual reality and head-mounted display (Oculus©) device, students will be able to learn history, philosophy and architecture of ancient Romans. In addition, having the ability to download or play this online edugame, students have the opportunity of a distance learning process, visit places far away in space and in history, which may now have disappeared. Besides, students can use these virtual reality media anytime anywhere, with the convenience and cost effectiveness of distance learning.

Italian Paper Reviews

In the last decade, education research developed a series of approaches that allow overcoming traditional dichotomy between learning through the experience in "presence" and distance learning, opening multiple trajectories of operational research (Fabbri, 2013)

This progress, of education research, and in particular in distance education It was possible, moreover, due to the diffusion of low-cost wireless connection in schools, and everywhere, offered by mobile and fixed Internet Service Providers (both in Italy and in the rest of the world) and this allowed a diffusion of a new paradigm called "Bring your own device". In this way everyone have an own

device that can be connected and used also to study. That allowed a spread of web-based learning and possibility to use Internet to study and search information (Falcinelli, 2013).

Today, the possibilities offered by World Wide Web through social networks can built groups of people that share knowledge, to support a real process of construction of knowledge, to create training environments, build learning practice communities that, integrating with activities in the classrooms, emphasize students learning, where students are, and remain, the center of educational activity. (Falcinelli, 2013).

A Brief Introduction to distance education could start from a series of points of view on this theme, for brevity, it is possible to highlight two of them: as educational-pedagogical perspectives and as a network computer system. In the first vision, open issues are many, we can just list a few: 1) the number of interlocutors to interact with (Interaction one-to-one one-to-many, many-to-many one-to-many); 2) interaction of various moments, synchronous or diasynchronous interaction (Parmigiani, 2013); 3) formal, informal or not formal learning contexts (Parmigiani, 2013); 4) testing of various educational models consolidated in teaching to do in classrooms.

If distance education is referred as a part of a social network computer system, it is important to ask ourselves other fundamental question: 1) costs of this system; 2) development times of this system. In fact before activating a distance education service must be applied all software engineering typical procedures, this means evaluate platforms already developed (many are free) and the ability to program a new one. These questions are at the base of any new realization of a software and fall under the expression "Buy or doing" using by any computer analyst or programmer. It is important to take care about this theme, in order to activate new projects with a clear idea about costs and times for realize it.

According to some Italian educational research lines the wide world of distance education, It can be classified by three main categories:

1) On-line Computer Based Training (OCBT), Individual based, implemented through courses without instructor or peer interaction. We are in front of the cognitivist tradition (Damiano, 2013);
2) On-line Distance Education (ODE), which refers to training traditional mail Distance Education, but faster, economic and efficient use the email (and other new media). It offers courses, implementing them as self-study and one-to-one with a tutor, based on the paradigm instructionist of cognitivism (Damiano, 2013);
3) Online Collaborative Learning (OCL), that it could be framed in a constructionist matrix that builds knowledge through a dense network of exchanges between the actors, and thanks to teacher support. In this category, it must be considered essential to establish a group as a virtual community (Damiano, 2013).

Studies done at the University of Salerno, propose to consider a fourth macro-category, proposing edugames and ITS (Todino, Di Tore, Maffei, De Simone, Sibilio, 2017), as an opportunity, in the coming years, to create distance education system. Some issues, related to distance education macro-categories proposed, found a number of open requirements and trouble that are addressed by educational research:

1) Teachers must be prepared to work in an on-line computer based network environment (Damiano, 2013);
2) Build/buy/customize a suitable equipment in terms of hardware and software on-line computer based network environment.
3) Investigate and study the role of teachers in distance education (Damiano, 2013).

In conclusion, the teaching-learning process, which it is done through distance education, basically, is growing. As in our specific case study, distance education allows access to information that often come from places geographically away from the learner. In this case study, a local *equipe* (archaeologists for a site survey, architects for create a 3D model and computer scientists, experts in education and pedagogy, of University of Salerno), working one after another, to realize a downloadable edugames to visit a place vanished 2,000 years ago. Distance education will be one of the great educational challenges to follow with care and attention (Bowyer, Blanchard, 2003).

Downloadable Edugame based Distance Education

The distance education, as seen in introduction, it can be done through a fully automated system, in which the teaching-learning process takes place through an interaction between an intelligence tutoring system, integrated in a edugames, and learner. In this way students, having the possibility to download and play this edugame, have the opportunity of a distance learning process, visit places far away in space and in history, on their own devices, anytime, anywhere, with cost effectiveness of distance learning.

The edugames are a natural evolution of exergames and serius games. Exergames are games that integrate traditional video games with element of user's movement, digitized and included in the gameplay by a series of new-generation controller, for examples Wiimote and Balance Board, accessories of Wii Nintendo console, and the Kinect sensor. User's movement allow a deep learning and require an extended engagement. This engagement is favoured by a process of identification, challenge and control. (Di Tore, 2016)

A serius game is a software that uses same technologies of videogame (3D game engines, game controllers, etc.) but its purpose is to conduct a training is some specific areas. Serius games include for examples simulators (flight simulators, drive simulators etc.).

Edugames can be directly related to serius games and exergames but the main purpose of edugames is to promote and facilitate the teaching-learning process. It is important to specify that is anyway defined edugame a videogame unless it has both components: user's movement and a virtual simulator. It can also be an interactive digital storytelling or any other form of video games that contain educational elements. In this case, edugame using virtual reality, that should be downloaded and used with an head-mounted display (Oculus©) where:

> "students will be able to learn history, philosophy and architecture […] In addition, having the ability to download or play this online edugame, students have the opportunity to learn at a distance, visit places far away in space and in history, which may now have disappeared.". (Todino, Di Tore, Maffei, De Simone, Sibilio, 2017)

In this edugames each student can move through a series virtual experiences, follow a virtual tutor. Such experiences, through modules of contents, are suitable for a distance education and they are able to integrate potential and characteristics of new media supports (Frignani, 2016), in this case, virtual reality.

It is important that educational research will be interested to the world of edugames because videogames is one of the language of children and teenagers (Jason, 2008) who see a videogames familiar, typical of their daily lives, and due to "Digital stories allow today's students to pursue in their own language" (Jason, pg. 10, 2008).

Moreover there is another important reason to follow videogames sector due to the steady growth of this market, in economic terms (+7.8% from 2014 to 2015). Videogames actually is one of the compartments in expansion of world cultural industry and it move more than 47.9 billion euro has a total sales each year (Ernst & Young, 2015). In particular, in Italy, videogames market closed 2015 with a economic balance nearly one billion (952,172,036 euro) as declared by AESVI (Associazione Editori Sviluppatori Videogiochi Italiani) with a growing trend of +6.9% compared to 2014.   In detail, the growths were the following: software (+ 6%), console (+ 8.7%) and accessories (+ 7%) (source www.aesvi.it). Some reports, from 2013 to 2015, of the Entertainment Software Association (www.theesa.com), one of the most important data analyst of video game industry, shown that videogame industry is producing a huge stream of games that continue to expand their nature and impact. Actually, videogames are more than a simply program, but it is, at the same time, an artistic, social and collaborative products. In online videogame a massive numbers of people, from all over the world, play simultaneously the same story and they share experiences and knowledge. Beside videogame offers an immediate learning feedback and this is one of the more exciting features of it, because players can see their progress, they can try something, in terms of actions, through trial and error and be happy or frustrated at each step or level. This immediate learning feedback is one of the reason of why videogames are so engaging to us.

This market greatly influence worlds of childhood, teenagers and adults. Italian's institution, MIUR (Italian Ministry of Schools and University) and MiBACT (Italian Ministry of cultural heritage) through universities and museums are very interested in these new trends, and about creation of edugames. There are lots of examples and projects, such as: Trip eMotion[1] (a web social interactive platform serious games); the iPhone game "Father and Son" realized by the National Archaeological Museum of Naples[2]. On this line of development, there is also this "Villa of the Papyri" edugame.

"Villa of the Papyri" Edugame

The examples set out above, point out that the project of a "Villa of the Papyri" Edugame, is consistent with this trend: a joint vision of Italian Universities and Museums to introduce videogames to study, enjoy and improve knowledge about Italian cultural Heritage. "Villa of the Papyri" Edugame, here described, developed as a virtual reality games, is a possible way to know the time of the Roman Empire. This project, therefore, on the one hand have a social and cultural commitment (education sector point of view), on the other it is a new technological challenge due to the new type of man-machine interface used. Furthermore, it is important to remember that a Oculus© virtual reality head-mounted display, does not have a stable hardware-software version but is sold on the market as a development kit (Todino, Di Tore, Maffei, De Simone, Sibilio, 2017) and this increases the complexity of software development. This project promotes a system of distance education because it is made in Italy, but it can be downloaded and played everywhere around the world (in according to rules decided by the Virtual Archaeological Museum of Herculaneum that have all right reserved about 3D models and will decided policies in terms of price, privacy etc.).

---

[1] more info at http://archeologos.ibam.cnr.it/trip-emotion-conoscere-il-patrimonio-culturale-e-un-gioco-da-ragazzi

[2] more info at http://www.museoarcheologiconapoli.it/wp-content/uploads/2017/01/Cs-lungo-con-nuova-foto-1.pdf

Figure 1. *Downloadable Edugame Based Distance Education Scheme*

Videogames, such as movies or books, can be divided in categories (fantasy, horror, fiction etc.). Furthermore, in the case of videogames, there are numerous taxonomies regarding other aspects of videogames. For examples videogames could be played in various places (coin-up played in bars, console used at home, portable console, etc.), and could be stand-alone games or network games, as indicated by AESVI. "Villa of the Papyri" Edugame as a part of videogames family can be view as a Role Playing Games (RPG).
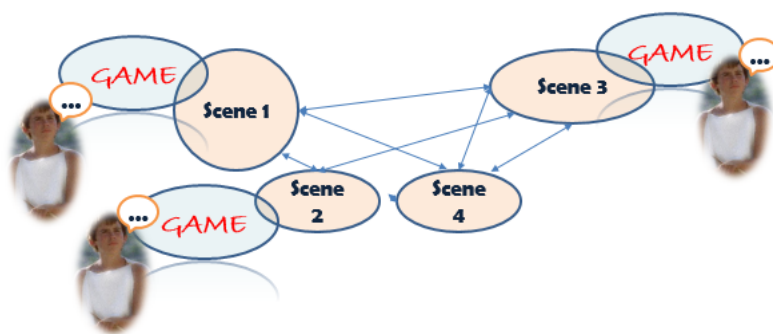
Figure 2. *Types of Online Games Played*
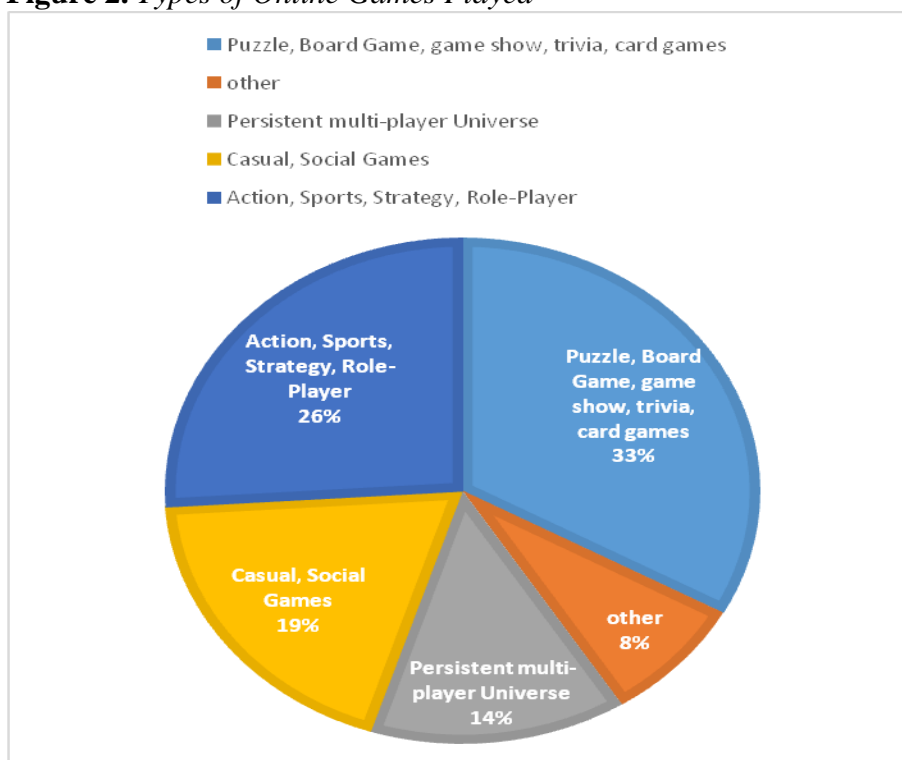
Source: Entertainment Software Association report 2013

Every RPG videogame has a wide narrative component; this kind of videogames derive directly from RPG board games, played in presence with a theatrical style, such as Dungeons & Dragons created by Gary Gygax in the seventies[3].

Therefore, edugames needs a long period of initial reflection, to focus and to developed narrative components, and to create links and correlations between each storytellings. In such a way that the main storytelling, and the secondary ones, are congruent. As in a TV documentary or a school book, rhythm and structure of the scenes are made to anchor some concepts (Todino, Di Tore, Maffei, De Simone, Sibilio, 2017) and made possible for learner to remember information in the future, even after years of had played the edugames. As already specified, a RPG edugames has a strong narrative component in which it has been developed some parallel storytellings. Today, the use of this didactical technique of tales, represent an important pedagogical frontier (Jason, 2008).

---

[3] more info at: http://dnd.wizards.com/dungeons-and-dragons/what-dd/history/history-forty-years-adventure

Figure 3. *Alternating Scenes and Player's Decisions*

In this edugame, player's decision bring player in new scene, each one correlated with the main storytelling or with a secondary ones. In this edugames, besides, player is represented by a 3D virtual Avatar, a kind of ancient Rome able to move inside the 3D model of "Villa of the Papyri".

ITS, telling stories, guides player through a virtual environments and participate to creation histories, game interactions, which takes place in the sphere of this 3D historical reconstruction used as a setting to evoke life, culture and society of ancient Rome. A goal of this edugames is to be able to create suggestions and stimuli to correlate with that period of history. To create such suggestion, all context and all virtual characters (both artificial intelligence characters played by computer and one played by the learner), will be historically relevant with the reality of ancient Rome, in the first Imperial period, as used few years before the eruption that destroyed Pompeii and Herculaneum.

As it regards the characters guided by the computer, in the last years of gaming world, and their interacting with the character controlled by the player has many issues. To increase the realism, ITS has an human voice (Recorded by professional actor as in a TV documentary), instead of a synthesized one. The Virtual Archaeological Museum of Herculaneum prefers the first of these two options, in general for each installations present in the museum, also for this edugame.

Contextualizing in the world of artificial intelligence system, an ITS can be included in an artificial intelligence sub-category called expert systems. They are driven by a series of scripts, which are programs that based their acts as a response of behaviour of the player. Using the definitions of Russel and Norvig an ITS is a system that operates as human beings (Todino, Di Tore, Maffei, De Simone, Sibilio, 2017), but for this reason, they encounter many problems due to the fact that this machines tries to do something that people make better (Russell, Norvig, 2003). As said before, a virtual tutoring system task is to explain to a learner each areas of the game, describes scenes and situations. As well as player's Avatar, ITS 3D graphics is a customized character, among those available in the Unity3D game engine store, that it is contextualized in the historical period.

Storytelling, Storyboard and Storycore

As already specified, in this edugame there is a main story, which we will define Storycore (Jason, 2008) and a series of secondary situations that form a branching of storytelling. In the eighties, this technique was used to create book game (book where was allowed to the reader to participate in the story by making choices and change path). Depending on the player's choices, also in this edugames, can occurred different situations that determine different "scenes" in which to play. All these stories are matched and mapped on the 3D virtual space environment (through the mapping of gaming space) defining what is also called storymapping (Jason, 2008). Player, moving in the 3D space, goes in and out from one story to another, activating part of the game, approaching objects, approaching virtual characters, in the same way that happened   in a huge number of videogames present in the videogames stores.

In order to facilitate a narrative approach, it will be used a figure of the omniscient narrator that is Athena as a character guide. This omniscient narrator help player to switch from one situation to the next one. In some places, there will be another ITS, a figure of an ancient Magister, who will manage, in other story branches, interaction between edugames and player.

An edugames, like every videogames, born from the union of many technical factors, programming, art and design. Through its main story and its ramifications, it created something new and every single game is unique, both for the choice of player and for different sequence interactions played during the game. Similarly, to what happens when a staff tried to create a new movie, also for videogames, and their sub-category, the starting point is:

1) a sequence of sketches of the virtual world of the game;
2) sketches of main characters (Avatar and ITS);

Only after that, is possible to create a 3D model and developed programming scripts based player's actions. A good sequence of sketches follows of photographic composition rules, although it can be done simply with a pencil on paper.

Sketches used to design the edugames storyboard, are often the same ones used to create movie. They include a large white area to draw the scene, a zone where make annotations, and a series of technical information (duration in seconds of each scene, etc.). Sketches are used, initially, to imagine the game, to describe the main story and side stories, transitions that lead from scene to scene, and those videos that create a link between the various stories, as we are used to seeing in commercial video games.

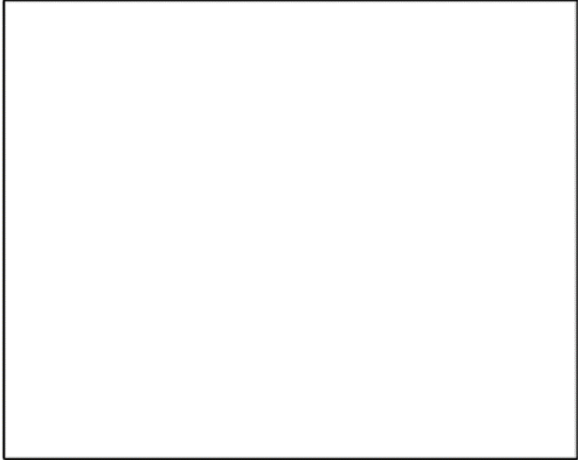**Figure 4.** *Sketches Used to Design Edugames Storyboard*

**Figure 5.** *Storyboard is a Sequence of Sketches*

Some pictures in "Villa of the Papyri" Edugame sketches sequence refer to scenes of "Alexander" a movie directed by Oliver Stone, realized in 2004, used as a starting point to create a historic setting. This movie, indeed, has some sequence recorded in a reconstruction of an ancient library (Alexandria in Egypt) that made possible to do a comparison between edugame environment and this other realistic fiction environments. It is important to remember that the "Villa of the papyri" was famous, at the time of Rome, for the huge number of papyri preserved, and, between the various functions of that building, it was a library and a place of culture. Besides, as starting point to create an edugames, a

good movie should be a good idea due to influence that videogames and cinema have continuously nowadays (just think about the huge number of movie derived from videogames and vice versa).

It is important to note that commercial videogames, on the world market, use the same aesthetic rules, and the same expertise, required to realize a movie (and sometimes the same budgets). A storyboard designer knows "photography", understood as in cinema, as an element that influence the visual impact of video game on the player. A designer uses, therefore, photographic composition rules, in each step: from the sequence of paper and pencil sketches to arrive at a 3D model of the virtual world. Photographic composition rules are relate to the visual area subdivision (rule of thirds), use of golden zone (perspective and strengths) and use of diagonals to stretch the scene.

Figure 6. *Rules of Photographic Composition*
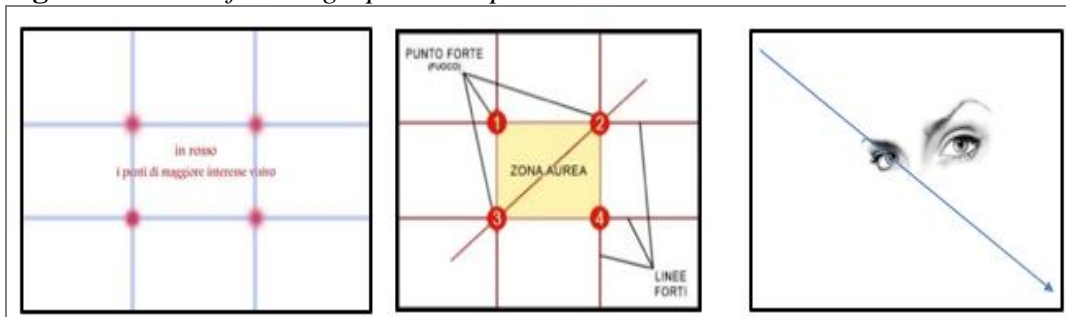
Branched Storymappings

As mentioned above, edugames has a main story, which it is define Storycore but also a series of situations that created a big number of storytelling branches (uses game's branches is not new for example it is possible to remember gamesbooks launched in the 80's) depending on the player's choices and decisions were occurring different situations that determine "scenes" in which to play. All these stories are combined with the virtual environment spatial subdivision, through the mapping of gaming space, defined storymapping. Playing will entered in and out from one story to another (as in many role playing video games on videogames market). In summary, it is possible to define many kind of storytelling: 1) linear storytelling where player cannot change history with only one begin and only ne end of the story. 2) multi-storytelling where it is present many branches of possible story 3) multi-storytelling with never ending, many story rings and it is possible an unlimited play (for example to end the game must pressed "esc").
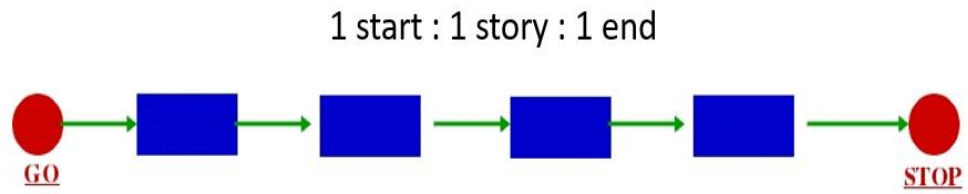
Figure 7. *Linear Storytelling*

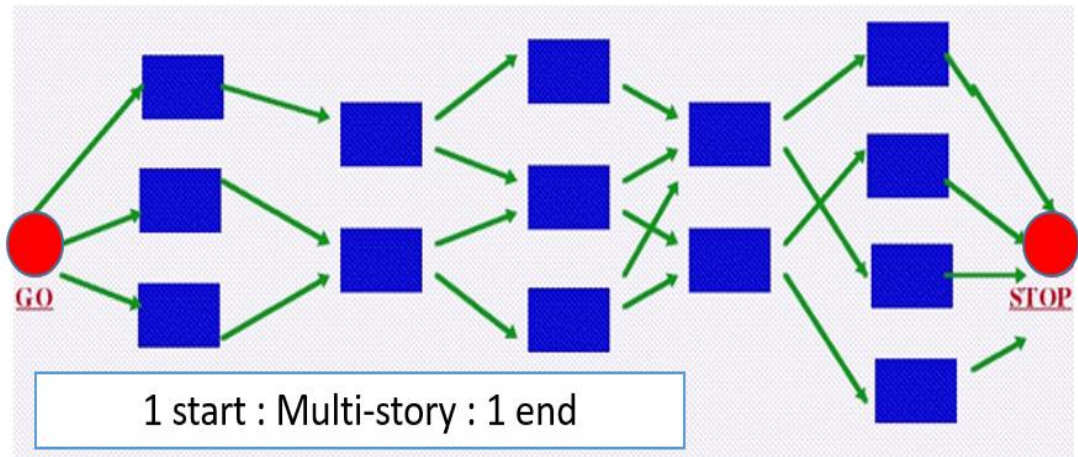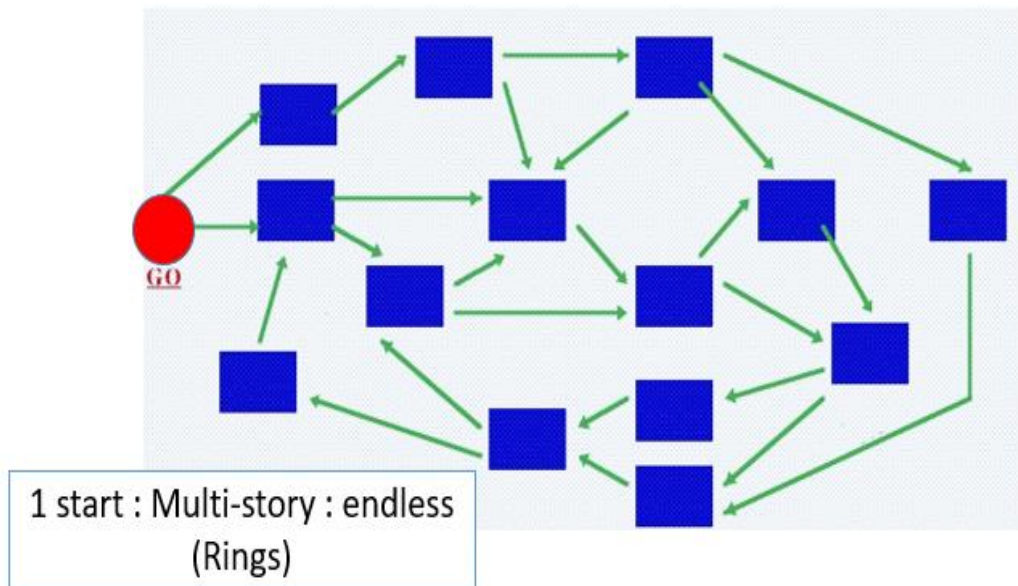

Figure 8. *Multi-Storytelling*

Figure 9. *Multi-Storytelling with No End Many Rings*
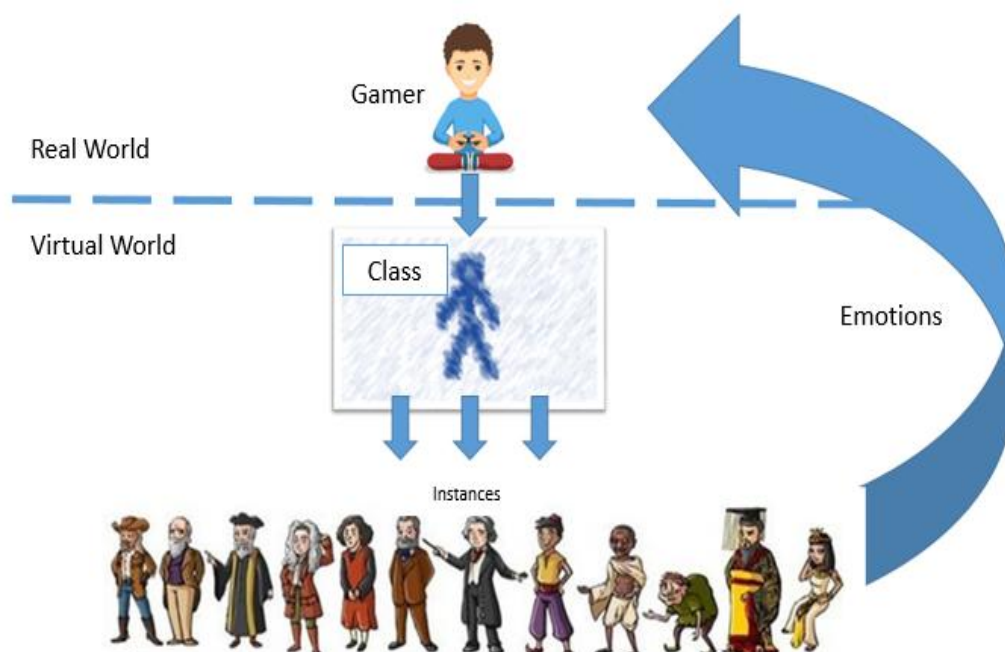
Videogames Avatars

A particular form of interactive simulation, used in edugames of "Villa of the Papyri", it is realised through artificial Avatars that act under player's control. Generally, an Avatar is a character played by the gamer in a video game (and its subcategories: activegame, seriusgame and edugames), they are those 2D or 3D characters guided through joypad or other input devices and in multi-player videogames often every Avatar is driven by a real person. Avatars, through a story that is common to all users, make possible to share a fantasy world in which players collaborate each others.

In these imaginary worlds, if the game is addictive and well realised, players feel "teleported" inside them, and have the feeling that "other real people have done the same", this creates a true "social Vicariance" (Berthoz, 2015), where an Avatar is an "instance" of all possible version of Avatar customized in video game. This typology of customization create a strong relationship between player and Avatar that became a cybernetics "creature" played by a real users that can perceive the Avatar as his double (Berthoz, 2015). It is possible to correlate the verb "to instantiate" (related to Avatar) with the world of Object-Oriented programming paradigm (actually the most popular programming paradigm that include: C ++, Java, C # and Visual Basic .NET, etc.) in which there are a series of objects that interact with each other, exchanging messages, maintaining their own state and their data.

This programming paradigm, which has an approach closer to the way of thinking of people, makes possible to create abstract classes and "instantiating" that class[4] objects. For example, create a class "character" into the program of a videogames and to instantiate a number of them (for example in a Fantasy video games it will be able to play of various hero stereotypes etc.). This programming paradigm has influenced video games, especially a player can instantiated in videogames himself/herself through an Avatar (in which characterized). This Avatar running from a standard model (in an object Oriented vision of programming) and instantiate that will represent the player in the game (through a customization which usually includes items such as hair color, height, dress, sex, etc.). This brief description on Object Oriented programming languages allows us to better contextualize the previous statement, which correlates the Berthoz concept instance of Avatar, previously introduced whit the actual programming methodology.

---

[4] In object-oriented programming, a class is an extensible program-code-template for creating objects, providing initial values for state (member variables) and implementations of behavior (member functions or methods).

Figure 10. *Avatar Videogames Return a Series of Emotional Feedback to the Player*


It is important to note that a gamer, in many video games, has the ability to identify with many variations of Avatar. Each Avatar has a facility to make the player experience different emotions. Berthoz highlights a case happened to the artist Claire Sistach, who had selected an Avatar (it is not specified in which videogames) that always lost the games and for this reason Claire start to be depressed, when Claire decided to choose a new instance of Avatar. Through a series of victories Claire has brought her joy and optimism (Berthoz, 2015), this situation described a situation that reinforce the idea that there are an Avatar emotional feedback on the gamer. These emotions, that are real and not virtual, even if caused by a virtual system, can create moods difficult to manage. If the duration or intensity of the relationship with the Avatar becomes such strong emotions can create not only momentary states of mind but deeper. This can be even stronger if the game is in first person and uses a head-mounted display (such as Oculus©), This is caused from the fact that player see the games through the hypothetical Avatar eyes and projected into the imaginary world, again, through the egocentric point of view of the character. For this reason gamer adopt a self-centred strategy to identify Avatar, it follows that will be adopted a cognitive strategies to play and interact, for example to choose a path to follow to explore game space (Berthoz, 2015). This promotes, in the player a kinesthetic memory that consists in recalling Avatar's movements (Avatar start to be a vicar in the games mind), deviations, when turns and reference points that adopted to move (Berthoz, 2015) and if player will have to describe a path to a game-mate recur to describe the way.

Figure 11. *Villa of the Papyri" 3D Computer Graphic*

Figure 12. *Villa of the Papyri" 3D Egocentric Point of View of the Character*
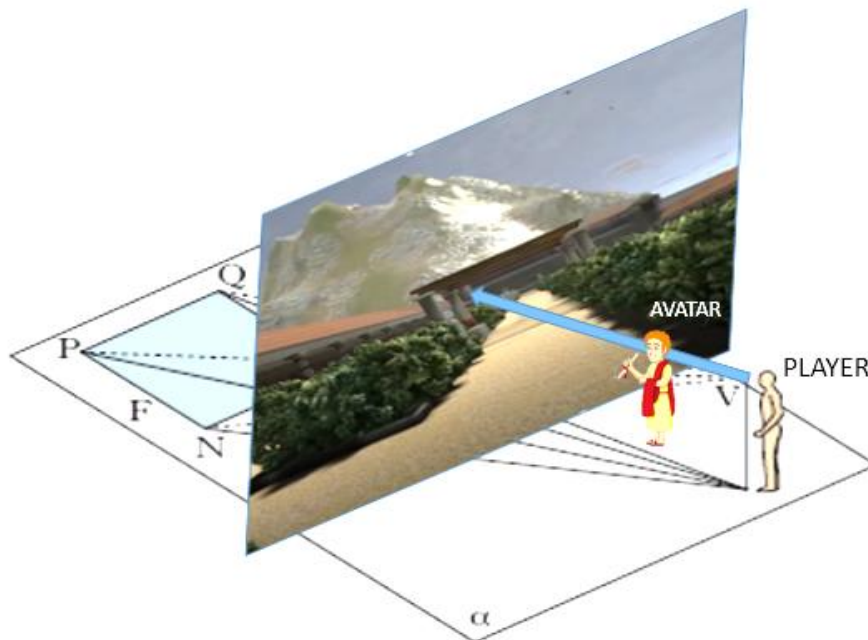
It may be added that some problems solved through a virtual vicar in a simulated environment, can be useful in real life, and increases solution strategies of problems classes. On this basis, for example, it is underlying the principle of flight simulators that are used to training pilots in a digital reconstruction of reality. Simulation is a technique used in the human-machine interface systems for training, evaluation of performance and research in a safe environment. One strategy to avoid that emotions caused by video games may be to inhibit the emotional contagion comes from the game itself. This is possible if the player is already able to inhibit emotions from other contexts (for example if it is able to inhibit their emotions when watching the TV, movies or reading a

book) i.e. when this person is capable of creating a right emotional distance from media. Several inhibitory mechanisms in cascade allow a gamer, for example, to distinguish elements of which frightened from the elements to overlook.

This generally takes place by changing spatial perspective (Berthoz, 2015), taking away from the point of view of the Avatar, reducing or eliminating the element that makes us feel embodied in it. It is also true that aim to numerous videogames is excite us, intimidate, make us euphoric, for example, when we are driving a sports car or when we are in the middle of a fight. In this case, as has happened, there arises the question of whether this new frontier of media education is in a sense to "educate", or if you can create standard criteria to "tame" these video games in a sort of trend that can It is enclosed in media pedagogy. The reference was repeatedly placed in its epistemological and political character, being able to say that the media "are not educable" (Rivoltella, 2016), you can definitely educate the gamer who is invited to read videogame's manual and follow instructions related to minimum age and time recommended for a daily game.

A pedagogical perspective that binds these new media (edugames using Avatar) to search trajectories can definitely include the ability to find different cognitive strategies to perform the same task (Berthoz, 2015). Many decision strategies could be used to solve problems in different ways offered in the game, and feel emotions through a virtual environment and then through simulation, and this generally allows the use of an informal teaching-learning environment that uses the language of the students such as video game "language" (Jason, 2008). Studies related to edugames using Avatar (and Intelligent Tutoring System realised through 2D and 3D characters) should follow closely the phenomenon of Effects of Virtual Human Appearance Fidelity on Emotion Contagion in Affective Inter-Personal Simulations and uncanney valley studies because Virtual humans are being deployed to simulate social inter-actions with humans, therefore, they should be perceived as real (Volante Et. All, 2016). Realism of robotic or virtual characters issue is not new, in 1970 the Japanese roboticist Masahiro Mori explained that the psychological reaction to anthropomorphic robots, or more broadly any human facsimile, it can be described through the phenomenon of uncanny valley[5]. For Masahiro Mori humans react positively to robots that approach human-like appearance, but when robots (or other human facsimiles) look too human, emotions start to be negative and this is also true if it is applied to the Edugames Avatars.

Conclusion and Future Work

"Villa of the Papyri" Edugame is a possible alternative of online education. It is not an Internet web applications, because it is possible to download it, install on computer and it could be used both with Oculus© or without this device,

---

[5] http://www.uncannyvalley.us/about/uncannyvalley/

although use edugames through a virtual reality device, and not as a simple video game has more appeal. The Department of Humanities, Philosophy and Education of the University of Salerno and The Virtual Archaeological Museum of Herculaneum have been finalized phase real-time 3D environment used Oculus$^{©}$.

Technically, the game can already be delivered as a downloadable and installable package, and be used as a tool for distance education. As explained there is not yet determined the roles about privacy, costs (although copyright remain of the museum). Actually, the edugame is an experimental game and not a final version of the project. Summarizing this project allows:

1. the opportunity of a distance learning process, visit places far away in space and in history, without going to Herculaneum to understand culture, history and society of ancient Rome.
2. The cost effectiveness of distance learning used a downloadable solution.

3D digital environments and virtual reality devices give new opportunities in teaching-learning processes. Future works can quantify if there is a real improvements of this process between:

1. Who learns using this edugame;
2. Who learn through other methods, such as who visit the archaeological site of "Villa of the Papyri" with a traditional travel-book, a tourist guide or a professor expert in teaching the history of Rome with a disciplinarist point of view.

All things that has been exposed in this work refer to current state of the project, that will be further developed, in according to this paper, in the next two years.

Bibliografia

Aiello P., Di Gennaro D. C., Palumbo C., Zollo I., Sibilio M. (2014), "Inclusion and Universal Design for Learning in Italian School", International Journal of Digital Literacy and Digital Competence (IJDLDC), 5(2), pp. 59-68.

Berthoz, A., & Ferraresi, S. (2015). "La vicarianza. Il nostro cervello creatore di mondi". Codice: Torino.

Bowyer, P. K., & Blanchard, C. L. (2003). Multimedia based enhancement of the science of oenology in the distance education learning environment. Australasian Journal of Educational Technology, 19(3).

Damiano, E. (2013). "La mediazione didattica. Per una teoria dell'insegnamento". Franco Angeli: Milano.

Di Tore, S. (2016). "La tecnologia della parola, didattica inclusiva e lettura". Franco Angeli: Milano.

Ernst & Young Company (2015). "Cultural times. The first global map of cultural and creative industries December 2015" report for CISAC, The International Confederation of Authors and Composers Societies.

Fabbri, L. (2013). "Ricerca didattica e contesti di apprendimento". In Rivoltella, P. C., Rossi, P. G. "L'agire didattico: manuale per l'insegnante". La Scuola: Brescia.

Falcinelli , F. (2013). "Le tecnologie dell'educazione". In Rivoltella, P. C., Rossi, P. G. "L'agire didattico: manuale per l'insegnante". La Scuola: Brescia.

Jason, O. (2008). "Digital Storytelling in the Classroom: New Media Pathways to Literacy, Learning, and Creativity". Corwin Press: Thousand Oaks.

Parmigiani, D. (2013). "Dispositivi, ambienti, artefatti". In Rivoltella, P. C., Rossi, P. G. "L'agire didattico: manuale per l'insegnante". La Scuola: Brescia.

Rivoltella, P.C. (2016). "Per una storia pedagogica dei media e delle tecnologie". In Rivoltella, P. C. Felisatti, E. Di Nubilia, R. D. Notti, A. M.; Margiotta, U. "Saperi pedagogici e pratiche formative. Traiettorie tecnologiche e didattiche dell'innovazione". Pensa: Lecce.

Rossi, P. G. (2011). "Didattica enattiva". Franco Angeli: Milano.

Russell, S. J., & Norvig, P. (2003). "Intelligenza artificiale: un approccio moderno". Pearson Italia: Torino.

Todino M.D., Di Tore S., De Simone G., Sibilio M. (2017). "Virtual Reality head-mounted display Used in Online & Distance Education", conference proceeding of SIRD, Italian society in research education, international conference "Didattica e saperi disciplinari" 2 dicembre 2016 Università di Milano Bicocca.

Volante, M., Babu, S. V., Chaturvedi, H., Newsome, N., Ebrahimi, E., Roy, T., Fasolino, T. (2016). Effects of Virtual Human Appearance Fidelity on Emotion Contagion in Affective Inter-Personal Simulations. IEEE transactions on visualization and computer graphics, 22(4), 1326-1335.