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On Creativity in Multimedia: "Serious Games"

Oscar García-Pañella, Emiliano Labrador-Ruiz de la Hermosa, Anna Badia-Corróns, and Pau Moreno-Font

Memorable experiences intend to deliver intense usable moments with the support of different platforms and social networks. Higher degrees of motivation ensure efficiency and performance. Serious Games deliver powerful and truthful experiences on the basis of providing the user with goals, challenges, problem-solving and rules, besides a clear internal value and an interactive experience. Our software and hardware-based tools should have the power to teach and change us, while making us better problem-solvers and professionals. This article intends to educate on Serious Games and Entertainment Technologies as a strategic source of developments that can be applied to very diverse fields such as Sports, Education, Tourism, Physical Therapy, Medicine, Entertainment, Culture, Historical Heritage Recovery and Marketing, amongst others.

Keywords: 3D, 2D, Learning, Modelling, Serious Games, Simulation, Virtual Reality.

a different purpose to a purely ludic one, they represent a clear example.

1 Introduction

The role of new information and communication technologies (ICT) in our society is becoming increasingly relevant. In fact, science and technology are already present in many different sectors providing unquestionable added value. Without going any further, Multimedia in general and Serious Games in particular, are defined as applications with

1.1 Multimedia

Multimedia is transversal given that it can be applied to uses for multiple clients and final disciplines, in addition to strategy it can always be used. Multimedia "drinks from different wells" such as imagination and creativity, aesthetic criteria, the analytical and communicative capacity, commitment, the technical and engineering skills, as well as psy-

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chological skills, among so many others. According to Tsuhan Chen, Editor-in-Chief of the magazine *IEEE Transactions on Multimedia* in 2004: "...true multimedia is the combination of different elements (whether medium, modality, technology, algorithm, or application) that provides a fuller experience of the effect of that combination...". It is a very neutral and simple, objective definition and explains the multimodal character of this discipline, independent of the sector in which it is applied.

1.2 "Serious Games"

ICT have enabled Serious Games to achieve unexpected levels of success and today they are present in many sectors helping to advertise products effectively, transmitting social values, strengthening different skills, overcoming psychological problems, and an infinity of other purposes. Not without taking into account Multimedia, one of the fundamental elements that enable it. The transversal character of this makes it similar to any discipline and accessible to all kinds of professionals who could apply it in all kinds of final sectors. Technology is one of its ingredients, together with many others such as those we have already mentioned.

Let us look at some specific and innovative examples regarding the application of Multimedia in the context of Serious Games:

- *Application for the Recovery of Historical Memory*, with content regarding Script, generation and programming of 3D Graphics, Animation and Modelling in 2D and 3D in addition to diverse techniques for the Improvement of User Experience. Thanks to the virtual reconstruction of historical structures that are sometimes non-existent, simulators are implemented that enable interactive views. Without going any further there are already diverse implementations based on various Spanish cathedrals, famous squares and even Roman bridges.

- *Application of Telemedicine in the reconstruction of organs in 3D* using medical images. Thanks to image processing and Virtual Reality techniques, there are now complex surgical simulators that enable handling in real time. Thanks to these, there are auxiliary diagnostic tools available as well as training systems for new doctors.

- The experience of *Aggressive marketing* which, via different Technologies, Usability Techniques and algorithms of Artificial Vision, offers the opportunity to create installations with which the audience interacts and is entertained, at the same time as "enjoying" a novel advertising campaign.

- *It helps the disabled community* when we are capable of using sensors of three and six degrees of freedom (rotation data on the three axes or also on the transfer onto these) in order to monitor gestures and movements in real time. This type of technology and algorithm allows them to handle all the systems in their houses (Domotics) or a computer (Tracking).

- *Sports simulators*, which via Artificial Intelligence, Graphics and Animations and Virtual Reality peripherals, can also be user-friendly for the disabled or inexperienced community. Once again monitoring sensors and intelligent tools are used that suitably filter the movements and enable

them to be finally effective.

- Virtual Reality peripherals and graphic applications for the *simulation of a professional soldering environment* in which future professionals can train without having to assume the cost of the material besides reducing to a minimum the risks of possible burns and accidents that frequently occur at the start of training in this discipline. Phenomenon of instruction in its early stages.

... Among so many other possibilities.

2 The Game

Multimedia is based on an interdisciplinary approach. Only from the mixture of roles, profiles and disciplines does true innovation emerge, capable of providing imaginative and different solutions to new or "traditional" problems.

Virtual Reality is a clear exponent of complexity by the number of disciplines that involve its developments. As in the case of Multimedia, it is necessary to know everything, and furthermore all the different areas have to be integrated.

Video games are clear examples of Virtual Reality applications directed at the general public. Extensive, complex, computationally efficient and performing thousands of calculations relating to all kinds of situations, such as: physical, concerning artificial intelligence, related to computer graphics or based on the calculation of movements and animations, to mention just a few. All working in perfect harmony, in practically any existing personal computer configuration on the market and for a "reasonable" price. These are perfect simulators in which we learn to reassign resources in real time, change our goals as the situation defines itself and activate hundreds of sensors and mental alarms, which enable us to be alert and finally "dominate" the software. Undoubtedly our learning process is based on competencies. That great challenge of the new European Higher Education Area (EHEA).

A game is a clearly structured activity (like the coding that we so carefully program), which is normally related to a ludic activity although it can also be educational (those simulators we referred to when we were talking about Serious Games). In order to play we need rules, challenges and constant interaction, which doesn't appear to be so different from one of our working days.

Jesse Schell, a well-known game designer, talks about games as "activities related to the solving of problems following approximations based on typically ludic attitudes". In fact, the same affirms that we can "have fun" thanks to our capacities for modelling, concentrating, showing empathy for somebody or something and imagining.

2.1 Creation of a Serious Game

Our simulator is based upon four disciplines or axes. These are applied in the Game Design; specifically, the Aesthetic Criteria, the Rules or Mechanics of the game, a suitable Story and a good design from the Technological point of view. All at the service of the right balance between Skill and Luck. And it is a fact that the rules of Playability are those which guarantee success, or guarantee failure, and they promote the winning of prizes and re-

wards.

Once again we can paraphrase Jesse Schell mentioning some good ways regarding the conceptualization stage of our Simulator or Serious Game:

- The right design for all,
- The right balance between the presented challenges and the success in overcoming them,
- A set of decisions both significant and full of meaning,
- Equal doses of skill (competence) and luck,
- Good use of "the head" without forgetting that "the hands" will also be important at certain times,
- Competitions in which there is also room for cooperation,
- Continuous prizes and rewards,
- A certain level of "punishment", always within a controlled experience (although it might not seem as such to the player),
- Presentation of details still leaving enough space for manoeuvre for our own imagination.

Ian Schreiber, another well-known designer of memorable experiences, talks about rules for an entertaining learning process or "fun stuff". In this sense we should program software pieces that guarantee the possibility of exploring, that offer us social experiences, which, as far as possible, guarantee the perception of physical sensations and mental challenges like puzzles and that allow us to cooperate and compete.

2.2 So a Simulator would be....

Clark Aldrich, the simulation guru, <<http://www.amazon.com/Simulations-Future-Learning-Innovative-Revolutionary/dp/0787969621#>>, was challenged with the creation of a very original tool: a leadership simulator called "Virtual Leader", <http://www.simulearn.net/leadership_training/vLeader2007.html>.

A marvellous piece of programming that had to be used by a good handful of potential executives. Leadership is a somewhat ambiguous and undoubtedly complex concept. Clark Aldrich suggested starting the design with the definition of everything that needed to be transmitted in order to subsequently use this list, search for and define its rules and write them out in a way that could be understood by a computer. A simulator that indoctrinates us in certain rules and which allows us to put them into practice. That teaches us through a process based on soft skills and which pushes us to use them in situations which will require them. From a more IT point of view, we could be referring to a set of subsystems which are relatively modulable and personalizable that simulate certain interactions thanks to the use of Artificial Intelligence and Multiuser Access techniques.

Melinda Jackson speaks about optimum and fast learning of sets of complex data that we can handle and touch. The user has a specific role and moves around a multimodal environment. He/she learns "through discovery". Nature is wise. We will manipulate time and space, we will control

speed and we will regenerate past or limit situations, with the detail we require. Remember that a notable generational change is occurring. Technological design does not only have to make sure that the applications work but also that they have to be able to offer people memorable use experiences. It is a question of doing and enjoying while doing. Let us allow our users to experience hundreds of "Eureka" moments. As the famous expert Sid Meier said: "*A good game consists in a series of interesting alternatives.*"

3 Dominate Creativity

Proust, Gaudí, Einstein, Van Gogh, ... the list of geniuses who failed at school or who were put down at some time by their contemporaries is quite long.

The work of judging creativity is a task that carries great responsibility, as it is a matter of deciding whether the solutions provided by the creative are a new idea or just nonsense. In both the work and academic environment, producing an algorithm or designing a building, even if attention is paid to specific parameters with which the level of imagination of a person can be determined, the subjective component is large, and there is always the risk of not understanding the proposal you are being presented with.

But there is a task that is much more difficult to judge. How is one taught to be creative? What subjects must be presented and explained so that a student learns to externalize something as barely tangible as creativity?

3.1 Our Experience

The main problem that a creativity subject has to confront at a master's degree level, is that students have an academic background based on a considerably extensive accumulation of knowledge. An academic past in which for many years they have studied numerous subjects in which they have had to assimilate content in order to subsequently decipher statements, write pseudocodes, solve equations, determine answers and decide whether the results are valid. But always for a given and closed statement. In the case of the MCDEM (Master's degree in Creation, Design and Multimedia Engineering) in which we develop different types of Serious Games, the entry profile of the students, in its first editions, was almost exclusively engineers (IT technicians, multimedia, telecommunications), although in subsequent editions, the range of qualifications has broadened considerably, as the fact of wanting to do a multidisciplinary master's degree has been prioritized. But in all events, irrespective of their previous knowledge, all the students have had a similar academic background. All are immersed in an educational system that teaches the student to solve problems set out by the professor.

The subject Design, Art and Creativity (DAC), is a semestral subject, whose purpose is to create a series of interactive projects of diverse nature, all with a technology base, and where the part most worked upon is that of the idea, the physical execution of the subject being one part of the process but not the most important part.

In addition to teaching creativity techniques and showing the students numerous examples of work by artists and

a wide variety of contemporary multimedia projects, the statements of the practical classes and assignments are based on a few guidelines to be followed, but it is the student who mainly decides how to resolve the practice. It is definitely not a question of doing projects where a few rules are stipulated and a few models are followed. A few guidelines are set out so that there is a minimum of uniformity, which is what will be assessed (the use of a webcam, be it street action, the participation of a group of a social nature...) but it is still the student who decides what to do and why.

This provides the student with a practically infinite range of possible solutions, and it is at this point that personal conflicts start. The solution of the exercise involves deciding what one wants to do. Drawing up a list of intentions, technologies to use and the expected result are practically equal to producing the statement on the practice.

The final practice of the signature consists in creating an interactive multimedia project in which the students (in groups) are forced to choose a group and work with them. The initial shock is always quite hard. First collision: there is no specific problem to be solved. Second collision: it is not going to be the professor who does the judging, but someone from outside the university who does not know the student at all. The first few days are chaotic. The premise is to generate a problem that they have to solve. They have to create a need in a group and then provide a solution to that need. The fact of choosing the project, and having to contact people they do not know, can be quite stressful to begin with, but in very little time it becomes the greatest motivation they have ever had. This exercise has resulted in such interesting projects as an interactive performance in which a ballerina controlled a series of movement, strength, RFID and various other sensors through her movement; a virtual piece controlled by a pedal that was used in several classical music concerts; a gymkhana whose courses were controlled by mobile telephones and Bluetooth; a game for bars where the beer mats are augmented reality patterns; and a game for a climbing wall, where the climbers produce music or deactivate bombs as they climb.

Most of the students, or even all of them, have never had to consider what they want to do. The current educational system requires that students look for information, that they synthesize it and apply it to the solution of a specific problem. The students are good (they have a lot of practice) at solving a closed enigma, but not at creating the enigma itself. Or at least solving it when it is not clear what the enigma is. The first exercises often tend to have timid solutions as a result of fear. Fear of not being liked, fear of making a fool of themselves in front of their class mates, fear of getting a bad mark (yes, even this late in the day!). Fear is the number one enemy of creativity. Throughout the course the students' enthusiasm increases and their fear lessens, and the lack of experience takes them to the other extreme: creating over-ambitious projects. The next thing learnt on the course is being able to measure. An excess of enthusiasm is also dangerous. Projecting ideas that exceed temporary, economic or knowledge possibilities is the next problem to be solved. Finding the balance is the final objective of the subject. And

it is a balance that can only be reached through self-knowledge.

Companies in the 21st century, especially those that base their economy on technology, and even more on multimedia technologies, do not often have specific problems. The requirements of the market and the needs of the client are variable and require creative professionals who are not afraid of tackling this uncertainty. Uncertainty can only be tackled with creativity, and creativity only flows when one overcomes fear.

4 And Lastly, the Profiles...

A good developer of Serious Games is often a Manager or Producer with a Multimedia character. A firmly prepared profile for tackling the creation of any product or interactive service irrespective of his/her importance or his/her final application sector. The expert in simulators of Game Design implementation of simulators knows the different roles present in the industry (Designer, Developer, Interaction Expert, Producer, among others) at the same time internalizes the necessary skills for working as a cross-discipline manager.

A profile that includes the total knowledge of the Multimedia pipeline (Creativity, Script, Usability, Design, Technology, Content and Management) for the creation and suitable narration of the initial ideas, its suitable design for the end user, the implementation and the architecture of the information involved and the application of the most suitable management mechanism, such as a methodology based on Agile Management.

5 Conclusions

"Learn while you play" is an idea that has been establishing itself in our society with increasing strength. Fortunately it is no longer understood as "something for kids" thanks to the clear benefits for the adult public. Serious Games (games with a purpose other than ludic), applied to education (Edutainment), are a clear example of applications of this nature and universities with both technical and social teaching and even artistic teaching are applying them in study plans. Companies include them in their training plans as complete simulators for training employees.

We must bear in mind that Serious Games are also applied in many other sectors, enabling the development of learning simulators as mentioned earlier, advertising campaigns (Advergaming), recovery of historical memory, training systems and an infinity of other applications that fulfil their objective at the same time as entertaining the user.

The creation of a Serious Game must take into account the Aesthetic Criteria, the Rules, the Mechanics of the game and the Story; and it must have a good technological design. Multimedia is rising as a key ingredient that is concentrated in the use of Technology but also in that of the Script, Usability, Design, Content, Management and Creativity.

In our experience, the students of our Creation, Design and Multimedia Engineering Master's degree at La Salle-URL come with different profiles and from different sec-

tors and they acquire the necessary skills to be able to successfully apply Multimedia in all types of transversal projects. These skills are supported by diverse fundamental elements such as the imagination, creativity, the aesthetic criterion, the analytical and communicative capacity, commitment and technical skill, among others. IT workers with Designers, Multimedia workers with Communicators, Electronic engineers with Architects, etc. All of them working together in disciplines that would traditionally be very separate.

Creativity is a fundamental element when it comes to developing new concepts and applications and this is why today it is greatly valued competence. In matters related to Design, Art and Creativity, future professionals in Multimedia work on creating their own project statements that they will subsequently carry out, rather than solving problems that are given and well defined from the start.

All in all, Multimedia as a discipline, and Serious Games as a specific example of application, enable one to redefine in many sectors in which Technology is present in one form or another, the way in which people learn, experiment, communicate and interact, among many other activities, going beyond Technology itself in order to apply a concept as old as "the game."

Add to all that the fact that "Achieving while playing" can be very effective and furthermore, give us pleasure as users.

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