

Virtual University as a Role Playing Game

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Abstract— Research and development in design of games for education focus on understanding better what features of games can be inherited to further motivate students and simultaneously improve learning outcomes. Since, a common design standard is not available for educational games solutions are usually carried out by an ad hoc process. In this paper, a novel approach to design this kind of games is presented taking into consideration key features of the most successful massively multiplayer online role-playing games (MMORPG). The proposed design incorporates fun and learning through the key ingredients of MMORPGs that make them ‘addictive’ keeping the players constantly motivated. Our main contribution is to suggest design issues that should be taken into consideration when designing educational games.

Keywords: Educational games, Virtual worlds, Motivation

I. INTRODUCTION

The use of educational computer games in teaching has received significant attention for increasing motivation and for enabling other types of learning experiences than those offered by traditional teaching methods. Despite the fact that this approach is mainly used in the area of lower education [1], more often higher education schools and universities adopt similar teaching methodologies [2]. In designing any learning game, it is all too tempting to simply graft academic content onto existing forms. While this approach may work, many believe that in any academic discipline, there are elements that are fundamentally game-like. An educational game should put players in touch with what is fundamentally engaging about the subject, should help them build a scaffolding of core concepts, and should motivate them to go deeper. The main features of games that could be applied to education are already identified [3] as: lessons that can be practiced repeatedly until mastered, monitoring learner progress, closing the gap between what is learned and its use, personalization of learning, and clear goals. In addition, modern video games may develop higher order thinking skills such as problem solving, strategic thinking, analysis, planning and executing, resource management, multi-tasking, and adapting to changing work scenarios.

One of the potential roles of video games in education is recognized as effective learning paradigms [4]. For example, discovery based learning is an approach to learning that highlights learner’s active exploration of a subject. The use of computer games for military training is a reality [5]. Research

is needed to advance games for learning. These research need to determine how (1) to design learning games to deliver positive learning outcomes, (2) to develop tools to automate the process of developing games for learning, and (3) to propose methods and techniques to assess the knowledge and skills learners acquire from educational games. This paper addresses the above research problems, providing a novel educational computer game design based on the characteristics and the features of a role playing game.

The structure of the paper is as follows. After this introduction, we examine, in Section 2, the evolution of games for learning, the motivational aspects of learning end education, as well as basic design concepts of online multiplayer games. This leads us to propose, in Section 3, our approach where we present modeling framework based on existing massively multiplayer online role-playing games (MMORPG). In Section 4 we demonstrate our approach giving a design example on framework for educational games we are developing. In Section 5 conclusions are drawn.

II. PREVIOUS WORK

The problem of designing educational games has been considered in the past [6 – 10]. Based on studies on learning procedures using games and psychological theories of motivation and learning, we combine them in the designing of educational games. In this section, we give an overview of these fields, emphasizing their critical aspects.

A. Background of educational games

Mayo in [4] suggested that video games may teach science and engineering better than lectures exposing potential to address many drawbacks of modern educational systems. It has been found that effective learning paradigms are supported by specific kinds of video games and improve learning outcomes. In [11] Bransford et al found that video games stimulate chemical changes in the brain that promote learning. Mainly it was found that playing video games stimulates dopamine release, which is a chemical precursor to the memory storage process. Further research on video games indicates that an online educational game gives teachers the ability to reach students where they live, with compelling video games that can deliver educational content would increase the time spent on learning. Also, it has been noticed that the development of

educational games that integrate learning with video gaming technologies is increasing.

Few of the potential roles of video games in education are recognized as effective learning paradigms and collaborative tasks. Discovery based learning is an approach to learning that emphasizes learner's active exploration of a subject.

In educational games, story can be used to structure the players experience to achieve educational objectives. Example includes Storytelling Alice programming environment [10] for creating interactive 3D virtual worlds. While there are numerous efforts that games can be applied to learning, relatively few attempts can be found where principles of learning and motivation theories were explicitly followed a priori in design.

Computer games are used for training purposes by the army, companies and institutions. Defense Advanced Research Project Agency developed a universal, on-demand training wars program (DARWARS) as a lightweight training simulation. Airplane simulators are widely used to train pilots, racing games are provided e.g. in formula 1 to increase driver's performance. Furthermore, they may be utilised for research and evaluation of particular scenarios or conditions e.g. driving under the influence of alcohol.

B. Motivation in learning process

The human's social development is driven by needs for competence, autonomy, and association. High degrees of motivation require satisfaction of natural psychological needs and are directed towards what people find interesting or important. According to [12 – 15] the Self-Determination Theory (SDT) gives the following classification of motivation:

Intrinsic motivation – refers to doing an activity for the inherent satisfaction of the activity itself;

Extrinsic motivation – refers to the performance of an activity in order to achieve some separable outcome;

Amotivation - denotes the absence of motivation.

Motivation leads to the activation of efficient cognitive strategies for long-term memory issues like monitoring, elaborating, or organizing information. On the opposite, amotivation decreases memorization and personal development. Motivation appears to be a key asset to get actively involved in the learning process.

C. Multiplayer Educational Gaming

Games can be effectively applied in many learning contexts. They can engage learners in ways other tools and approaches cannot, and their value for learning has been established through decades of research. MMOs in the entertainment sector have been seen to attract and retain players; counting millions of active subscriptions to MMOs worldwide, [16].

Over the past decade, the interest in educational gaming has grown and the research that has been conducted to bring games into the classroom have advanced our understanding and led to a more widespread acceptance of educational games. As research indicates, it will become more common to see MMOs offering immersive, engaging experiences in a variety of disciplines. It will still require effort and thought to create appropriate spaces and design compelling problems, but the very nature of MMOs lends itself to use by many people, spreading the benefits to many students.

Another aspect of MMOs that is of value to the educational community is the types of activities they make possible. These games offer opportunities for both discovery-based and goal-oriented learning, and can be very effective ways to develop team – building skills. It is possible to design activities that cannot be completed by a single player; a group must work together to strategize, develop a solution, maximize the various talents of the team members, and execute their plan in concert to succeed.

Examples of massively multiplayer educational gaming applications across disciplines include the following:

•**Study foreign language and culture.** MMOs offer the opportunity for virtual concentration, not only in a visual or design sense, but also in reading, writing, listening, and even speaking. A world based on an ancient or modern culture could include quests that require players to read instructions, listen to non-player-characters speaking clues, and write their own responses or answers, all in a foreign language and in a setting that allows them to feel what it was or is like to be part of that culture.

•**Develop leadership and management skills.** Even in non-educational MMOs, leadership and management skills come into play. Research has shown that players who take on the responsibility of leading a guild (group of affiliated players) or a raid (smaller group of players who team up to complete a specific objective) develop skills which are transferable into their lives at work and at university.

•**Practice strategy and apply knowledge competitively.** Multiplayer games offer an opportunity for students to practice what they have learned. For example, free online games allow players to make business deals and build up their net worth.

III. PROPOSED APPRPACH

In our approach, we are reusing ideas from MMORPGs inheriting all the available multimodal user interfaces combined with techniques used to increase the students' motivation and the learning outcome. In this section, we give an overview of the three main design areas of an online Virtual University.

A. *The University:* In the virtual community, each university would be responsible for designing facilities (e.g. virtual labs, virtual campus etc). These facilities would be utilized either by the employed lecturers or they may be rented by other educational institutes.

Universities would be able to establish collaborations with other institutions exchanging facilities and even more tutorials and assignments (quests). These collaborations could be either bidirectional or not depending on the established agreement, see figure 1.

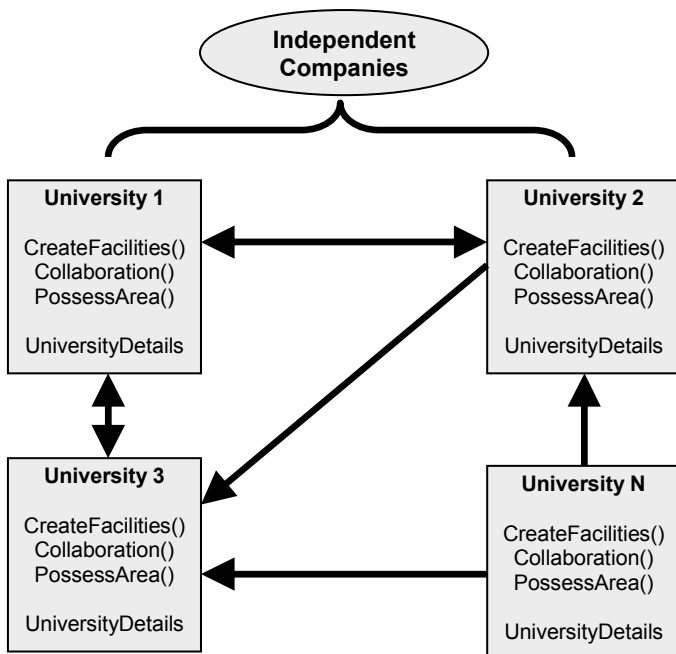


Figure 1: Diagram of established collaborations between institutions exchanging facilities, tutorials and assignments.

Third party companies could be employed by the institutions to design and implement virtual labs and facilities, building for example a virtual lab for dentists or engineers or music studies. Also, the virtual labs may be based on other educational games such as the Immune Attack [6] that is a PC-based single-player video game combining a realistic 3D depiction of biological structure and function with educational technologies for teaching immunology.

B. *The Lecturers*: Each lecturer, creating an avatar, would be locating in the campus supplied by the affiliated virtual university. The avatar would be able to provide a set of ‘quests’ e.g. assignments, exercises and tutorials that may or may not require the use of the available virtual labs. For example, a lecturer teaching electronics may provide an exercise to implement a circuit using the virtual electronics lab and so on. Quests may be for individual students or for groups either from the same course or not. Tools would be provided to the lecturers in order to design and upload their ‘quests’. The second responsibility of a lecturer would be to correct and mark assignments that have been designed by lecturers over the entire virtual academic community of the same field assuming that marking instructions would be provided by the assignment’s original creator. The marking procedure would be similar to the one used in conferences. Therefore, a list of topics of interest would be created for each academic avatar and based on these topics the appropriate course works would be assigned for marking.

C. *The Students*: The first time a student logs into the system would be asked to create an avatar, confirm his affiliation and select a path (‘race’) e.g. medicine, computing, etc from the list provided by the university. Then a course (‘class’) would be chosen and the student would be ready to join the virtual university. Based on their path and course students would have access to a set of assignments, virtual tutorials either from their university or other institutes if collaboration has been established. A variety of assignments would be available (e.g. for one person, a group, with or without time limits etc) providing at the same time several options. When the students complete the coursework they return it to the lecturer’s avatar from where they initially obtained it, ranking also the quality of the assignment, the available tutorials and the virtual facilities. The coursework would be automatically transferred to more than one randomly selected lecturers from any university for blind marking. According to their marks students gain points and move to the next level having access to more advance exercises (‘quests’), facilities and tutorials. Some additional features that could be integrated into the virtual university are the property ownership and prices both virtual and real provided to students with the best performance. Regarding the first feature, students may own a room in campus or share a house with classmates. Functionalities to decorate their rooms would be available. Useful tools or equipment may be parts of the virtual prices. Also, in-game visual displays can be used to broadcast such events including virtual interviews of the best students. The real prices can be scholarships, money or opportunities for further studies or collaboration with companies.

Another feature that will be integrated will be a talent system. Based on the results on their quests students may obtain talent points for example in mathematics, history etc creating a more unique character with specific expertise and capabilities.

D. *Companies*: Virtual stands of companies could be integrated into the Virtual University world, either for job advertisement that may include interview tests or as a research partner providing facilities and ‘quests’ to students. Companies would not be part of the assignments marking but it will be optional to join the students’ evaluation system.

IV. DESIGN EXAMPLE

In this section an analysis of the proposed design is presented. The main classes and their relationships are shown in figure 2. The proposed game design is consisted of three main classes representing the University, the Lecturers and the Students. Companies are not integrated in the current version of the system. The key functionalities and properties are presented for each class. A university is consisted by lecturers, students and facilities with a set of courses to be provided. Each course includes a list of available modules with students and lecturers registered to them. This relationship would provide access to the corresponding ‘quests’ set, designed by the lecturers related to that particular module.

Regarding the platform that is used for the implementation of the proposed Virtual University, research was conducted and

157 students participated. According to the statistical analysis 70.18% of the students prefer to play MMORPGs on a PC, 15.79% on Xbox360, 14.03% on PS3 and with 0% on a Wii or a portable device. Also, 80.70% of the students would prefer to play the game on a system with nice graphics and with just 19.30% to prefer a web based approach with low quality graphics but higher mobility (e.g. player would be able to login from any system, computer, laptop or mobile, without any software installation to be required). Based on the above analysis C# and XNA were suggested as implementation tools providing the option to implement a game simultaneously for both PCs and Xboxes360 without sacrificing any graphics quality.

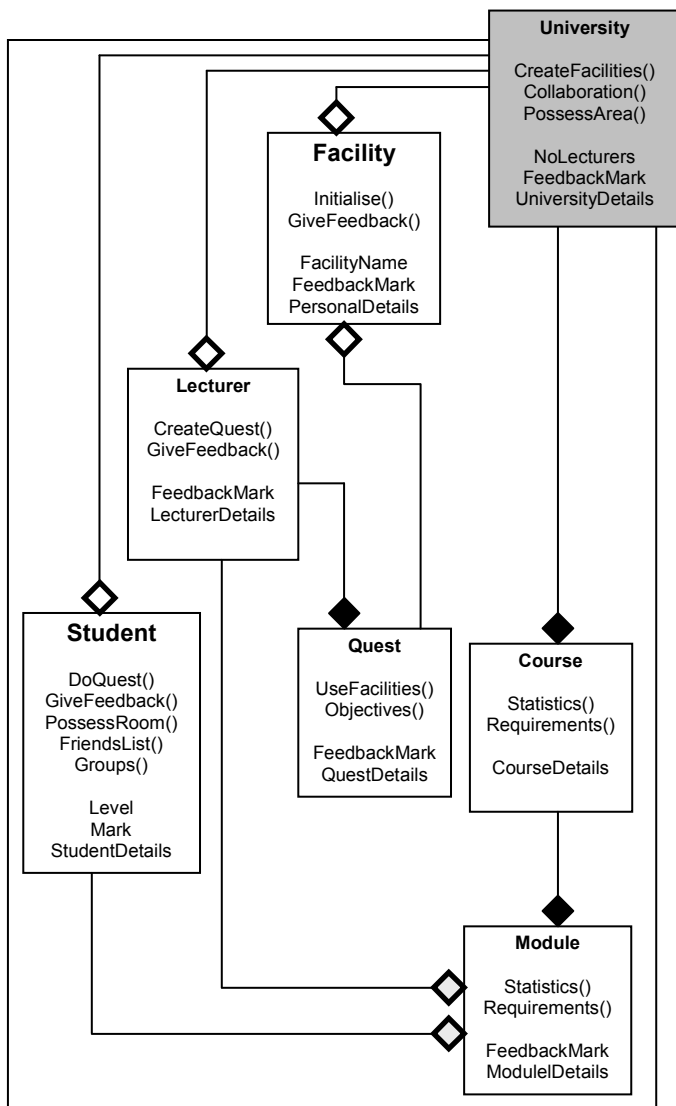


Figure 2: Main class diagram of the proposed Virtual University MMO game.

Based on the preliminary research MMORPGs were considered that provide more educational features compared with other types of games. In more details 42% of the students considered the MMORPGs above the average on an educational scale from 1 to 5. MMORPGs were regarded as high educational games by the 18% of the students and 40% below the average. Regarding other type of games, simulators

(e.g. for airplanes and cars) and brain testing games were also considered as educational but for specific applications. Significant emphasis is given on group quests either including students from the same course or not. From the analysis it was obtained that almost 60% of the students consider the group quests as the most important feature of MMOs, with the leveling concept coming second at 21%. The variety and the constant updating of the quests were selected by 12% of the students and the remaining was the graphics and the AI.

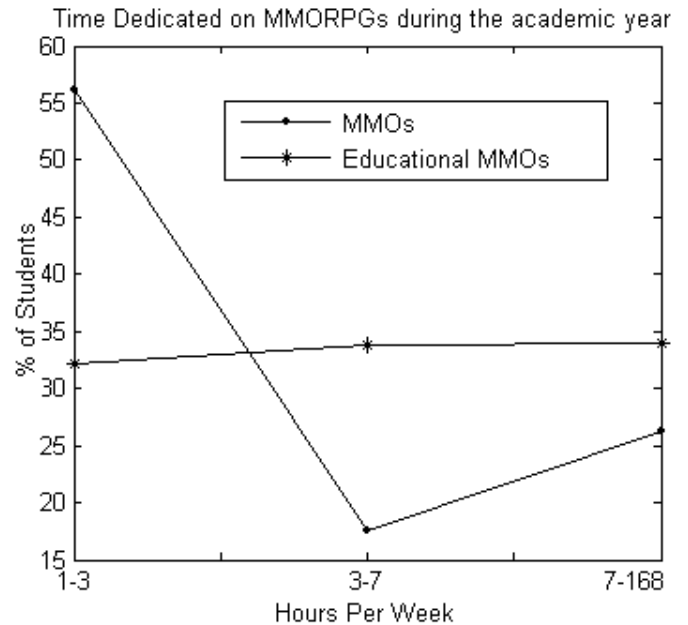


Figure 3: Percentage of students versus the hours dedicated on gaming per week for MMOs and educational MMOs.

During the academic year more than 56% of the students spend less than 3 hours per week on MMOs, almost 18% between 3 and 7 hours and more than 26% is spending above 7 hours. This trend is changing if the MMO game was part of the education with a significant part of students to dedicate more than 3 hours per week, see figure 3.

V. CONCLUSION

In this paper we propose a design for a virtual academic community based on the principles and the characteristics of a role playing game. The proposed design would provide lessons that can be practiced repeatedly until mastered, monitoring learner progress, closing the gap between what is learned and its use, and clear goals. In addition, the proposed video game design may develop higher order thinking skills such as problem solving, strategic thinking, analysis, planning and executing, team working and multi-tasking.

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