

Experiences from Developing Online VR Environments: The ‘SimSafety’ Case Study

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Abstract — This work presents the authors’ experience in implementing an online VR platform targeted to young pupils with the aim to achieve an in-depth understanding regarding Internet safety risks, protective measures and actions, primarily within the school and family environment. We a) outline design and technical considerations with respect to ‘SimSafety’ development and b) briefly discuss our progress so far under the “serious game development” paradigm.

Index Terms: game playing, OpenSimulator, Internet Safety, Internet risks, children & RPGs, serious games.

I. INTRODUCTION – PURPOSE & SCOPE

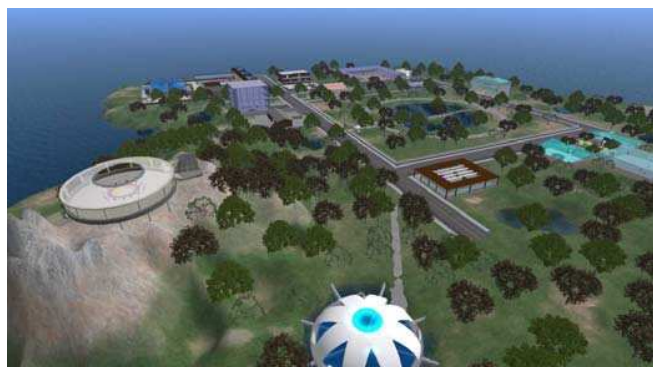
Internet provides significant opportunities as a means for information sharing, communication and learning and is clearly enhancing our society. But there are dark sides to this wonderful resource that present risks and concerns for the well-being of at least children. The recognition that the boundaries between offline and online social presence of kids are particularly elusive (often dissolving) brings forward the need for sophisticated mechanisms and frameworks for effectively negotiating cyberspace and avoiding risks and areas of concern [1].

SimSafety (acronym for “Flight Simulator for Internet Safety” <http://www.simsafety.eu>, a project co-financed by the Lifelong Learning Programme/Transversal Programme/Key Activity 3: ICT, EU) is an example of how education and technology merge. We aspire to develop a comprehensive virtual world that challenges the existing boundaries between educational and domestic environments by involving kids,

parents and teachers into a shared experience that provides information, social activities and fun and ultimately raises kids’ awareness on Internet risks.

Current estimates claim that by 2012, 80% of active Internet users will have a virtual life (e.g. a “second” life) in some form of 3D virtual world environment [2]. Moreover, experiential learning (based on the work of Dewey, Lewin and Piaget [3]) is increasingly being examined under the Second Life paradigm with very promising results so far [4]. Our approach is similar, in establishing a virtual 3D world that provides conceptually rich scenarios of simulated Internet-related activities, as well as risks and pitfalls, under a “safe” (controlled) mode:

- e-communication within a comprehensive 3D world
- avatar appearance customisation
- avatar interaction simulating social networking (making friends, cyber-bullying, etc.)
- mini games and quizzes (related to Internet safety)
- class multiplayer scenarios
- information spots
- (ro)bot deployment
- etc.



Since entertainment was a prevalent feature among the afore-mentioned desired functions, we restricted our search for suitable open-source platforms providing high quality graphics, advanced communication-chatting and expansion capabilities, finally resorting to the OpenSimulator platform

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[6]. In the following sections we a) present a brief outline of the design, technical and functional elements of the SimSafety environment b) contrast our approach to what is recently referred to as “serious game development” and c) conclude by future prospects and limitations of this work.

II. WHY OPENSIMULATOR

Our venture began with extensive research and examination of all available software platforms, able to facilitate the creation and hosting of virtual 3D worlds. During this phase, we had to bear in mind all the limitations imposed by the nature of the project, i.e. the fact that our target group consists of young pupils (of age 10-12) who would hopefully perceive our environment as a “game”. The look and feel of this game should be modern, matching experiences pupils gain from other computer games and game consoles. Impressive, eye-catching 3D graphics were called for.

On the other hand, the out-dated computer equipment that one typically encounters at mainstream school labs (including the project targeted test labs) set the need for compliance to low system requirements, thus narrowing down our initial list of options. In addition, the ideal platform should also support a massive multiplayer environment, turning maturity, stability and sustainability to key features. While many alternatives are available, our attention was almost immediately caught by the OpenSimulator project [6]. While other platforms were technically more mature, OpenSimulator seemed to be the most promising one.

OpenSimulator is a 3D Application Server, able to host massive multiplayer on-line 3D environments. This platform bears many similarities to the popular Second Life environment, since it is a project inspired by Second Life (in an attempt to inverse-engineer and deploy its functionality under open-source terms). Despite being at an early stage of development (hasn’t reached Beta version yet), the platform proves to be quite stable and robust, even when serving many concurrent users. The server side requirements are considered to be quite reasonable and as far as the client software is concerned, the requirements are quite fair.

By default, when having a fresh installation of the OpenSimulator at hand, you are immersed in a virtual island which you can change to your liking. On this island you can start building artifacts and serving content in the form of audio, video and images. Using tools provided by the client software, one can shape the environment to resemble a city, a forest or something completely imaginary. The players navigate through this 3D world using human avatars, whose appearance they can completely customise. Functionality can be later added to each artifact using the built-in LSL Scripting Language supported by the system. Events, such as an avatar touching an object, speaking or visiting a place can be programmed to trigger a system reaction and thus give (traceable) ‘semantics’ to this action. In order to add extra features to the platform, OpenSimulator supports external modules that help programmers enrich existing functionality,

create new events and improve the user interface.

Among the most difficult challenges we faced during the development of the environment was the need for conceptually rich activities and scenarios. OpenSimulator and all similar platforms are mainly intended to function as fancy, 3D-boosted chat environments where advanced graphics and artifacts are provided to primarily enhance the social/chat experience. Therefore, concepts that would familiarise kids with Internet-related activities and eventually transfer the virtually gained experience to real life such as friendship tracking, cyber-bullying simulation, addressing a helpline and in general monitoring a user’s (re)actions were particularly difficult (if possible at all) to implement. Guided by the conceptual game framework described in [5], we tried to devise advanced programming techniques and mechanisms to conceptually enrich the environment’s events and services along these lines. Some of those technical constructs are summarised in the following Section.

III. CUSTOMISING-EXTENDING OPENSIMULATOR

Hosting 3D virtual worlds does not by itself render OpenSimulator suitable for hosting a (successful) multiplayer game. Several additions/modifications were required in order to enable gaming functionality and enhance user experience:

A. Database programming

A custom database was created, working side by side with the original OpenSimulator one, in order to store several game-related data (such as scoring, particular user log parameters, several game parameters such as cyber-bullying frequency and type, quiz data, dynamic data, etc.). Since OpenSimulator’s database primarily serves the needs of the platform (in terms of avatar location and movement), the range of stored information is significantly limited while on the other hand not always modeled and indexed in a straightforward manner. Moreover, persistency of any type, i.e. the ability to store historical data or keeping user states was not originally included in OpenSimulator specifications. Therefore, the information used to model a user’s progress through the game is accommodated by the custom database. This information can be accessed through the environment with the use of in-game scripts and external web services, acting as an interface to the custom database.

B. Module programming

OpenSimulator platform functionality can be extended through the use of modules, which are programmed using a native API (Application Programming Interface) that allows programmers to access and alter core functions and variables of the simulator. These modules constitute the most powerful tool a developer has available, especially when considering game development. In the context of SimSafety, we have created several modules to help us out. The default friends-making procedure of the game was modified and enhanced with additional dialogs in an effort to raise awareness on making friends online and its related risks. A module that

creates disturbances to the players throughout their whole game experience, in a manner simulating real life, has also been developed. Extensive logging of user actions and scoring has been made easy in the same way.

C. Bot programming

Another component usually included in computer games is the NPC (Non-Playing-Character, or ro-bot). NPCs are computer controlled players that can be programmed to perform various tasks and can serve various purposes. In our case, NPCs were employed in order to simulate internet dangers but also to provide guidance to the players. Once logged in, a player may become victim of a cyber-bulling NPC, receive spam or turn to another for help. Providing NPCs with artificial intelligence can be critical to the success of a game since it increases the realistic feel and playability of the game, as NPCs start to behave like normal users. In SimSafety NPCs are quite primitive, in the sense that their list of instructed activities is limited at the moment, but in the future we plan to put serious effort to this extent.

D. The SimSafety portal utility

SimSafety differs from a traditional computer game for two main reasons: a) it is on-line and multiplayer and b) it is an educational game. As a result, besides developing the main game engine, one needs to be concerned with a fair amount of administrative tasks related to user accounts, content management and server maintenance. In an attempt to address these issues we created a web portal to help us organise and control the aforementioned parameters. The portal acts as an external interface to both the system's and the custom-developed database, providing easy management of user applications, account approvals, user rights, scores and dynamic content (e.g. multilingual information provided by Safer Internet nodes and published in the virtual Info Centre).

IV. THE SIMSAFETY VIRTUAL ENVIRONMENT

In this section we present the main virtual spaces comprising the 'SimSafety Park' along with their indented functionality.

Welcome area



This area was designed to give users a pleasant first impression of the game. It mainly consists of a sci-fi building looking like a spaceship with posters containing all the

information needed by new users to walk around the SimSafety Park and familiarise themselves with game controls.

The Park

A virtual park with a lake, a small bridge and a boat was designed to make our virtual environment more attractive to the players. It is a place to gather, relax, stroll around the lake, sit on a bench and meet with your friends online. Apart from the entertaining element, in this area a user may randomly find a credit card or a wallet which they can either turn in or keep for themselves (actions related to accessing inappropriate Internet content which are penalised accordingly).



Avatar Customisation area

In order to make the game more engaging we have implemented the Avatar Customisation area which is the equivalent of a real life clothing store in our virtual world. Players have a wide range of jackets, trousers, shirts, etc. to choose from and create their unique outfit.

Information Center



A modern building providing Internet Safety material in the form of posters was among the first to be “built” in the SimSafety Park. This building was designed in a museum-like fashion, so that a classroom could make a visit and learn about current issues concerning Internet dangers and threats. Additionally, there is a special multi-language room where posters hosted can be translated into several languages. Current posters contain information available at Safer Internet nodes (<http://www.saferinternet.org>).

Mini Games Zone

In an attempt to simulate Internet dangers in the best possible way we created a series of multiuser role playing games based on real life incidents of children that had offensive online experiences. Roles are automatically distributed among the players and they are scored based on their “acting” according to their role. By the end of each mini game, each player knows what was the Internet danger involved, what was the correct reaction for each “role”, and how they could cope in similar situations in the future.

Quiz and puzzles



“Quiz boxes” and puzzles are scattered throughout the world in various locations frequently visited by the players. Touching a box triggers a quiz dialog consisting of several questions about Internet safety. Based on the player’s answers a quiz score is generated which is added to the player’s total score. Similarly, puzzles are clever constructs implicitly conveying a message (e.g. scrambled pieces of a Safe Internet poster that the player should put in order).

Cyber-bullying



Being one of the major Internet threats, particularly among young kids, cyber-bullying is extensively modeled and treated in SimSafety. Several NPCs randomly bullying the players while they walk around are implemented. The NPCs communicate through the players’ native language and the user is judged (gets a score) according to his/her reaction to bullying. The recommended action is to visit the “report center” and “sue” the avatar that bullied them. In this way,

apart from increasing their overall score, they won’t be bullied by the specific NPC again.

Free expression areas

One of the concerns of the project’s pedagogists team was to foster children creativity by offering them free expression tools. In the SimSafety park “free expression” areas provide kids with the basic OpenSimulator designing toolbox (creating primitive 3D objects like cubes and spheres, geometrically combining them, giving colour and texture or even leave a free message as an image on a shared wall). In this way, using more or less the same tools the developing team used, the players can design their own places, games or activities they wish to share with their classmates.

Scoring

We have already referred to a complicated scoring system deployed in SimSafety, in previous sections. A series of score types has been implemented in order to track and evaluate all user actions related to our learning objectives. For example, there are different scores related to a player’s quiz performance, mini game participation, SimSafety world exploration, reaction to random object findings and cyber-bullying management. Apart from being displayed in the Hall of Fame of SimSafety homepage, scores are weighted and summed up to a general user score indicating the player’s overall performance in the game.

V. SIMSAFETY VS. SERIOUS GAMES

SimSafety “is a game designed for a primary purpose other than entertainment”. Instead, its primary purpose is to raise Internet safety awareness of the players. According to Wikipedia this is the definition of a “serious game”, a rather new trend in the video gaming industry. According to recent reports [7] this new trend is rapidly growing and is expected to be a 10 billion euro market in the next 5 years.

Serious games have been acclaimed for playing an increasingly important role in learning, psychological development and social change [8]. So far three different models of entertainment education have been utilised:

- the *motivational paradigm* suggests that entertainment elements of a product (in the form of enjoyable add-ons) elicit the specific selection of it
- the *reinforcement paradigm* supports repetitive usage by offering awards after successful completion of a task
- as opposed to the two previous approaches (being at the core of what is frequently termed *edutainment*), the *paralleled experiences* paradigm stands out on its own by postulating that educational components need to be enjoyable and entertainment elements should be closely associated with education

Of course, enjoyment entails a strong personal taste, depending on the user and the situation. Some consider challenge and competition as entertaining while others find

pleasure and enjoyment in role playing, creative work and challenging activities.

The following set of questions was postulated in order to successfully classify a game as “serious”. Considering the current stage of SimSafety development, one could favorably argue:

Does it work? (beta-testing)

Pilot implementation in schools has provided useful feedback in relation to different aspects of the project. In summary we could conclude that:

- SimSafety is robust enough (it effectively supported several dozens of concurrent users during the pilot implementation phase) – so, *the system works*

What are the learning goals?

How well do the learners achieve those goals?

What else are they learning?

Does it track the learner’s performance? (learning)

Moreover,

- SimSafety is a virtual environment that pupils can take full advantage of provided the support of a dedicated teacher. The primary objective is to make the players (students, parents and teachers) aware of the dangers lurking in the Internet and implicitly indicate appropriate response to potential such incidents
- Often visits to SimSafety minimise the technical problems and highlight the positive aspects
- Mini games are successful when one of the roles is being played by an adult making provocative questions and initiating interesting discussions
- Interesting discussions among teacher and pupils occurred during mini game playing and while answering the quizzes
- Overall, pilot implementation so far has been embraced by teachers and pupils and provides strong indication that this idea may be at the right track towards offering a fresh and up-to-date approach to an equally new and up-to-date problem.

Therefore, our initially set learning goals were achieved to a significant extent.

Is the content accurate and appropriate for target audience? (content review)

The current educational content is provided by a group of experts, including teachers and pedagogists with a long-standing experience in the field, as well as scientists at the forefront of EU activities related to Safer Internet. In addition, the platform itself supports easy and seamless incorporation of additional multilingual content for the non-expert user.

Is it easy to use and easy to learn to use? (usability-navigation)

The interface supported by SimSafety resembles closely that of Second Life environment, a serious application on its own. Pilot implementation proved once more that young kids have an extraordinary way to master computer usage and in particular navigate and take full advantage of the platform’s features, not even visiting the game instruction areas. Older players (parents or teachers) found these particular areas helpful enough to get started the virtual tour and master the main interface functions in a reasonable amount of time. This observation was confirmed by the questionnaires as well.

Is it compelling/engaging for the target audience? (realism, satisfaction)

One of our greatest challenges during the design of the environment was to make it engaging for the players. In this aspect, the relative success of SimSafety can be attributed to several factors, some of which are also summarised in previous sections (apart of course from the main environment components and activities):

- a comprehensive scoring system, which is in turn closely related to a comprehensive set of potential actions, is a strong motivating parameter, especially for young players who are eager to understand ‘right’ and ‘wrong’ moves and actions in order to achieve higher performance
- fancy, high quality graphics count very favorably to the environment’s realism and overall satisfaction
- finally, the “multiplayer” nature of the platform which gives players the opportunity to communicate live and openly using text messages, voice chat or even gestures increases the kids’ willingness to come back to the virtual world for another game session

Does learning in the virtual world transfer to real life? (learning experience)

The resemblance of aspects of the virtual environment to real life led to our early expectation that learning and experiences in SimSafety might transfer to real life in different ways. In several cases during the pilot implementation phase this was intensified by the kids reaction to issues like ethics and professional and/or ethical codes especially when using the Internet, which in some cases led to serious class discussions and probably cultivated a meticulous attitude (to some of the kids) towards (re)visiting the environment and experimenting with the provided activities.

Summarising this section, we could argue under a relatively high degree of confidence that SimSafety has the main ingredients of a serious game. Players become engaged in an entertaining environment which can excite their imagination, need for communication and fun while increasing their awareness and shaping their attitude towards using Internet safely.

VI. CONCLUSION – FUTURE PROSPECTS

In this work we briefly outline under a rather technical perspective our experiences from developing SimSafety, a virtual world targeted to young kids (as well as parents and teachers) who wish to have fun while at the same time learn how to deal with Internet risks and dangers. Although at an early stage of development, our approach seems promising and is expected to flourish in the following years as an immersive learning paradigm.

Regarding current limitations, mainstreaming of the application to multiple school labs both in terms of server performance as well as typical system requirements is among the most important ones. The need to provide conceptually rich activities will always remain a challenge for the designers and the developers of SimSafety. To this extent, future enhancements of the platform indicatively include the following:

- more sophisticated use of audio for the deployment of educational activities
- enhancing AI aspects of NCP behaviour
- automating the import of other OpenSimulator applications' world and graphics
- experimenting with newer OpenSimulator versions (hopefully to be released soon by its enthusiastic

community) in terms of supporting many concurrent users

- codifying and automating the scripting content of certain events, which would subsequently facilitate the deployment of “the quest for hidden treasure”-like scenarios.

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