

# Learning Support and Legally Ruled Collaboration in the VirtualLife Virtual World Platform<sup>\*</sup>

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**Abstract.** The paper addresses the purposes and design decisions produced while developing a peer-to-peer virtual world platform. The work is being done within the FP7 VirtualLife project. The purpose of the project is to create a safe, democratic and legally ruled collaboration environment. The novelty of the platform is mainly in the issues of security and trust and in the implementation of an in-world legal framework, which is real world compliant. In the paper the authors reflect on user needs and learning support in a university virtual campus, a potential scenario. The opportunities of a virtual world in enhancing learning are discussed. A new paradigm of the content is characterized as interaction versus information.

**Keywords:** intelligent virtual world, e-learning support, reputation management, value based interaction, virtual law.

## 1 Introduction

The paper presents early results obtained while developing the VirtualLife virtual world platform. It is designed under the following requirements: (1) the use of a peer-to-peer communication architecture, (2) security and trusted transactions, and (3) legally ruled collaboration. The work is being done as part of the FP7 project “Secure, Trusted and Legally Ruled Collaboration Environment in Virtual Life”.

Currently VirtualLife is targeted at distance learning scenarios. The authors reflect on e-learning scenarios in 3D immersive virtual collaboration environments often called virtual worlds. Present virtual worlds are mainly leisure-based. A user may have several identities. Therefore distance education is mainly hybrid: the learning is provided in a virtual environment whereas signing a contract of a student or teacher and passing exams is performed in the real world. A trusted and secure user identity is required in order to transfer real world activities to a virtual world.

Virtual worlds offer new opportunities to enhance collaboration. Involving virtual worlds for learning provides more adequate motivation for contemporary students that cannot imagine the world without the Internet. Students perform certain activities in

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the immersive 3D environment for which they obtain instant feedback. We also argue that a more elaborate legal regulation is required.

In the real world, human communities develop and enforce their internal rules whereas this is not permitted in present virtual worlds. The rules are established by virtual world creators and administrating avatars that enforce the rules. Consequently, a virtual world is like a text-based Web 1.0 platform where webpage creators influence the content. Web 2.0 enables a user to be an active creator and community builder. The user got used to be active in Web 2.0 environments and may feel restricted in a present virtual world.

## **2 About VirtualLife**

Collaboration in a VirtualLife's virtual world is achieved through the definition of common rules that take care of all the involved cultures. A standard collection of laws and the Virtual Constitution, finalized to the creation and regulation of a secure and trusted environment (Virtual Nation), form the VirtualLife's legal framework. Hence the virtual world is not a game. The project and the software are introduced in [1].

VirtualLife architecture is based on a peer-to-peer network with nodes connected using a secure protocol. Thus the resulting virtual world is not hosted on a central server cluster but is based on a network of Virtual Zone Servers.

## **3 Learning Support in Virtual Worlds**

This section is devoted to potential use cases and user needs. A University Virtual Campus is foreseen as a sample scenario for a validation of the VirtualLife platform. We further explore e-learning scenarios and design decisions.

### **3.1 Learning Needs of Today Learners**

Young learners do not perceive the world without the Internet. They easily switch to a chat, e-mail and reality. This new generation is called the "digital natives" [2]. Their multitasking nature limits the learning abilities in a traditional format as traditional lessons require the lasting concentration. Traditional education requires learning and memorizing for a later use. But the students are inclined to seek for learning materials. Digital natives need an environment that supports multitasking and search.

Young people are active users of Web 2.0 applications that encourage to stay there and to return. Young people like to impress peers with curious facts. Hence social interaction and participation in group activities is their natural expectation. Platforms like Wikipedia show that their users are collaborative and altruistic contributors. Forums and blogs support communication with competent volunteers in addition to peers and teachers. MMORPG (Massively Multiplayer Online Role-Playing Game) environments have developed an instant gratification mechanism that encourages a player to achieve a higher level of skill. Learning tools based on Web 2.0 principles included the following features [3]: dynamic reward of learner's actions, visualization of learner's reputation, and a peer rating of learner's contributions.

The following ways to make learning more gratifying can be recommended [4]:

- Learning should be a combination of challenge and fun.
- The feeling of achievement should be promoted by providing instant feedback.
- Performance should be related with the status in a peer group and the grades.

Thus a modern learning environment should be learner-centered. It should support 3D visualization, context awareness, multitasking, rewarding, reputation management, contribution ratings, interactive learning objects, and chat.

### 3.2 Requirements of Learning Support in a Virtual World

Design decisions below are formulated considering the modern learner's needs and the experience gained using Web 2.0 based learning tools. Thus the platform becomes appealing for e-learning applications. Essential features of the developed platform such as security and trustiness would reduce the need of face-to-face meetings.

#### 3.2.1 Encouraging the Motivation for Learning through Playful Experiences

Virtual worlds enable the creation of more elaborated and appealing learning environments comparing to text-based Web 2.0 platforms. In a 3D environment a learner immerses to a certain situation where interactive 3D objects are provided as in the PWI (Practice-World-Interaction) model [5]. In such an environment the learning of complex subjects is feasible through interaction. For example, Mantyka claims that it is hard to teach subjects involving the development of complex knowledge structures

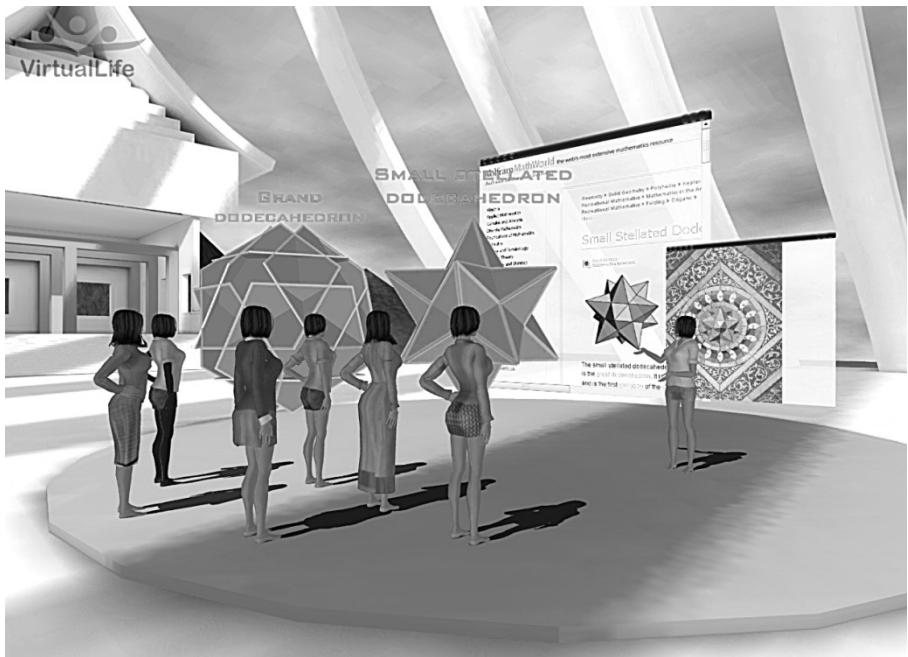


Fig. 1. Interacting with a complex spatial geometric object in a virtual world

that demand a lot of exercises, such as math [6]. But in a virtual world, an interactive object, for example, the graph of a certain mathematical function,  $y = kx + b$ , can be provided. The learner could observe the results and draw a conclusion while changing the coefficients  $k$  and  $b$ . Such a learning procedure accords with an active learning attitude which is expensive to introduce in the real world. Virtual worlds are more flexible and less expensive. Furthermore, students can be involved in the creation of interactive learning objects. Of course, this approach cannot cover all the topics of math but can intersperse difficult studies.

Two-dimensional environments hardly support subjects where 3D imagination is needed. For example, while teaching geometric solids in the real world environment, the teacher demonstrates paper models that help the learner to understand their composition. When teaching this subject in an e-learning environment, 3D simulations are enough. VirtualLife demo screenshot shows a sample geometry lesson where a teacher and learners interact with complex solids (see Fig. 1).

A learner gains playful experience when she interacts with learning objects and stays in a nice futuristic setting. Learning a complex material is a challenging task. But if combined with playful experiences, it makes fun and encourages to stay and repeat the actions. Fig. 2 shows an interaction with a complex geometric solid. A purpose is to understand solid's structure.

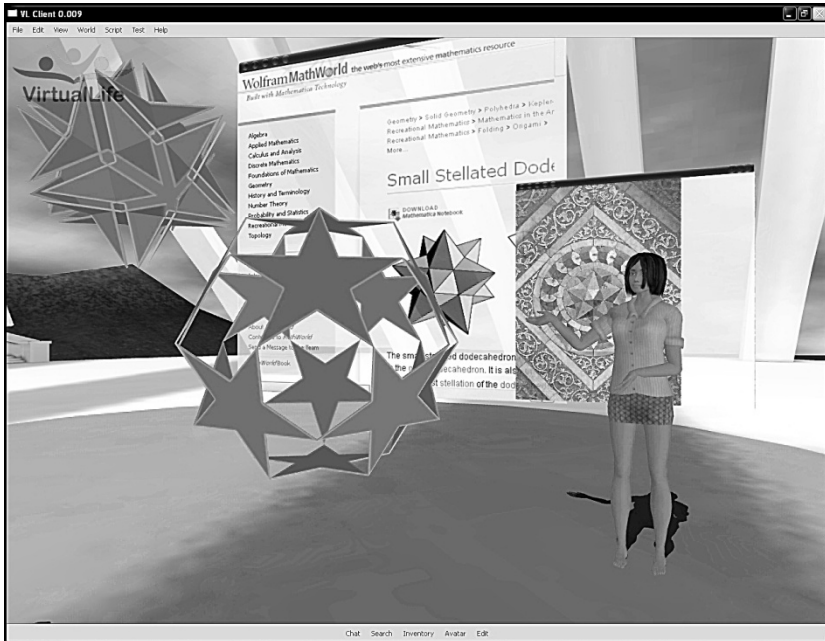
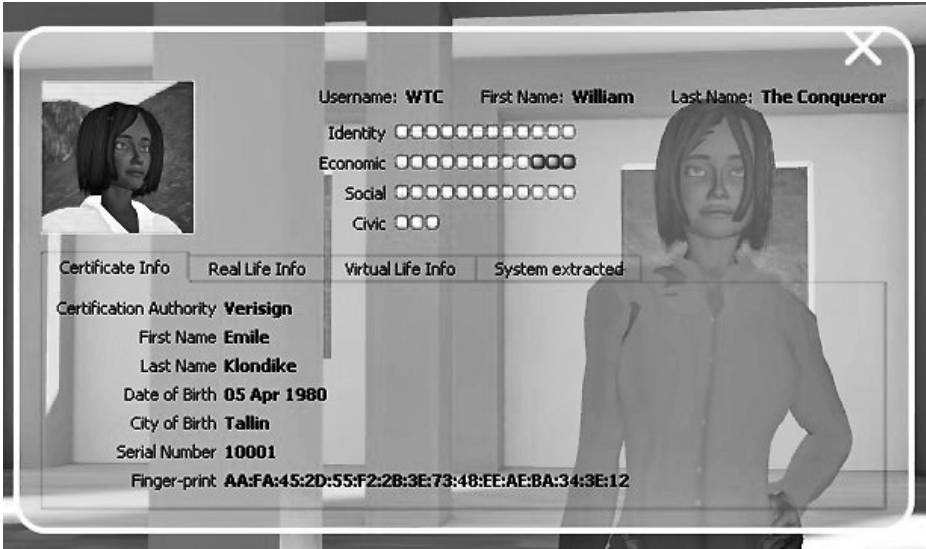


Fig. 2. Combining a complex material with a playful experience in a virtual world

### 3.2.2 Instant Gratification for Encouraging the Quality of Contribution

A successful learning environment has to meet the gratification challenge. It ensures user participation that is important for all online communities [7].

Instant feedback and performance is a natural feature of a synchronous communication platform. The Comtella learning environment depicts student status in the group in the form of circles which are sorted into four levels depending on their contribution along various criteria [3]. Such reputation visualization is effective when criteria are implicit. Thus it helps to avoid the gaming effect. For example, if a student knows that a certain amount of a contribution is awarded, she is encouraged to send a lot of low quality contributions.



**Fig. 3.** Reputation visualization in the VirtualLife virtual world platform

The learner's status in a group can be achieved by reputation management. Reputation in e-business and e-learning has different meanings. Therefore VirtualLife distinguishes between civic, economical and social reputation (see Fig. 3). The civic reputation represents the avatar's status regarding the virtual law. Each violation automatically decreases it. The economical reputation is determined by avatar's behavior in economical transactions. During each transaction the avatar can rate the partner. The social reputation is determined by the users. It is rated during interactions with other avatars, e.g. evaluating the quality of learner's contributions.

In order to avoid evil-minded behavior, a negative social reputation cannot be assigned in VirtualLife. A high reputation can be gained only from positive responses for a high quality and useful contributions. This mechanism should encourage active participation and the quality of contribution. The learner is motivated to accomplish group tasks in order to achieve a high reputation in the group. An explanation of a learned knowledge to peers is also rated and is perceived as a valuable contribution.

## 4 Focus on VirtualLife Legal Framework

A VirtualLife legal framework was elaborated in project deliverables, see also [8]. Further the elaboration was in the form of a specification of Virtual Nation laws [9].

A virtual world is quite different from a standard video game, where there is a story, a final purpose, and the system only allows for a limited set of actions. In a virtual world there is not a determined purpose and there is not a game over. People move their avatar and establish their second life, driven by different purposes. Thus the rules of play should be replaced by a sophisticated legal framework, which is considered to be essential in order to guarantee the existence of a secure and safe virtual world. In VirtualLife, the legal system takes into account both real life values and real world laws [1].

### 4.1 From Norms in Law to Rules in Artifact

The legal framework is a three-tier system that is compliant with real world law. The framework is comprised of the Supreme Constitution, a Virtual Nation Constitution and sample contracts.

A Virtual Nation Constitution contains special provisions as regards, for example, the protection of objects used in that Virtual Nation under copyright law or the authentication procedure required to become a member of that nation. Distinct virtual nations, e.g. a university virtual campus and a virtual mall, are governed differently.

As one can note, the Supreme Constitution is placed in the level of contract law. This binds the user on the contractual level and contributes to law enforcement. Of course, a user of VirtualLife software is ruled not exclusively by the sources above, but also by the user's national law.

The editor of rules comprised in the VirtualLife platform is a tool to compose laws. The rule concept is approached considering Vázquez-Salceda et al. [10]. A sample toy rule 'Keep off the grass' is transformed into 'The subject – avatar – is forbidden the action – walking on the grass'. Other examples of rules, see [9]:

- An avatar is forbidden to touch objects not owned by him or a certain group.
- An avatar not belonging to a given group is forbidden to a given area of the zone.
- An avatar is forbidden to use a given dictionary of words (slang) while chatting.
- An avatar of age is forbidden to chat with avatars under age.

If an avatar violates the rule (e.g. walks on the grass), his reputation is decreased. The rules above show that the "Ought to Be reality" concept, which is used in legal theory, can be extended from the real world to a virtual world.

Rule enforcement is implemented by triggers. They trigger the changes of the virtual word states and thus invoke avatar script programs. The triggers implement a demon concept which is known in artificial intelligence. AI is an "umbrella" discipline and comprises a variety of paradigms [11].

One can note that we follow a legal informatics approach "From norms in law to rules in artifact" [12]. The approach contributes to a bridge between law and informatics. In the approach we advocate the thesis "code is law" [13].

The translation of legal rules into machine-readable format requires human intelligence. The translator faces certain problems. Just to mention a few: (a) abstractness of

norms, (b) open texture, see e.g. Hart's example of "Vehicles are forbidden in the park", (c) legal teleology, (d) legal interpretation methods (e) heuristics – to translate abstract concepts and invent low level ones.

## 4.2 Values Protected by VirtualLife Laws

VirtualLife laws – like laws in general – identify purposes and protected values. These are the values of a Virtual Nation. The values shall be enforced by code – a set of technologically implemented rules and laws [1].

Examples of values, which are immanent in a real-world constitution of a state, are democracy, human life, sanctity of property, legal certainty, etc. Values can be worded explicitly, but mainly they are implicit. They can be inferred from the text of a legal source and the whole legal system. For example, the Code of Conduct within the Supreme Constitution identifies equality (non-discrimination), avatars integrity, honor, reputation, privacy, free movement, freedom of thought, freedom of association, etc. Such explicit representation contributes to detect violations of the Virtual Nation laws by the users.

## 4.3 The Law of Avatars

The behavior of artificial agents (including avatars) shall also be governed by law – "virtual law". An example of a norm is that an avatar is forbidden to commit a (virtual) crime over another avatar. For example, an avatar is forbidden to harm (kill, hit) another avatar, steal its inventory, etc. Thus we approach a code of avatars [14].

Designers of actions over avatars have to care that such actions do not infringe the so called "virtual rights" of other avatars. For example, the physical integrity of the body of another avatar shall be preserved when my avatar takes an action – walks, moves, flies, etc. Here a question arises what the concept of an "objective right of an avatar" is. An answer can be entailed from a virtual world implementation. The right is a list of actions which are permitted to the avatar in the virtual world program.

Virtual law accords with the concept of a community of programs [15]. Many years ago Lyubimskii came to the conclusion that programs should interact similarly to humans: "the structure of the community of programs and the means of their interaction are largely similar to the structure and means of interaction in human society". Hence the interaction of programs should be ruled by similar laws.

## 5 Conclusions

Virtual worlds are likely to become an extension of our real lives. Therefore legal and security features have to be improved. VirtualLife implements this requirement. Certain elements of the virtual law can be implemented technologically. In a sophisticated reputation management system, avatar's activities are evaluated by the system and the users. The system detects infringements of the virtual law and decreases the civic reputation. The social reputation is influenced by teachers and learners while rating the contributions of a student.

Virtual worlds add synchronous interaction to a mere asynchronous information provision as in 2D Web applications.

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Reflections on legal informatics issues are stipulated by Friedrich Lachmayer.

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