

SITUATED SIMULATION AS A LEARNING TOOL – EXPERIENCING FORUM IULIUM WITH THE IPHONE

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ABSTRACT

Applications on handheld devices are becoming more influential in our digital lifestyle. The *Forum Iulium* produced for smartphones is a variant of augmented reality that with the use of geopositioning present a virtual representation of a known landmark in Rome. The effect of digital learning can be enhanced by learning through experience and the engagement through immersive interfaces. In this paper I discuss the experiences in developing and testing this application, what opportunities it creates for teaching and whether it can replace other more traditional teaching methods.

KEYWORDS

Situated simulation, augmented reality, situated learning, Forum Iulium

1. INTRODUCTION

As technology advances, digital devices become more advanced and mobile phones open up a gateway to new features and areas of application. The mobile phone is common property, and it is turning into an affordable handheld computer. As the support of geopositioning and multimodality have come into use, we might see more of learning through doing where augmented reality gives a much clearer coherence between what you learn and where you learn it, in the sense of both context and location. Thus it brings a unique contextualization opportunity for learning experiences.[2]

This paper will discuss learning potential and benefits concerning handheld devices through the production of the iPhone application *Forum Iulium*.¹ The application was planned and implemented before it was tested on location in Rome. The results will be presented and discussed in context of learning through immersive interfaces; “the subjective impression that one is participating in a comprehensive, realistic experience” [2] and a pedagogical perspective on situated learning; “learning is a function of the activity, context and culture in which it occurs. [6] Does such a situated simulation have the potential of replacing or supplementing older methods of teaching like guiding and presenting? And could it have additional benefits?

2. A SITUATED SIMULATION

Augmented reality allows the superimposing of computer generated images over real scenes in real time.[9] Closely related, Situated Simulation, first introduced by Liestøl, is built in 3D and requires the handheld unit to handle high level graphics. It combines the users’ real position and movement, with the 3D graphics on screen developed as a representation of a space, phenomenon or a structure, forwards or backwards in time. As these two perspectives are calibrated, the real world which the user is moving in and the virtual presentation align and create an alternative view on the case studied.[8]²

¹ *Forum Iulium* was prototyped in the spring of 2010 at the University of Oslo in the course “digital media: construction and interpretation” at the media and communications department lead by prof. Gunnar Liestøl. In collaboration with the Inventio-project, which had already produced situated simulation applications like the Oseberg Viking ship, the Mission Dolores and Parthenon (Acropolis)

² More on situated simulation at the Inventio web-site: <http://inventioproject.no/sitsim/>

Forum Iulium is a situated simulation of the famous landmark found in the center of Rome, Italy. The application utilizes mobile devices and location based technology to enable the user to experience the forum and the temple through situated simulation. As the iPhone 3GS both have a touch screen, GPS, accelerometer and compass the application will know the location and which direction the user's facing, enabling the movements from the real world to be transferred into the application. When the application is turned on, today's landscape in 3D is shown on screen. Through thorough calibration and the use of satellite photos during 3D modeling, the 3D model and what you see create coherence between the two. From this point on the user will start interacting with the application. A balloon situated in the terrain close to the starting point triggers a transformation, takes the user back to ancient Rome, and builds an interpretation of the temple, the forum and a very limited representation of its near surroundings. Inside the 3D world the balloons are represented through multimodal media. Voiceover, pictures, text and 3D are used to teach about the *Forum Iulium*. Since we wanted to see the learning potential, a quiz was added. Through this quiz, the user was tested on his or her knowledge about *Forum Iulium*.



Figure 1. Reconstructing *Forum Iulium*

The Situated simulation was tested with a group of students doing a bachelor course in aesthetics at the Norwegian Institute in Rome. These students had different technological competence but a good knowledge of the history of ancient Rome and experience of being at an archeological site. After testing, the students went through a survey, group discussion and finally a group debate with the production team. All quantitative and qualitative data presented here is acquired from the testing in Rome.

2.1 Learning through Experience

In the most basic of learning situations, people have gained skills through observing, understanding and participating in activities. In the educational system, traditional methods of teaching dominate and alternative ways like utilization of technology are often neglected.[10] Digital educational software, simulations and commercial educational video games (edutainment) [5] are amongst the digital genres that are trying to get a foothold in the educational system.

Constructivism has had a strong influence on how we view learning inside a cognitive learning perspective. The main focus in constructivism is that people do not receive information through a passive state, but through activities which give them knowledge about their surroundings. It is when a person is active, physically and intellectually engaged in the surroundings, and manipulates and explores them, new skills are developed. [10]

"Edutainment titles that adhere to a constructivist approach are often referred to as microworlds. When interacting with objects in microworlds, we are learning about the object's properties, connections, and applications." [5] In augmented reality or situated simulation the focus is similar. The information is there to be found and explored, but how the user interacts and structures the content is up to him or her. The interactivity in such environments is a significant feature for learning. Bransford claims interactivity makes it easy for the user to move back to a specific part in the simulation to explore them more thoroughly.[1] The information inside a situated simulation is highly contextualized and location dependent which causes a stronger link to the real world than seen in such edutainment titles. Close connections between activity, reality and simulation can cause strong user engagement and thereby enhanced learning effect.

2.2 Immersion

"Immersion is the subjective impression that one is participating in a comprehensive, realistic experience." [2] What we experience today is a world where new devices and services change the way we use technology. Changes in media use, and immersive interfaces can aid in designing new educational tools and experiences to students and others. When an immersion in a virtual environment is based on design strategies combining actional, symbolic, and sensory factors, it causes users to feel that they are experiencing something quite realistic, like they are "inside" the digital enhanced setting. Actional immersion enables the user to experience a situation not possible in the real world. Symbolic immersion triggers psychological associations

to experiences inside the application. Sensory factors through atmospheric sequences or elements like sound, motion and interacting with objects are used to influence the users' emotions which help to remember and make the experience more real. [2]

Immersion causes the user to engage with the situated simulation, and in our work we put a lot of effort into two elements with some importance to the immersion. The first element was how sounds affected the user's engagement. The test group commented that the voice-over clips gave good and concrete information. The sounds placed to specific locations inside the virtual world however were confusing to some of them due to poor volume adjustment, positioning and reach. We also focused on the coherence between screen and reality. Positioning through GPS and calibration between the 3D model and *Forum Iulium* in Rome would have to be closely matched for the situated simulation to work. When testing, there were small problems in regards to the GPS on one of the devices, which caused both the movement and the ratio to be off. The rest of the group said it was from ok to very good, but wished for more reference points (buildings and natural landmarks) around the structure to enhance navigation and orientation.

When *Forum Iulium* was tested, one of the testers expressed that she felt a certain pride while using the application, explaining that she felt lucky having the opportunity of experiencing the simulation of the forum and temple while being at the location in Rome. This feeling could originate from a number of reasons: a) Being able to see and experience something other people around the Forum did not. b) Having the possibility of experiencing a virtual model the Forum and temple in its' natural context, giving a better overall experience of the site. c) Being able to interact with the surroundings dated back to ancient Rome and gain knowledge from the experience. The most typical way of enhancing the experience at an archeological site would be to hire a guide³. In the survey one question touched briefly on this topic.

The result showed that most of them would prefer a guide and the reasons they described were: a) you do not have the option of asking questions and follow-up questions in a situated simulation. b) The quantity and the quality of the information are better coming from a guide. c) The situated simulation works better as a supplement than a substitute. d) The situated simulation would work better as an introduction to a lecture, than on its own. To sum up these arguments, the historical content of the application was seen as superficial with limited possibilities for in-depth study and not as valid as the information coming from a guide. The students also argued in the focus groups that they felt the screen was too small to read text documents on and that if the information quantity was to increase they would prefer it to be voice-over rather than text. They felt that they were able to learn from the application, but that there should be different levels depending on the users' knowledge on the topic. They all agreed that the *Forum Iulium* can increase interest, and make a person curious to explore the topic further.

2.2.1 Perspectives

Studies have shown that immersion into digital environments can enhance learning in three ways; giving the user multiple perspectives, learning through situated experience and transfer. [2] Being able to change a users' perspective or frame of reference can be powerful tools in helping someone understand a complex phenomenon. Typically this is done by shifting between an exocentric and egocentric frame of reference. The exocentric frame of reference provides a view of an object, space or phenomenon from the outside, while an egocentric frame of reference provides a view from within the object, space or phenomenon.[2]

In his article, Bernard Frischer, Director Rome Reborn Project⁴, describes an observation done after finishing the 3D modeling. "But once we have the model of the entire city, we can see something we never even thought to ask: you could also see Trajan's statue when you entered the Forum of Julius Caesar." [4] For the first time since the city was still intact, one could see how the buildings were standing in relations to one another. This also gave a pin pointer to the positioning of buildings and structures inside Rome, a clear example of how vital such a frame of reference can be in terms of knowledge. [4] As *Forum Iulium's* perspective is similar to what you see in the Rome Reborn project the same arguments can apply here. There is one important difference though – the size of the application. It is therefore evident that to fully utilize the egocentric perspective, the *Forum Iulium* needs to be expanded.

³ By a guide I mean a person or machine which leads one or more people through a place of interest. It could be by speaking, speaking through a microphone and headsets, or it could be a pre setup machine with contextualized content recorded on a storage medium and played back.

⁴ Rome Reborn is an international initiative whose goal is the creation of a 3D digital model of ancient Rome from the year 320 A.D. when its population was at its peak. (Rome reborn: <http://www.romereborn.virginia.edu/>)

In *Forum Iulium*, a third perspective comes into place which is also the key to a situated simulation. “The combination or juxtaposition of two different perspectives (real and virtual) creates a double perspective, which makes it possible to present on site (on the screen) topics or subject matters, which are otherwise (in reality) absent or invisible. Such subject matter may include topics from past present or the future” [7] This perspective can cause a feeling of presence and coherence between the real and virtual which strengthens the immersion, engagement and maybe also the learning effect.

2.2.2 Transfer

Situated learning⁵ is the study within an authentic context. In the view of situated learning, knowledge and understanding are products of the learning situation and the nature of the learning activity. Jean Lave argues that learning is situated; in the way that it normally occurs, gaining knowledge is embedded in the activity, context and culture. She describes it as unintentional rather than deliberate.[6] “Immersive interfaces can draw on the power of situated learning by enabling digital simulations⁶ of authentic problem solving communities in which learners interact with other virtual entities who have varied skills.”[2]

Situated learning in the context of the *Forum Iulium* is different from typical situated learning as problem solving is less emphasized. With its multimodal design and interactive learning environment it can engage students who are academically low-performing, or with achievement issues and give them a new perspective on how to grasp and memorize content.

In situated learning an important factor is the transfer. “Transfer is defined as the application of knowledge learned in one situation to another situation.”[2] In *Forum Iulium* the knowledge you gain from exploring the microworld can help you understand the structures and architecture of ancient Rome. By visualizing the constructions and making them interactive it is possible for the user to get a close view and recognize architectural elements in other monuments found in Rome. It can also enhance a user’s skills and imagination to understand how life was lived and how things might have looked, when visiting a different archeological site.

3. CONCLUSION

Media today are changing rapidly, and so is the way consumers use media, especially the young. They have gone from passive consumers to interactive users, watching, producing, sharing and multitasking. This does not only change how they process information from media, but how they absorb knowledge. What we see in situated simulation is the connection between what we learn and where we are. “A strong contextual connection is being made; according to studies something that can engage the user more than traditional methods of teaching”[2] In this case it is the *Forum Iulium*. This type of simulation is still in an early phase and can be improved in many ways, but the reactions from testing show that it provides the user with a new perspective from which it is possible to gain useful knowledge. It is hard for some people to listen to a guide or a teacher for hours. *Forum Iulium* gives a more visual impression, relies on multimodal information that can be accessed in a realistic setting and it is interactive. It is unlikely that the application can be a substitute for being guided by a professional, gaining information through lectures or reading books, but as a supplement for any of them most probably. Seeing *Forum Iulium* in the context of Chris Dede’s theory on engagement and learning in immersive interfaces, *Forum Iulium* fulfills most of the criteria. Through further development and technological advancements it has the potential for being a tool for teaching as; it is engaging, it presents a new perspective and it is available on a technologically advanced and popular handheld device that sells millions worldwide.

⁵ Examples of situated learning can be role playing in the real world setting, field trips, and apprenticeship.

⁶ Digital simulations which also can be described as simulations in a "safe" virtual environment, opens up the possibilities in some areas of situated learning, but has been mainly used for training skills like flying airplanes and military training.

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