

Virtual reality in the e-Society

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This special issue explores the extent to which virtual reality (VR) is affecting the creation of an electronic society. E-Society is a broad term used to describe a research area covering aspects of digital technologies for large user communities. Recent years have seen the emergence of various electronic services in an attempt to facilitate everyday life and improve the way common tasks are being carried out.

E-business and e-learning were of the first areas of e-Society to emerge. E-business refers to the use of information and communication technologies to facilitate transactions between businesses and customers or between businesses. Online shops, often called virtual shops offer customers the possibility to buy products through Internet. E-learning on the other hand encompasses technologies that allow teachers and students to interact either synchronously or asynchronously.

E-government is another application of ICT for the benefit of e-Society, aiming to digitise services, informational or transactional offered to citizens and businesses and improve the exchange of information between governmental bodies. E-democracy is tightly

coupled with e-voting, e-participation and e-inclusion, and aims to ameliorate and enhance democratic procedures, by providing the means necessary to citizens to participate in decision making and monitor governmental processes.

Lastly, e-health describes the use of digital technologies in the health care sector. Services provided range from telemedicine and collaborative systems for patient diagnosis to online systems for medical records.

As described, the term e-Society covers a wide range of applications from e-government, e-democracy, and e-business to e-learning and e-health. Although the term “virtual” is used in this context, such as for example in “virtual e-shops” or “virtual learning environments”, it has to be stressed that it is has little to do with VR technologies. It is rather used to denote the fact that these “virtual” systems do not occupy space in the real-world. User interfaces for these systems usually fall into the typical windowing, 2D paradigm; thus the potential for using VR technologies in an emerging e-Society is enormous. VR technologies for visualising remotely health data, creating online communities, developing online stores or educating groups of people can contribute to the growth of the e-Society by making it more tangible and real for the users.

In order for VR to contribute to the creation and advancement of e-Society, a number of issues have to be tackled. A successful VR system has to find a balance between the hardware requirements, user interaction methods, content presentation and the effort required for development and maintenance.

Hardware requirements define to a large degree the extent to which an end-user can afford to execute the VR system at her home. VR systems span from online,

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web-based systems to large VR installations such as caves and domes. If the requirements are set too high, the average user will not be able to afford the system. In that sense web-based VR systems are the most affordable since they set modest requirements. To this end, game engines can also be employed for the development of VR systems. On the other hand, the VR system can be set up at a location open to the public, ensuring the users' access to the system.

User interaction methods have to cater for the variety of users' needs. Especially for e-Society applications user interaction methods have to be kept simple with a minimum learning time to support first-time users in adopting the new system. Depending on the nature and the domain of the application, other issues have to be considered as well. User perceived trust, credibility, social acceptability and pedagogical issues affect user interaction and influence the system's usability.

Overall, design and implementation of a successful and engaging VR system is a rather difficult and complex task which requires increased effort in human power and resources in comparison to typical window based applications. Flexibility in development and subsequently maintenance of such a system can be achieved by adopting techniques already present in rapid application development environments, like abstraction, automatic code generation and reusability.

The selected papers cover a wide range of e-Society applications realised with VR technologies, such as e-tourism, e-commerce, e-learning, e-government and e-health. They all serve a common goal that is to facilitate citizens' access to information and services, and engage users in the interaction process. The papers also address a number of the issues relevant to VR applications, such as development, affordability, trust and social acceptability.

In "Opening New dimensions for e-Tourism" the authors describe a new 3D environment which allows travelers to virtually meet and exchange information, make a reservation or just observe others users. The system described is based on a 3D game engine that provides the necessary mechanisms for developing the content and establishing the network connections. In this multimedia-based, information-rich environment users are impersonated by avatars that can move freely in the e-Tourism building, use the Communicator window to chat and socialize with other travelers and exchange experiences.

In "Developing Semantic VR-Shops for e-Commerce" the authors propose the use of ontologies to capture semantics of a VR-shop in terms of domain concepts, such as products, which allows reusability of

existing product information and eases modifications. The ontology specifies relations between objects of the virtual world, their behaviour both between them and the end-user. The ontology concepts are instantiated as actual products and mapped to objects that can be visualised in the VR environment. Once this is accomplished the code can be automatically generated. Since the environment is based on an ontology, search functionality can be improved by adding a semantic search engine. Thus the user needs not necessarily fully explore the virtual shop but she can form queries to find products that meet her requirements and get directly transported inside the VR shop to the location of a product.

In "Applying Virtual Reality for Trust-building E-Commerce Environments" another dimension of using VR in e-commerce is presented. The author introduces a model for building trust in e-commerce through the successful adoption of VR technologies. Based on this model a VR shopping mall is implemented and consequently evaluated with an empirical study. Assessment results show that in comparison to a conventional web store, an online shopping environment which is based on VR has a number of advantages. Users in such an environment have an enhanced customer experience and can be more attractive especially for novice users. Apart from conducting pure commercial transactions, customers can also perform shopping-related activities of social nature, such as window-shopping, moving around stores, seeing other shoppers, going shopping with others or even socializing.

In "European Virtual Classrooms: Building Effective 'Virtual' Educational Experiences" the authors present Learning@Europe, an educational service that has involved in year 2004–2005 more than 1,000 students from six different European countries. Through a large scale assessment of the service the authors discuss the pedagogical impact of virtual reality in an e-Learning environment. It was found that in this context, VR enhances social presence and reinforces the community in the class and helps create a virtual, multicultural, long lasting community of students from different European countries. The environment had a strong pedagogical impact, in terms of increased knowledge, skills and attitudes on participating students, indicating that virtual reality techniques can help create efficient, credible and compelling learning environments.

In "Supporting Participation in Planning New Roads by Using Virtual Reality Systems" a road planning system is described which employs VR techniques to visualise alternative routes and assist citizens

in evaluating the consequences of each respective alternative. Although the main system is locally based, versions of the models are made accessible on the Internet and by CD distribution. The authors offer a better understanding of the implications of using virtual reality to engage citizens in governmental decision-making and reveal the social issues associated with this technology. Observations and data from questionnaires and interviews show clear benefits in adopting VR technologies and issues that have to be tackled. The authors conclude by proposing solutions that can resolve or at least alleviate these problems.

In “M²S Maps: Supporting Real-World Navigation with Mobile VR” the virtual reality application is executed on a hand-held device, offering the user mobility. The presented application aims to support users navigate in the real world by integrating 3D environments with 2D maps. To enhance user spatial cognition information is being presented in multiple formats including 2D maps, 2D maps in perspectives, and 3D models, at different scales ranging from global to local, and along with semantic information that helps users see the transition between different formats and scales. Although the application has some limitations, it shows the potential of employing VR techniques in the e-Society era.

In “Design of an Emotional and Social Interaction Paradigm for the Animation of 3D Characters: the Case of a Therapy for Brain Injured People” the authors present a model and an architecture that applies VR technologies in the e-Health field. An interactive environment is proposed where people suffering from

brain injuries caused by cerebral vascular accidents can carry out controlled, quantified and modulated exercises which will help in the rehabilitation process. To this end, the patient represented by an avatar in the virtual environment, follows the instructions given by a virtual therapist. Based on the “mirrors neurons” therapeutic paradigm and through the generation of a social and emotional immersion the authors expect that the patient will improve her recuperation.

In conclusion, it appears that e-Society can significantly benefit from the application of virtual reality technologies. Given that VR technologies evolve rapidly and become more affordable, it is expected that it will be possible to deliver these benefits to increasingly larger portions of the population. It is the guest editors’ hope that these articles capture some important elements faced both by research and industry communities today in the area of applying virtual reality technologies in e-Society.

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