# Humanity and Virtuality – A Case with Virtual Reality

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## ABSTRACT

In this research, I present the design and usability aspects of a virtual reality (VR) -based animation application (AnimaLand). By applying a user-centered design process I have succeeded in building an intuitive system for particle animation. I have studied both the basic usability aspects (learnability, ease of use, performance) and fundamental psychological phenomena (presence, flow, creativity) in the context of an artistic application. Doing so I are trying to form a holistic view of the users' experience. This application has been both developed and tested with professional artists.

## 1. INTRODUCTION

Current user interfaces to ignore human factors to a great degree.

The classical design method is concerned with task- or job-oriented approach. New approaches study have emerged during the last few years. Researchers are now more interested in the the irrational human factors — in particular emotions. This leads to more complete understanding of the user. There are yet topics that are hardly studied at all. As an example cultural issues related to technology are largely ignored. The culture in itself is a wide area covering national, socio-economical and mythical fields.

My Ph. D. research is directed towards the human-technology interaction — human experience rather than just the user experience or the user interface.

Relationship between human consciousness and technology is the general theme of my research. The target area — or case — is a user interface for artistic work in virtual reality.

The direct utility of our work lies in two areas: 1) I present a case of building a VR application for artistic work with a user-centered design process and 2) study the user experience beyond traditional usability metrics. The knowledge of the design process can be useful when designing other systems with novel user interfaces.

## 2. BACKGROUND

The importance of good user interfaces has been realized in 3D computer graphics since Ivan Sutherland's work in the sixties. Usability of 3D tools is far more than simply ergonomics of the user interface. Usability is a critical question in all levels of application design: Basic algorithms such as spline curves have been designed with special care in creating parameterizations that are intuitive and flexible. Object modeling techniques such as polygons meshes, spline surfaces, constructive solid geometry (CSG) etc. have been designed to match user needs and technology [4]. A large number of special- and general-purpose applications has been designed with usability in mind.

As VR technology has matured, several projects have demonstrated the potential of virtual reality in 3D content creation. For example Keefe [12], Schkolne [16], Li [13] and Wesche [17] have built 3D modeling tools that work in VR.

In the technology-driven VR research, usability has not been the top topic[1]. Fortunately research exists also in this field: Bowman has written a comprehensive overview of VR interaction techniques [2] and also made empirical tests of navigation and selection performance with different methods. Kaur's PhD. work concentrates on the usability problems of virtual environments and gives design guidelines that a VR system should satisfy [11]. All of the above research give information of what the application should contain, but do not tell what kind of design process would be most effective.

An artistic application is a tool for creative work. Even though we do not have a reliable model of creativity we know that flow-experience is a critical component in creativity [3]. Because there is evidence that presence – the experience of being there – is a prerequisite of flow in VR both were measured.

## 3. RESEARCH TASKS

1. Creation of a toolkit for processing multimodal input
2. Creation of an artistic application that works in virtual reality.
3. Psychological studies with the application

4. Theoretical framework for analyzing the impact of technology

## 4. SCHEDULE

Research tasks 1, 2 and 4 have been carried out to the point that publications have been made of them. At the moment I am working on the psychological tests (task 3) and improved application framework (task 2).

Over the last year I have successfully published the results of research that have been out over the last three years, giving accepted six publications in one year.

I expect to graduate in 2004, once the pending publications have been accepted.

## 5. PUBLICATION PLAN

Research task 1 has led into one publication in the 7th ERCIM user interface workshop [7].

Research task 2 has so far yielded two publications [6] [9]. Of these the first one is most probably not goingto be used in the thesis (assuming that I can write a better publication with similar topic).

Research task 4 has been analysed two papers [8] [10].

The four previous publications are to be used in my PhD. thesis. The following publications have been made during my research, but only indirectly contribute to the thesis.

Artist Wille Mkel has written two articles describing the use of virtual reality technology for artists' work [14] [15].

I also have one audio-related publication that was published in ICAD 2001 conference [5].

In addition to these fully published articles I am preparing new articles that are needed to fullfil the PhD.

There is one technical journal article under revision. This will hopefully find its way into the Journal of Graphics Tools (JGT).

There are two psychologically oriented papers under construction. One is about usability of a VR drawing system while the other is about the concept of presence in fictive digital environments.

## 6. REFERENCES


[1] D. Bowman, J. Gabbard, and D. Hix. A survey of usability evaluation in virtual environments: Classification and comparison of methods. *Presence: Teleoperators and Virtual Environments*, 11(4), 2002.

[2] D. Bowman, E. Kruijff, J. LaViola, and I. Poupyrev. An introduction to 3d user interface design. *Presence: Teleoperators and Virtual Environments*, 10(1):96–108, 2001.

[3] M. Csikszentmihalyi. *Creativity: Flow and the Psychology of Discovery and Invention*. New York: HarperCollins, 1996.

[4] J. D. Foley, A. van Dam, S. K. Feiner, and J. F. Hughes. *Computer Graphics – Principles and Practice*. Addison-Wesley Publishing, second edition, 1992.

[5] T. Ilmonen. Mustajuuri - an application and toolkit for interactive audio processing. In *Proceedings of the 7th International Conference on Auditory Displays*, pages 284–285, Helsinki, Finland, 2001.

[6] T. Ilmonen. Immersive 3d user interface for computer animation control. In *The Proceedings of the International Conference on Computer Vision and Graphics 2002*, pages 352–359, Zakopane, Poland, September 2002.

[7] T. Ilmonen and J. Kontkanen. Software architecture for multimodal user input – fluid. In *The Proceedings of the 7th ERCIM Workshop*, pages 223–242, Chantilly, France, October 2002.

[8] T. Ilmonen and J. Kontkanen. Open-ended vs. goal-oriented applications. In *Universal Access in HCI: Inclusive Design in the Information Society*, pages 103–107, Crete, Greece, June 2003.

[9] T. Ilmonen and J. Kontkanen. The second order particle system. *The Journal of WSCG*, 11(2):240–247, 2003.

[10] T. Ilmonen and J. Kontkanen. Technology, society and mind. In *Universal Access in HCI: Inclusive Design in the Information Society*, pages 98–102, Crete, Greece, June 2003.

[11] K. Kaur. *Designing Virtual Environments for Usability*. PhD thesis, City University, London, 1998.

[12] D. Keefe, D. Feliz, T. Moscovich, D. Laidlaw, and J. LaViola. Cavepainting: a fully immersive 3d artistic medium and interactive experience. In *Proceedings on 2001 Symposium on Interactive 3D graphics*, pages 85–93. ACM Press New York, NY, USA, 2001.

[13] F. W. B. Li, R. W. H. Lau, and F. F. C. Ng. Collaborative distributed virtual sculpting. In *Proc. of IEEE Virtual Reality 2001*, pages 217–224. IEEE Computer Society, 2001.

[14] W. Mäkelä and T. Ilmonen. Drawing, painting, and sculpting in the air: Development studies about an immersive free-hand interface for artists. Worksop paper in IEEE VR 2004, March 2004.

[15] W. Mäkelä, M. Reunanen, T. Takala, and T. Ilmonen. Possibilities and limitations of immersive free-hand expression: a case study with professional artists, October 2004. To be published.

[16] S. Schkolne, M. Pruett, and P. Schröder. Surface drawing: creating organic 3d shapes with the hand and tangible tools. In *Proc. of the CHI 2001*, pages 261–268. ACM Press, 2001.

[17] G. Wesche and H.-P. Seidel. Freedrawer: a free-form sketching system on the responsive workbench. In *Proceedings of the ACM symposium on Virtual reality software and technology*, pages 167–174. ACM, 2001.