

Contextual Virtual Reality Prototyping

Co-operative User-centred Design using Distributed Simulations

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1 INTRODUCTION

The development of mobile products such as multimedia phones is usually done using interactive computerised models, or virtual prototypes, for as many design and development phases as possible. But how can we prototype products that are used in different contexts, different locations, and even with different collaborators? What about the cases where the interactions with prototype are not enough, but there is also the need to have interactions with the environment and with other users? Can the design team member located in different part of the world and in different culture really "see" the concept from the figures? How can we test and evaluate a product when there is no product yet, and when the use environment is not directly accessible?

Lack of the users, use environment and context in Virtual Reality Prototypes (VRP) makes it difficult for designers to exploit the computerised models of mobile devices. The concepts of a future product can be difficult to understand, test and evaluate in cases where fully functioning physical prototype is not an option. One solution for the problem is the proposed *Contextual Virtual Reality Prototyping* that enlarges the concept of VRP by adding the missing context to the simulations. The product can be tried out and demonstrated in the corresponding environment with a number of test users, thus making it easier to understand the use-cases of, for example, a mobile device that has various location-dependent features.

The proposed solution is based on the utilisation of entertainment industry application (i.e., networked game engine) and it will provide possibilities for cost-effective, collaborative, and distributed prototyping and demonstration work.

2 RELATED WORK

One approach to the conceptualisation, design and development of products is to use virtual reality techniques that allow time and space independent product conceptualisation and visualisation. Virtual Reality Prototyping, according to Kerttula et al. (1999, 86) is "a process by which a product or a product concept, its behaviour and usage are simulated as realistically as possible using computer models and virtual reality techniques". The issues and problem areas tackled by the VRP research include the need to build prototypes in a short time (rapid prototyping), the requirements for interactive prototypes (functional, physical and tangible products) (Kerttula et al. 1999, 75-78), the possibility to use virtual prototypes in usability testing (Kerttula et al. 1999, 68-74), and demands of global design teams for distribution support (Tuikka and Kuutti 1999). One important aspect not directly discussed or answered within this field is the prototyping of the environment where the product is supposed to be used.

Examples of utilisation of game engines for non-gaming activities can be found, for example, from the areas of architecture and learning and training. One solution in utilising the Unreal game platform as a design, visualisation and presentation tool for commercial real estate has been described by Miliano (1999). The Unrealty concept enables the user to create realistic virtual worlds that are coupled with the technology to present and collaborate on the same worlds from anywhere in the real one. In addition to the complex and photo realistic main objects, the environment of the buildings can be modelled with various animated entities (e.g., birds, people, weather, etc.). In addition to the Unrealty system, the Unreal engine has been used, for example, as platform for virtual Notre Dame Cathedral produced by DeLeon (1999). This publicly available

demonstration shows how the engine intended for action games can be exploited as a cultural presentation tool. Although closely related to the issues discussed in this paper, the aforementioned applications originate from the somewhat different domains and, thus, do not provide adequate insight to the problem at hand.

3 CONTEXTUAL VIRTUAL REALITY PROTOTYPES

The major factor differentiating this approach from the earlier ones is the enlargement of the virtual prototype to cover also the environment, use case, and other contextual issues of the product under development. Furthermore, the distributed simulation approach enables multiple simultaneous users to participate in testing and evaluating prototypes and product concepts. This author proposes the term *Contextual Virtual Reality Prototype* to be used to describe the expanded scope of the prototyping.

The main idea of this work was to create a demonstration of a hand-held mobile game console by using the Contextual VRP approach. The demonstration simulates a small city environment which users can explore by walking around. The product prototype can be used to access various information and services located in the 'city'. For example, the user can look at the world through a semi-transparent screen of the mobile console to see any virtual objects located there. Figure 1 illustrates a location of the world viewed with the mobile console. The penguin is a virtual object and, thus, is visible only through the screen of the console. Other features implemented in the prototype include, for example, moving the console to the field of view, radar to show the directions of objects, location-based power-up collection, and several console configuration possibilities.



Figure 1. The world viewed using the console.

At this stage, the demonstration does not utilise highly realistic interaction techniques between the user and the prototype. The main input devices are keyboard and mouse. On the other hand, the mouse interactions are replicated as realistically as possible from the real-world case. This means that it is possible to 'press' the buttons of the console by pointing and clicking them with the mouse.

4 CONCLUSIONS

The Contextual Virtual Reality Prototyping with the corresponding demonstration indicates that there is true potential in a game engine such as Unreal - even for completely different markets than the traditional network games. All the tools of the application are integrated in the same package, so it requires small effort to create prototypes such as the one described in this paper. Furthermore, the increasingly important multiplayer aspect makes it possible to test how several simultaneous users would use the product in a specific place, when interacting with the world and with each other.

The Contextual VRP provides the designers a way to enlarge their field-of-vision by adding the use environment and context to the prototypes. With the proposed approach, the product can be tried out and demonstrated in the corresponding environment that includes other users. Furthermore, the evaluation of the concept requires less cognitive load in terms of figuring out the real-world counterparts of the VRP interactions.

5 REFERENCES

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