

An Approach for Designing Applications in 3D Virtual Worlds

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Introduction

This research proposes a new approach for designing VW applications. The features of the work are as follows:

- It is inspired by, and draws on the knowledge in architecture and built environments.
- Its theoretical basis is conceptual design, as well as software architecture.
- The output is the Virtual World Application Design Method (VWADM) - a method that facilitates designing specifications of VW applications.

Issues

Application development in VWs is similar to application development for other platforms. However, despite VW application development having been practiced for as long as VWs have existed,

- The concept of application development in/for VWs is informal and yet to be established.
- The practice/process of application development itself is still at an early stage of development. This means that it lacks many other "formalisations" and "establishments".



Most of what has been referred to as VW design has actually been ad-hoc development using:

- "Best guess" approaches.
- Reactive approaches such as developing first, then relying on usability evaluations as proxy for design.
- Older design methods and tools, which cannot manage newer platforms and applications such as VWs and VW applications.

Issues

Open Worlds, which is a characteristic not only common to VWs but also related platforms such as 3D video games, put **special requirements on the product** (i.e., VW applications or Video Games) and **the development process**. Specifically,...

- We cannot approach modern 3D applications the same way we've approached flat/2D applications in the past.
- VW applications require the use of new design metaphors (as opposed to using existing metaphors such as WIMP)

Implications

The lack of formalisations in VW design means:

- There are many inconsistencies in VW design.
- There is a lack of consensus on the correct way to conduct design.
- Very little progress in promoting or improving an agreed approach.

Why Design?

Establishing VW design and related concepts, provides us with a **proactive** and **systematic** way to develop VW applications.

Most importantly, **the VW design activity provides us with a way to reflect/embed requirements** into the development of VW applications.

Software Development Process			
Requirements	$\rightarrow \mathbf{D}$	esign →	Construction
	GDG	GDA	

Importance of the Study

The study focuses on the premise that: **VWs are democratic platforms that were created so that any user could develop any type of application for any purpose**. Therefore, the VWADM toolkit (GDG + GDA) is used to address two sets of problems:

- The GDG is used to develop static specifications for VW applications.
- The GDA is used to develop dynamic specifications for VW applications.

Importance of the Study

Work on the VWADM will contribute to:

- Laying the foundation for developing dynamic VW applications
- Making the VW development process democratic.
- Contributing to empowering VW users, for example:
 - Inclusion of more user groups such as limited access groups.
 - Allowing those users to fully participate not only in content consumption, but also content creation.

Methodology

The research is grounded in design science research (DSR)



Methodology

DSR is applied to this research using the following framework:



Aim

Using DSR, the research aims to develop the VWADM.

The VWADM is used to aid the design of VW applications. It has the following steps:

- Plan design
- Structure design
- Locomotion design
- Operation design

Design Scenario: A Virtual School

To demonstrate the use of the VWADM, we will go through a simple design scenario for a virtual school. We will assume the following requirements:

- The virtual school will provide an online place for supporting the learning activities of a real-world school.
- The goal is to have two classrooms where learning will take place for two different subjects (assuming that these classes may have to run in parallel to each other).

Design Scenario: A Virtual School

To design the virtual school application, we need to apply the first tool of the VWADM, which is the GDG, in a stepwise manner:

- Plan design designing the plan/various areas of the virtual school
- Structure design designing the physical structure of the virtual school
- Locomotion design designing the devices/facilities that enable moving between the various areas of the virtual school
- Operation design designing/ascribing behaviour to the virtual school

Step 1: Plan Design

In the plan design phase of the VWADM, we apply the layout rules of the GDG framework:



Step 2: Structure Design 1

In the structure design phase of the VWADM, we apply the object rules of the GDG framework:





Step 2: Structure Design 2

In the structure design phase of the VWADM, we apply the object rules of the GDG framework:





Step 2: Structure Design 3

In the structure design phase of the VWADM, we apply the object rules of the GDG framework:

²rD1





Step 3: Locomotion Design 1

In the locomotion design phase of the VWADM, we apply the navigation rules of the GDG framework:



The VW Application: A Virtual School



Step 4: Operation Design

In the operation design phase of the VWADM, we apply the interaction rules of the GDG framework:



Conclusion

Dynamic specifications of VW applications are characterised by agency. This work already contents a GDA model:



Further Work

