3 – virtual environments

Although this material forms the last chapter of the book, Ithought it worthwhile to start with the *conclusion*, so to speak,and present *virtual environments* as the ultimate interface to multimedia information systems.

virtual environments

- 7.1 virtual context
- 7.2 navigation by query
- 7.3 intelligent agents

The material includes online demos of the prototypes discussed. See also the resources.

0.1 virtual context

Imagine that you walk in a museum. You see a painting that you like. It depicts the Dam square in 17th century Amsterdam. Now, take a step forwards and suddenly you are in the middle of the scene you previously watched from some distance. These things happen in movies.

Now imagine that you are walking on the Dam square, some sunday afternoon in May 2001, looking at the Royal Palace, asking yourself is this where Willem-Alexander and Maxima will get married. And you wonder, what did this building and the Dam square look like three centuries ago. To satisfy your curiosity you go to the Royal Museum, which is only a half hour walk from there, and you go to the room where the 17th century city-scape paintings are. The rest is history.

We can improve on the latter scenario I think. So let's explore the options. First of all, we may establish that the Dam square represents a rich information space. Well, the Dam Square is a 'real world' environment, with it has 700 years of (recorded) history. It has a fair amount of historical buildings, and both buildings and street life have changed significantly over time.

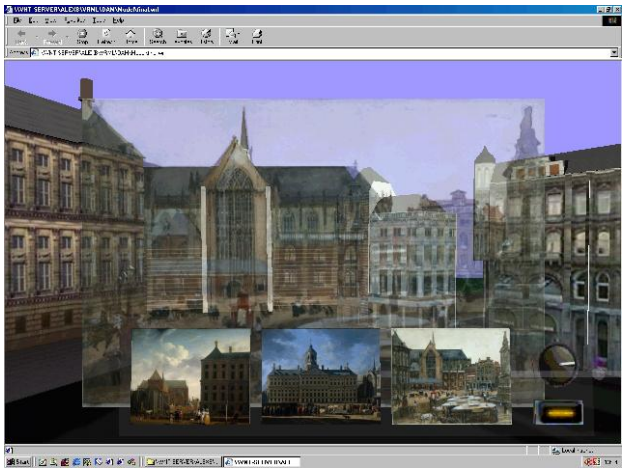
So, we can rephrase our problem as

how can we give access to the 'Dam square' information space

But now we forget one thing. The idea underlying the last scenario is that we somehow realize a seamless transition from the real life experience to the information space. Well, of course, we cannot do that. So what did we do?

Look at the screenshot from our *virtual context* prototype. You can also start the VRML demo version that is online, by clicking on the screenshot. What you see is (a model of) the Dam square, more or less as it was in 2001. In the lower part, you see a panel with paintings. When you click on one of these painting, your viewpoint is changed so that you observe the real building from the point of view from which the painting was made. Then using the controls to the right of the panel, you can overlay the real building with a more or less transparent rendering of the painting. You can modify the degree of transparency by turning

the dial control. You may also make the panel of paintings invisible, so that it does not disrupt your view of the Dam and the chosen overlay.



In other words, we have a VR model of Dam square and a selection of related paintings from the Royal Museum, that are presented in aa panel from which the user can choose a painting. We deploy viewpoint adjustment, to match the selected painting, and we use overlay of paintings over buildings, in varying degrees of transparancy, to give the user an impression of how the differences between the scene depicted in the painting and the actual scene in (the virtual) reality.

We have chosen for the phrase *virtual context* to characterize this prototype, since it does express how virtual reality technology enables us to relate an information space to its original context.

From the perspective of virtual reality, however, we could also have characterized our prototype as an application of *augmented virtual reality*, since what we have is a virtual reality model of a reallife location that is augmented with information that is related to it, (almost) without disrupting the virtual reality experience. In summary, we may characterize our approach as follows.

augmented virtual reality

- give user sense of geographic placement of buildings
- show how multiple objects in a museum relate to eachother
- show what paintings convey about their subject, and how

Considering the fact that many city-scape paintings of Amsterdam have been made, many of which are in the Royal Museum, and that paintings may say many things about their subject, we believe that our approach is viable for this particular instance. The augmented virtual reality approach would also qualify as a possible approach to cultural heritage projects, provided that sufficient pictorial material is available or can be reconstructed.

Although we were quite satisfied with what we accomplished, there are still many things that can be done and also a number of open problems. Guided tours

are a wellknown phenomenon. But how to place them in our virtual context is not entirely clear. As another problem, our approach does not seem suited to account for buildings that do no longer exist. Another thing we have to study is how to change the temporal context, that is for example change from a model of the dam in 2001 to a model of the Dam in 1850. We would then also like to have 'viewpoint transitions' over space and time!

Finally, to give better access to the underlying information space we must also provide for textual user queries, and find an adequate response to those queries.

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VRML To realize our prototype we used VRML, which limits us to medium quality desktop VR. At this stage, VRML is a good option, since it is a relatively stable format with a reasonable programmatic model. In short, what VRML offers is

VRML

- declarative means for defining geometry and appearance
- prototype abstraction mechanism
- powerful event model
- relatively strong programmatic capabilities

Although VRML allows for writing models (including geometry and appearance) using a plain text editor, many tools support export to VRML. As a consequence, often tools are used to create more complex models.

In addition, VRML allows for defining prototype abstractions, so reuse of models and behavior can be easily realized.

Defining dynamic behavior involves the routing of events that may come from a variety of built-in sensors (for example a TimeSensor for animations) to scripts or so-called interpolators, that allow for the manipulation of geometry and appearance parameters of the model.

In particular, the use of scripts or the *External Authoring Interface* (EAI), that allows for defining behavior in Java, is essential for realizing complex behavior.

Summarizing, VRML is a sufficiently rich declarative language for defining 3D scenes, with a relatively powerful programming model for realizing complex behavior. Some may think that VRML is dead. It isn't. The underlying model is endorsed in both the X3D and RM3D standards, simply since it has proven its worth.

research directions– *augmented virtuality*

Given an information space, there is a duality between information and presentation. For an audience or user to be able to digest a presentation, the amount of information must be limited. Effective presentation, moreover, requires the use of proper rethorics (which may be transcoded as *ways of presenting*) that belong to the medium. Using VR, which is (even in its desktop format) a powerful presentation vehicle, one should always beware of the question *what is it good for?* Generally one may ask, what is the added value of using VR? In an abstract

fashion the answer should be, to bridge the gap between information content and presentation. Or, in other words, to resolve the duality between information and presentation!

Let's look at an example, a site about archeology, announced as a site offering *Virtual Archeology*. Perhaps it is good to bring to your attention that the *virtual*, in Computer Science, means nothing but another level of indirection to allow for a (more) flexible usage of entities or objects. See [OO], section 1.2.

virtual archeology

- variety of archeological sites
- various paths through individual site
- reconstruction of 'lost' elements
- 'discovery' of new material
- glossary – general background knowledge

For a site about archeology, *virtual* means the ability to present the information in a number of ways, for example as paths through a particular site, with the possibility to explore the reconstruction of lost or perished material, and (for students) to discover new perspectives on the material. In addition, for didactic reasons there may also be a glossary to explain concepts from archeology.

Now, how would you construct such a site about virtual archeology? As a collection of HTML pages and links? It seems that we can do better, using VR and rich interaction mechanisms!

So, what is meant by *augmented virtuality*? Nothing that hasn't been expressed by the notion of *augmented virtual reality*, of which an example has been given in this section. The phrase *augmented virtuality* itself is just one of those potentially meaningless fancy phrases. It was introduced simply to draw your attention to the duality between information and presentation, and to invite you to think about possible ways to resolve this duality.