Chapter X
The Use of Virtual Museums, Simulations, and Recreations as Educational Tools

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INTRODUCTION

The idea of creating a virtual museum is far from new. However, creating a museum that an archaeologist could customize to match his needs is quite innovative. Here we present a system which can be used for online visualization of museums. Although there are plenty of online virtual museums, none of them is customizable. These museums are designed statically and represent certain museums, which makes it rather difficult to change.

On the contrary, our Dynamic Virtual Museum is easily managed through database entries, which provide all necessary variables (rooms, models, exhibits) and interact with the renderer through scripts. Therefore, the virtual museum can be easily transformed to match any given exhibition or a visitor's specific choices.

The system consists of two main elements, a database where all information about the exhibits, models, and so forth, is kept and a renderer which is responsible for graphically representing all this information on the computer screen.

The database part is handled by MySQL(Rose, Buchanan, & Sarrett, 1999), whereas VRML(Moschos, Nikolaidis, & Pitas, 2004) is responsible for all the graphics. In order to easily connect MySQL and VRML through an easy to use Web interface, php (Wang, Zhang, Wang, Lee, Pejun, & Wang, 2005) is used. Our goal is to create a fully customizable museum, which will be easy to navigate and control by any archaeologist or visitor. It could be used in a wide range of occasions, such as an exhibition centre where exhibits are changed quite often, and it could be an important help to a museum executive who needs to rearrange some or all of the exhibits, or it could be used by any visitor who wants an exhibit to match his certain needs.

THE RENDERER

The graphics subsystem of the application is responsible for rendering the museum rooms and the exhibits displayed therein. It also handles the interaction of the user with the virtual world. This would allow, for example, a verbal description to be played back, whenever the user clicks on an exhibit. The render is implemented using VRML (virtual reality modeling language), a Web-based network protocol for working with three dimensional (3D) scenes or data sets. It allows the creation of platform-independent 3D objects, described in text files, which can then be displayed on any computer platform for which an appropriate browser exists. VRML browsers come in two types: stand-alone and plugins for HTML browsers. They allow a user to walk into a VRML scene using a mouse or keyboard and navigate, as he or she does in the real world. A VRML document, like an html document, is a formalized text description of a Web page's contents. Unlike html however, VRML is not "marked up" text. It contains descriptions of three-dimensional objects and their interrelationships.

THE DATABASE SUBSYSTEM

The database subsystem of the application is responsible for the storage of all elements important to the museum model. It is organized in a way which makes it possible for the system to easily extract information about the exhibits and how they should be displayed in the virtual museum.

The database used is MySQL, the most commonly used database in conjunction with php. It's architecture makes it extremely fast and easy to customize.

Using a database, it is quite a simple task to record a large number of data and information about an object, without necessarily having to use them all in the construction of the model or the display of the object in the museum. Therefore, we can create a well organized library of all of our artifacts and exhibits.

The most important records that describe an object should be the object's type (whether it's a painting, a sculpture, a mask, etc.), its measurements (height, width, weight, etc.), a title (if there is one e.g., "Mona Lisa") and a short description of the artifact.

The description could be simple text or even a path (relative or not) to an audio file, which could be used in the museum model. The visitor then could hear a narrated description of the artifact by interacting with it. Other characteristic features that could be recorded as well are the artifacts' distinguishing features, creation date or period (if known), its origin, maker's name and the materials which were used. These descriptive items could be easily added even after the creation of the database through the Web interface or any other administration tool for MySQL databases. Such a tool is eskuel[1], a MySQL database administration interface written in PHP. It allows users to simply and fully manage one or more databases without any advanced knowledge of SQL language.

SCRIPTING

VRML was created for describing interactive, but static, 3D objects and worlds. Therefore, there was no need for variables when the specification was written. When creating a dynamic virtual museum you need to be able to process data and change many of the models' attributes (size, translations, geometry, materials, etc.). You must also have the capability of extracting specific fields from a database record and provide the field values to the VRML model. Hence, the need for a scripting language to solve these problems was born. For all the scripting tasks, php is used. PHP is an HTML-embedded scripting language. Much of its syntax is borrowed from C, Java and Perl with a couple of unique PHP-specific features thrown in.