

## Chapter 10

# Adaptive Virtual Reality Museums on the Web

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## Abstract

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*This chapter presents an architecture for supporting the creation of adaptive virtual reality museums on the Web. It argues whether the task of developing adaptive virtual reality museums is a complex one, presenting key challenges, and should thus be facilitated by means of a supporting architecture and relevant tools. The proposed architecture is flexible enough to cater for a variety of user needs, and modular promoting extensibility, maintainability, and tailorability. Adoption of this architecture will greatly simplify the development of adaptive virtual reality museums, reducing the needed effort to exhibit digitisation and user profile specification; user profiles are further refined dynamically through the user data recorder and the user modelling engine, which provide input for the virtual environment generator.*

## Introduction

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Museums have long been regarded as keepers and preservers of artefacts and cultural products. However, the notion of a museum with a primary goal of preserving has been changing during the past few years and is being replaced by one that couples education

and entertainment. Under this view a museum is an institution open to the world with an objective of aiding visitors learn while they are kept content. To this end, the Internet and especially the Web has offered museums the medium to open up to the public and reach a wider, ever-increasing audience.

The technologies underlying the Web provide a strong background for building online multimedia applications that can help museums attract Internet visitors. Towards this objective, one key aspect in developing a successful Web application is the ability to supply the proper information for the targeted user group. This is especially true for Web-based applications where the users visiting may come from a variety of cultures, educational backgrounds, ages, and have different preferences and objectives. This requirement can be met by implementing an application that will adapt to the user's profile, and each time an Internet user visits the Web site, it will provide the appropriate set of information in the most efficient way.

Virtual reality (VR) technologies on the other hand have been evolving during the past few years, leaving research laboratories and finding application in a number of areas. Virtual reality promises the creation of environments that are vivid, lifelike, and highly interactive, and where the user will be able to emerge in a synthetic world that may not exist or may be too difficult or too dangerous to visit in a real-world situation. In this respect, virtual reality technologies may find direct applications in museums, providing memorable experiences by helping users visualise and interact with exhibits.

The objective of this chapter is to specify the architecture of a system that combines the benefits of the aforementioned technologies in delivering adaptive virtual museums on the Web. Such a system may be used for both edutainment and research activities for a variety of potential target groups.

## Background

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The term *virtual museum* was coined by Tsichritzis and Gibbs (1991), where they describe the concept of a virtual museum and the technologies needed to realise it. However, in past years the term *virtual museum* has come to denote anything from a simple multimedia presentation of selected museum content, to a high-end, state-of-the-art installation, with 3D projection facilities where the user immerses in a virtual environment. In the context of this work, we will use the term *virtual reality museum* to refer to a virtual environment built with 3D technologies, not necessarily immersive, but one where the user is able to navigate in a three-dimensional exhibition. To this end, an adaptive virtual reality museum denotes a dynamically custom-built environment that fits the user's preferences, as well as her cultural and educational background. An adaptive virtual environment provides each user with a different view of him/herself, taking into account the user's profile. A virtual reality museum comprises the structure of the virtual museum building, the objects that are placed and exhibited within, as well as the interaction methods by which the user can navigate and interact with the objects. All of the aspects of the environment may be adjusted to better meet the user's preferences and profile:

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