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Visiting the Virtual City

Abstract

In 1999, the city of Glasgow in Scotland, celebrated the honour of being the UK City of Architecture and Design. The same year saw the successful launch, on the Internet, of <vrglasgow.com> a fully interactive virtual experience of the city.

This paper describes the evolution and functionality of vrglasgow over the last 10 years and anticipates its future development over the next 5 years.

Currently the system comprises the VRML topography, the road network and the 3-D geometry of around 10,000 buildings within the city centre. The visitor to the virtual city to navigate and search under a range of headings for items of interest and experience some of Glasgow's best architecture. Data from a number of information sources are interlinked and made accessible through VRML as well as through the conventional internet modes such as lists, tables and search engines. Consequently, the visitor can explore the city intuitively.

Resumen

En 1999 la ciudad de Glasgow, Escocia, tuvo el honor de ser la Ciudad de Arquitectura y Diseño. En ese mismo año se lanzó exitosamente, via Internet, el <vrglasgow.com> siendo ésta una experiencia virtual interactiva de la ciudad.

Este documento describe la evolución y funcionamiento del vrglasgow durante los pasados 10 años y a su vez anticipa su desarrollo en los próximos 5 años.

Actualmente el sistema comprende el modelo virtual de la topografía, las carreteras y la geometría tridimensional de alrededor de 10,000 edificios comprendidos dentro del centro de la ciudad. El visitante de esta ciudad virtual puede navegar y buscar, bajo un amplio rango de encabezados, sitios de gran interés pudiendo experimentar la vivencia de sitios que representan lo mejor de la arquitectura en Glasgow.

Los datos de numerosas fuentes de información se encuentran entrelazados haciéndose éstos accesibles dentro del modelo virtual así como a través del método convencional del Internet como pueden ser las listas, las tablas y los buscadores. De esta manera el visitante puede visitar la ciudad de una manera intuitiva.

Introduction

ABACUS (Architecture and Building Aids Computer Unit Strathclyde) is a research group based in the department of Architecture at the University of Strathclyde in Glasgow.

In the 30 years since ABACUS was formed, the group has explored many research directions, the most enduring of which has been centred on the visualisation of the built environment. During the 1980's the research unit developed an interest in the ability to model and manipulate large geometrical databases of urban topography.

Using their own software, the team built a virtual model of the city of Glasgow representing an area of some 25 square kilometres, and attempted to produce interactive real-time 'fly-throughs' using the massive urban geometry data-set. Backed with funding from 'Glasgow Action', a team of students was employed over the summer period to help with the mammoth task of capturing the necessary data.

The same model found new life in the late 1990s, when funded by 'Glasgow 1999', 'The Glasgow Directory' was created, an Internet-based system allowing the general public to access city information through an interactive 3D model of central Glasgow.

The Virtual City

The Glasgow Directory allows users to explore the 'virtual city', search under a range of headings for items of interest, and discover some of Glasgow's finest architecture.

It achieves this by linking to a number of information sources, accessible through conventional Internet techniques such as lists, tables and search engines, as well as indirectly through the VRML. Unlike many Internet systems, there is no pre-set route to follow, or list of useful links. Information is accessed through intuitive exploration of the site, and therefor varies depending on both the user, and the chosen route.

In this manner, the user becomes familiar with the virtual city, in much the same way as they would become familiar with the physical city. He or she may identify particular areas of interest, which can be revisited using the familiar routes, or accessed via browsing.

figure 1 – Typical interaction frame from VRGlasgow

Current information sources include:

•Multimedia database of General Tourist Information.

•Multimedia database of Glasgow Architectural.

•Alphanumeric database of property addresses and street names.

•External Web-sites.

A special feature allows architects and designers to download appropriate sections of the 3D model for use in proposed developments. Future additions to the system will permit design proposals to be integrated into the system allowing the audience to explore a number of possible urban design alternatives.

Applications

There are many potential applications for the Glasgow Directory, covering a range of interest and user requirements. The flexible user interface makes each participant's visit unique in terms of the information experienced. Here are four example applications:

Tourism: A prospective visitor to the city of Glasgow can explore the virtual city before arrival in the physical, resulting in greater knowledge of where to go and what to see. Browsing the city can influence choice of hotel, entertainment or shopping area, and transport networks may be examined for choice of optimum route. Places of interest worth a 'real' visit can be identified and details printed out for use during their visit.

Education: The Glasgow Directory could be used on various levels in an educational context. From primary school pupils, who could be given access and tasks such as, 'explore their city', 'find their school' or 'count and locate the museum', through to university or college students who could by exploring the model be introduced to the concept of computer modelling application and virtual reality.

Architects: Using the Glasgow Directory, architects may access parts of the city model which relate to design projects. These can be downloaded in a variety of file formats and used to enhance the presentation of new building or urban designs. By displaying design proposals within the context of the city, the architect and their clients, can understand and therefor assess the scheme more clearly.

City Planning: Proposed change to the urban fabric can first be evaluated by simulating the change within the model. Any number of proposals can be analysed in parallel, with the public being given the opportunity to vote for their favourite, a process similar to that used in the Netherlands at Ljburg.(figure 1)

Why Add Multi-user Functionality?

It was hoped that by activating virtual Glasgow as a shared 3D environment several issues could be explored and progressed. These included:

•Enable virtual tours of the Glasgow Directory software. This software provides access to multiple layers of information about Glasgow but many of the visitors to the virtual city only discover a small percentage of what is available. These tours would help to maximise its use.

•Enable virtual tours focussing on communicating something of the 'real' Glasgow, augmenting the available information with a personal perspective on the city, either on a one to one, or group basis.

•Enable visitors to share their knowledge of the virtual and real environment with each other, based on the premis that everyones experience of 'place' is unique.

•Act as a catalyst for continuing the evolution of the environment, given that it not only uses advanced technology, but offers another avenue for direct 'user feedback' and participation.

•Provide a stimulating shared cyberspace for people to meet in.

Implementation

To enable the Glasgow model to become a shared virtual environment a suitable software package had to be identified. For ease of implementation the VNET client/server package was chosen. This software as well as being simple to set up is freely available and has the support of a relatively lively user group. It is also based on the Java programming language which enables it to run on a variety of hardware platforms.

The system relies on a VNET server program running on the host machine which handles communication with each remote client as they login and explore the 3D environment. The process of joining the shared space activates a Java program on the clients machine enabling them to see avatar representations and communicate with other participants via a chat window. The VRML virtual world is downloaded onto each client machine with the result that the communication data set handled by the server is restricted to positional and text information.(figure 2)

Some customisation of the Glasgow model interface was necessary but once the interface was reconfigured all other aspects of the environment functioned normally.

Observations

Information on how people used the Glasgow Directory has been a key feature in progressing its development. The system is capable of tracking user participation in a sophisticated manner. The resultant log files relating to 10,000 visits have been archived and have proved to be a valuable resource.

figure 2 – Multi-user Interface to VRGlasgow

figure 3 – Gallery Users

Direct user feedback has also aided the development process, and prior to the systems official launch in June 1999, 300 people registered to test the system. From that period alone 150 detailed feedback forms were received, and as a result refinements made to the system.

In an attempt to aid deployment of multi-user functionality, profiles of visitor type2 were studied. The aim was to understand which aspects and elements of participant experience and environment may be important in the context of this new functionality.

As a result of this new dimension, a new set of participant data is emerging. This not only documents which aspects of the environment is explored and the duration of each visit, but the number of participants sharing the environment at the time, and also a record of their communication.

The user types featured in the study were:

•a participant visiting 'alone' via the standard interface (http://iris.abacus.strath.ac.uk/glasgow)

•participant(s) visiting an interface designed and installed in a public gallery space

•participant visiting via the multi-user interface (http://www.vrglasgow.co.uk)

Characteristics of user types

Visitors using the standard interface

Average time spent browsing the environment was 15 minutes. However two distict groups emmerged, those browsing and exploring the model, with an average time of 18 minutes, and those using the model primarily as a resource with an average time of 6 minutes.

Those 'exploring' the model were identified by their use of the 'view point' facility. This enables a tour of a city segment via pre-set observation points chosen from a menu. Those identified primarily as using the model as a resource were accessing the 'street finder' facility which enables the model to take on the role of a 3D map and route planner.

Additionally 20% of those using the model were connected for more than 30 minutes, and 30% for less than 5 minutes. Most of those connected for less than five minutes used the street finder facility, suggesting that they connected, simply to check the location of a street or check a street name.

The most popular location to visit in virtual Glasgow proved to be the areas of George Square, Merchant City and Central Station, which are also the liveliest sections of the 'real' Glasgow, with the average participant visiting more than three distinct areas in the model. There was also a correlation between those using the street finder and those visiting only one relatively obscure zone of the model.

Visitors using the 'public gallery' interface

Observations were made during the Meta-City Exhibition at the Lighthouse, Glasgow, during February and March 2000. A control system for the software was installed as part of the exhibition, and the results of user interaction was projected onto a wall in the gallery space, (see figure 3).

Average time spent using the system was 20 minutes, and frequently two or more people used it together. On occasion direct help was given by the observer when participants experienced difficulty operating the hardware or software. Patterns of use were similar to those using the standard interface, except that the system was used less as a resource, and perhaps as a result the average time spent was longer.

Also those using the software were already in the 'real' Glasgow while exploring the virtual city. Two related observation were of interest i.e. on occasion 'obscure' zones of the city were visited for relatively longer periods, and also when two or more people were present one would sometimes act as a tour guide. The former is suspected to be as a result of people familiar with Glasgow visiting areas of personal interest in the virtual environment (e.g. the street where they lived or worked), and the latter was an interesting chance to observe people acting as tour guides in a virtual world. For example one participant used three areas of the model to describe and discuss with another the difference between the 'old' and 'new' architecture of these areas, using the street layout as a guide to where the architecture from the past was located. Another group had a very lively discussion relating to new architectural developments in the city centre with one of the group acting as navigator or 'driver'.(figure 3)

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Visitors using the multi-user interface

Since this is the area under development, the number of observations gathered are limited at present.

The VNET software enabled several people to share the city centre zone of the Glasgow model, to see avatars of each other moving through the zone, and to communicate via a text window.

Average time spent using the system was 50 minutes, longer than the previous user types with the nature of the visit of course containing a social element.

Three aspects were of particular interest

•The fact that a tour guide was either present in the virtual world (via one of the ABACUS staff) or emerged naturally as a more experienced user guided a less experienced visitor.

•It was noted that when the 'official' tour guide was present participants would have no hesitation asking for technical help or advice about the city.

•The environment was explored to a greater level by a higher number of participants, most likely as a result of tour guides explaining how to get the most out of the system.

The discussions recorded were also of interest with participants often relating to each other their experience of the 'real' Glasgow, as well as discussing the virtual world both from a technical and environmental perspective. Other virtual and real cities and environments were also discussed.

One problem encountered by visitors was that they often 'lost' one another within the environment because they broke visual contact or used the view point option to jump to another location. Time was then 'wasted' trying to meet up again with often one user describing to the other where they had gone and the other then trying to find them.

Guidelines for Future Development

Based on the above observation a number of guidelines have emerged. These relate to the continued development of the multi-user functionality and to the system's evolution and growth

•More effort should be place on developing the central zone of the virtual city, since visitors tend to gravitate towards this area. Even those with no experience of the 'real' Glasgow were found to visit the city centre more than the surrounding areas. Regular developments of these zones will also encourage users to return.

•The valuable contribution made by a virtual tour guide should be recognised in future development and use. Regular times for virtual tours should be offered, and also the ability to contact a guide even if not present. The development of further automated tours should be considered, (there are currently two helicopter tours of the city).

•The system would benefit from the addition of a facility that helps identify the location of other participants. For example a map of the area with moving markers, one for each avatar.

•Avatars should be distinct from other elements in the environment. (We regularly found participants trying to hold a conversation with the helicopter and city statues).

The development and evolution of the Glasgow Directory as a shared cyberspace will continue, with the challenge being to integrate this new functionality in a way which adds value to the existing data set and application based which as emerged since the environments launch.

Acknowledgements