

## **GIS and Visualisation, Presented at GIS Research UK 2000, University of York.**

### **A Virtual Tour of the Princess of Wales Conservatory, Royal Botanic Gardens, Kew**

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#### **Biographies**

**Jon Gower** (25/12/71)

I entered the M.Sc. in Geographic Information Science with 8 years experience as an Archaeologist, with extensive field experience in Europe and the Near East. My interest in linking mapping and visualisation over the Internet led to the development of this application. Since the completion of this Masters Degree, I have begun employment as the Webmaster for ESRI (UK).

**Justin Moat** (15/03/70)

Justin Moat has been working with GIS at the Royal Botanic Gardens, Kew for the past 5 years, initially working on the Madagascar GIS project ( see: [http://www.rbgkew.org.uk/herbarium/madagascar/mad\\_gis.html](http://www.rbgkew.org.uk/herbarium/madagascar/mad_gis.html)). In 1996 he took the M.Sc. in GIS at University College London. He is presently employed at the Royal Botanic Gardens, Kew to develop the GIS unit.

**Jeremy Morley**

Jeremy Morley is the M.Sc. course director at the Department of Geomatic Engineering, UCL.

### **Extended abstract: A Virtual Tour of the Princess of Wales Conservatory, Royal Botanic Gardens, Kew**

"Visualisation is the transformation of data and information into pictures - the results of which should be a simple and effective medium for communicating complex and voluminous information" (Schroeder et al, 1997).

#### **Introduction**

A GIS Virtual tour was designed for the interior of the Princess of Wales Conservatory, in the Royal Botanic Gardens, Kew. By recording a series of thirty one 360° panoramas within the Conservatory, visual scenes were created to provide this "virtual" component. An Internet GIS application was developed, capable of serving a map of the building, in conjunction with these panoramic scenes.

The recent surge in Internet GIS technology, coupled with developments in multimedia visualisation software, made this project an exercise in the effective linkage of these two software innovations. By deploying a two-dimensional map of geo-referenced, panorama locations, and displaying an adjacent window of revolving panoramas, it was possible to create a dual interface through which the Conservatory could be both spatially and virtually explored and navigated. The embedding of hotspots within the panoramas allowed for the Virtual Tour user to jump between panoramic scenes and access further botanical information.

The results showed that the incorporation of virtual technology into a GIS application provides an extremely effective medium with which to explore and investigate geographical phenomena.

## Project aims

- Creation of a virtual environment.
- Link visualisation with GIS. This computerised, linked environment allows the user to move freely between the various zones, while also providing the links between a plant database, plant hotspots and a map of the Conservatory.
- Serve through the World Wide Web.
- Maintain a broad educational aspect to the tour.

## Visualisation

Panoramic VR is one medium of virtual reality, which encapsulates a spherical image of a real world scene. Panoramas offer the GIS developer a means of visualising geo-referenced data in an exploratory environment, where users can interact with the data. The user can navigate with either the mouse (by dragging the scene in either direction), or with the keyboard, both of which provide spin and zooming capabilities.

Twelve digital images were recorded within each panorama, with a 35mm lens set to wide angle, to ensure a 9% overlap between each image. These 12 images were subsequently stitched together in the Photovista software package. Java files were downloaded from the Photovista Web site (<http://www.livepicture.com>), which enabled the bandwidth-friendly panoramic images to be viewed with a lightweight Java applet. These also enabled the panoramas to operate with a range of browsers.

Two types of hotspot were embedded into the panoramas - navigational and plant information. The hotspots appeared as two concentric red circles, and could be defined and positioned within the Java applet scripts within each panorama. The navigational hotspots, when clicked upon, take the user into the next Conservatory room, whilst the plant hotspots (fifteen in all) were positioned upon plants of significant interest. Once the plant hotspots are activated, they create a new window of images and text relating to the plant selected. While providing a striking visual experience, the tour therefore included the capability to query the location and details of a number of plant species. This added an educational element to the application, as well as making the actual tour experience more interesting for the user, by allowing them to access system information through interacting with the visualisation.

## Application development

The coding of the two main programs of the Virtual Tour (VirtualTour.exe and World.exe) were written in Visual Basic 5.0. This code was responsible for all the functionality within the Conservatory map, as well as linking some of the panorama and HTML features into the application. JavaScripts were also employed to fully implement the interaction between the map and the panoramas. A number of procedures and routines were created as part of the VirtualTour.exe. These handled a variety of user requests and were responsible for a range of map navigation tasks. The map functionality consisted of the following tools:

- Zoom
- Pan
- Select panorama (loaded the new, selected panorama in the adjacent frame).
- Select zone (labelling feature, for navigation)
- Return to full extent

The World.exe represented an additional component of the Virtual Tour, which allows users to produce a global map displaying the regional habitat of the requested plant genus, which was either hotlinked from the plant information sheets or could be type in a request form.

The mapping data for the Conservatory was largely pre-determined by the architecture and layout of the 10 climatic zones present within the building. This resulted in the use of 3 map layers: zones, paths and panoramas (XY). These datasets were originally received in .dxf format (Drawing Interchange file format), from the Garden Development Unit, Kew, and were subsequently cleaned and converted to ESRI shapefiles. The zones were individually coloured to ease the room identification process for the user.

### User Interface

The focus of the Virtual Tour was evenly divided between the map and the panorama window. This dual representation was considered most appropriate, as it allowed the interface to reflect the underlying convergence of GIS and Multimedia technologies, with the intention being for the user to visit to both representations as the system was used. Frames were used to divide the screen, as they allowed for the targeting and updating of individual frames. This element of control was most useful when the application received a request to update a new panorama i.e. one frame could be just updated when needed and therefore reduced the upload time. The use of a JavaScript enabled this bi-directional linkage between the map and the panorama frame.

The map acts as a reference guide to the panorama focus. This is evident when the user first enters the Virtual Tour, and they are greeted with a panorama outside, and to the north, of the Conservatory. A hotspot is placed on the northern entrance to invite the user to enter the building, and thus quickly gets the user engaged in the navigation process.

The Virtual Tour also features a User Guide, Zone Information and a feedback facility for any user comments.

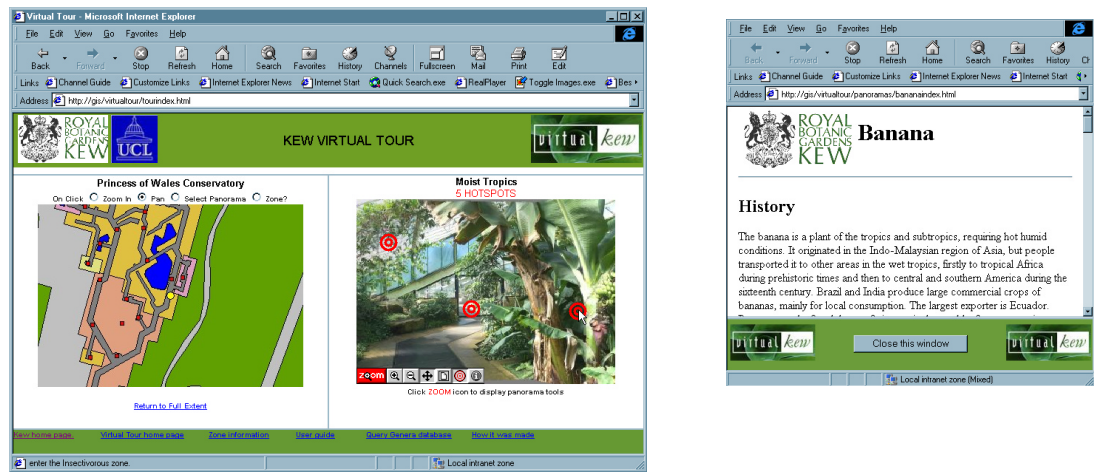


Figure 1: Screen shots - The tour in operation, with plant information for banana highlighted.

## Conclusions

This project set out to provide a means of visualising and presenting geographic information, through the development of a multi-component application. The methods used in this application, of linking panoramic scenes with maps, have been successful in producing a tightly coupled interface that allows for both cartographic and virtual exploration. The use of panoramas proved to be a very effective method of capturing detailed, botanical scenes and internal architecture, while the map of geo-referenced panorama locations provided a useful navigational tool.

The future of GIS and Visualisation will no doubt be a rapidly changing one, and the variety of VR mediums and Internet GIS software is broadening considerably. However, as this study proved, the use of digital imagery, with MapObjects IMS, can result in a most effective exploratory tool.

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