

Extending Virtual Globes to Help Enhance Public Landscape Awareness

Amii HARWOOD, Andrew LOVETT and Jenni TURNER

1 Introduction

The use of internet-based virtual globes has expanded enormously in the past decade and has great potential as a means of representing and communicating landscape characteristics (Tuttle et al., 2008). Virtual globes can help people interpret their present environment and plan for the future (e.g. SHEPPARD & CIZEK, 2009, PETTIT et al., 2011, SCHROTH et al. 2011); they can also provide a window into the past, e.g. through geological modelling (DE PAOR & WHITMEYER 2011, PARASKEVAS 2011). Increasingly it is possible to customise the content displayed to the viewer and this, in turn, facilitates opportunities to support community participation in activities such as GeoDesign (ESRI 2010), particularly by informing people about characteristics of their local landscapes and helping them engage in discussions about how these could alter in the future. This paper describes how virtual globe displays were customised to create tours of an urban fringe landscape in Norfolk, UK and some initial experiences in using these tools as part of public engagement activities.

2 Study Area

The Sustainable Urban Fringes (SURF) project (<http://www.sustainablefringes.eu>) is part of the Interreg IVB North Sea Region Programme and is partly funded by the European Regional Development Fund. There are 13 project partners, one of which is Norfolk County Council, a local authority in eastern England. In Norfolk the SURF project is focusing on the River Gaywood valley to the east of the town of King's Lynn (see Fig. 1).

The River Gaywood rises from chalk springs and flows some 13 km through a lowland landscape and the middle of King's Lynn to join the River Great Ouse, then via the Wash estuary into the North Sea. Some of the housing estates close to the river on the eastern side of King's Lynn are amongst the most socially deprived parts of Norfolk and there is generally little connection with, or use of, the nearby countryside by residents of the town. The SURF project is seeking to unlock the potential of the river and its catchment as a natural environmental amenity by increasing awareness of local features, enhancing access to green open spaces and improving flood-risk management and opportunities for wildlife through habitat creation and restoration.

Following discussions with members of the SURF project team at Norfolk County Council a set of virtual globe visualisations for the valley were commissioned to help raise awareness and use of the local landscape. Through subsequent technical work and consultations three main themed outputs were developed which provided i) an introduction to the valley, ii) information on geology and past climates and iii) details of green infrastructure.

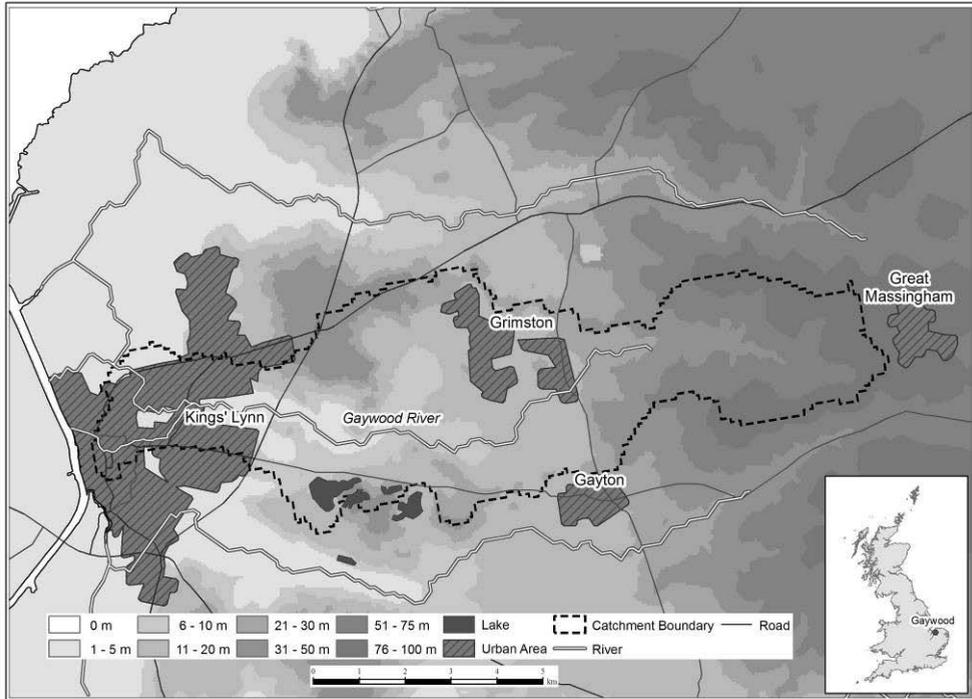


Fig. 1: The location of the Gaywood Valley study area in Norfolk, England

3 Data and Methods

Google Earth was selected as the platform for tool development from a number of available virtual globes (e.g. NASA World Wind, Microsoft Bing Maps, ESRI Arc Explorer, see reviews in TUTTLE et al. 2008 and SCHROTH et al. 2011). The attractions of this platform were that the basic version is free to download (<http://www.google.com/earth/index.html>), has a huge repository of associated online information, an established support system with user forums, and many additional tools such as SketchUp (<http://sketchup.google.com/>) to help with customisation. In addition, as arguably the market leader in this type of software it was thought more likely that the general public (especially younger generations) would have some experience of using it at home or school.

Three 'virtual tours' of the Gaywood Valley were produced by customisation of Google Earth version 6 using the KML scripting language (WERNECKE 2009). Fig. 2 illustrates the overall workflow, which involved integrating a number of different types of data.

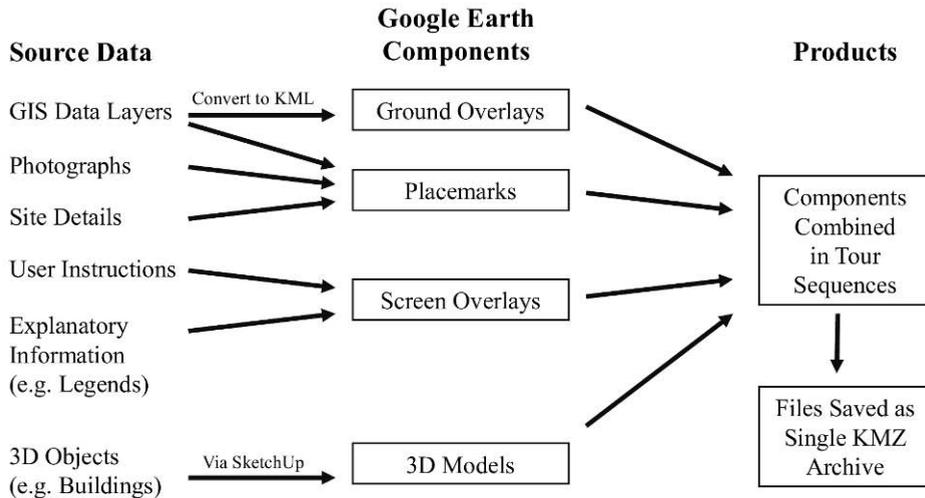


Fig. 2: The workflow adopted in the virtual tour development process

Additional spatial data, such as the catchment boundary and freely available geological maps (<http://www.bgs.ac.uk>), were imported into Google Earth KML as ground overlays or placemarks. Illustrative images, text descriptions and hyperlinks to external websites were included within placemarks. Screen overlays, images that have a fixed position in the Google Earth viewing window, were used to provide introductory information, instructions for the user or supplementary details on particular features (e.g. a map legend for accessible greenspace). 3D models were used to incorporate a geological cross-section and some key local landmarks. Fig. 3 shows an example of a placemark for a local nature reserve and Fig. 4 uses a number of different overlays and models to illustrate aspects of the local geology.

4 Producing Virtual Tours

The different types of content were integrated via KML code to generate the virtual tours in the form of an on-screen narrative for the user. The first few lines of code set the viewing position and angle for the user so that the study area was framed in the Google Earth window. Some welcoming information was also displayed, followed by instructions for the user supplemented by a series of screen overlays to provide explanations and link to additional sources of information. Fig. 5 illustrates the general style of presentation, with a placemark highlighting the source of the river, a screen overlay in the top-right corner containing a map indicating the viewpoint and other screen overlays providing instructions.

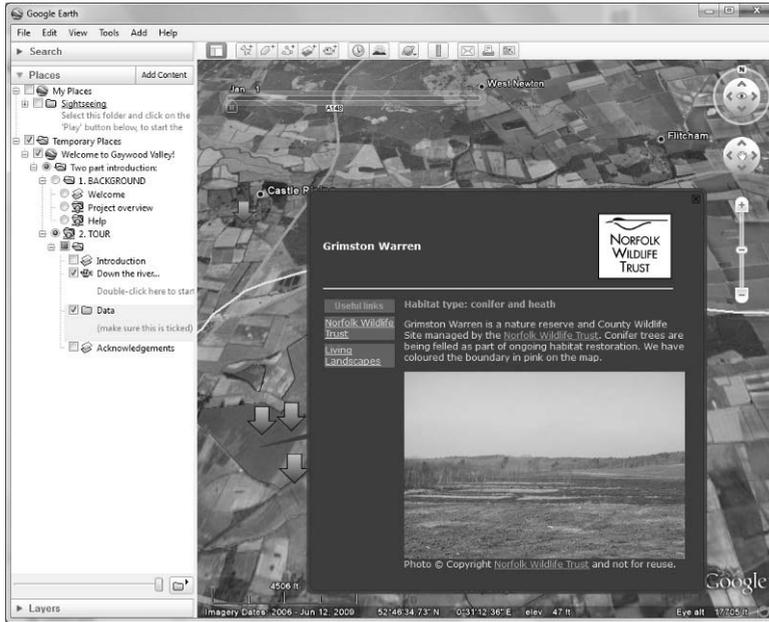


Fig. 3: Example of placemark content for Grimston Warren nature reserve

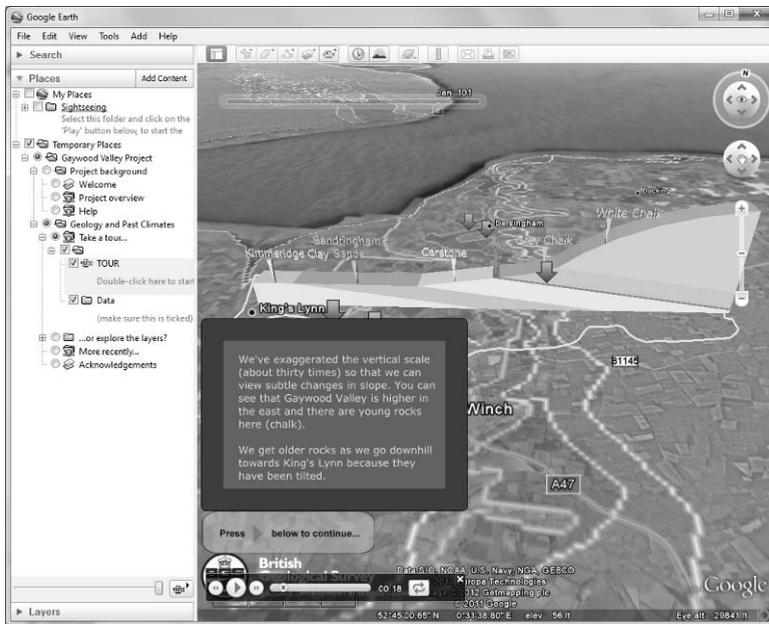


Fig. 4: Screenshot from the geology and past climates tour using a combination of ground overlays, screen overlays, placemarks and 3D models

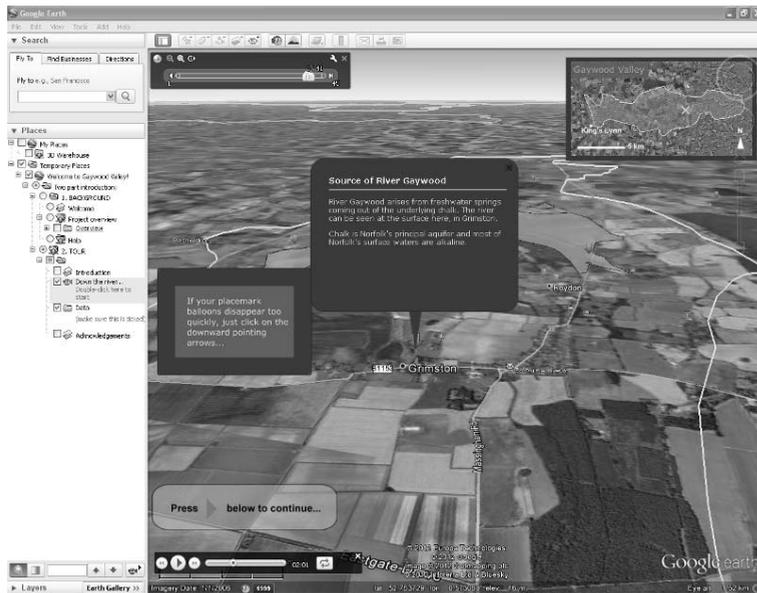


Fig. 5: Screenshot of example user instructions from the introductory tour

In each tour the users were taken on a virtual flight around the catchment which paused at placemarks in a developer-defined sequence. The timeslider feature in Google Earth (in the top-left of the display window in Fig. 5) was used to control this progression. However, flexibility was also built into the interface so that users could pause a tour, explore the data layers for themselves at their own speed, and then resume the presentation. For the green infrastructure theme more emphasis was placed on such self exploration, while the introduction and geology themes involved more of a structured guide accompanied by an onscreen narrative.

As the tours were developed, the content became more complex involving multiple layers of different spatial data and other components. Through the use of 'radioFolders' in the KML and 'network links' between KML files, it was possible to prevent overlap of incompatible elements and thus combine all the content within a single file system (WERNECKE 2009). Simple components were developed first and then revised and nested within a wider structure. To aid dissemination it was possible to zip together a hierarchy of folders and KML files into a single archive in KMZ format. The user could then download and display the content for each theme directly from a single file (each had a file size under 3.5MB). The KMZ archives were developed and tested to run on a Windows OS. At present, compatibility with Linux or Mac computers has not been evaluated.

5 Public Engagement

The public launch of the Gaywood Valley Project in May 2011 allowed testing of draft tools. At this event early versions of the introductory and geology tours were shown in a continuously looping form on a portable virtual reality immersion device. UEA researchers were also available alongside the display to answer questions and receive feedback (Fig. 6).



Fig. 6: Demonstration of the Geology and Past Climates tour at a project launch day in King's Lynn, May 2011

Subsequently, the tools were revised and demonstrated to the project advisory group, interested school teachers and at a meeting with local councillors in King's Lynn (September 2011). The response to the content and the style of presentation was positive so in October 2011 the files were made available to download from a University of East Anglia website (<http://www.uea.ac.uk/env/research/reshigh/gaywood>). By the end of February 2012 this site had received over 300 unique views, with particular peaks on days following publicity via social media and a short report in a local newspaper. Correspondence with people who have downloaded the files has also helped to improve the instructions provided.

The next phase of engagement will involve day events with several local primary schools and for this purpose a number of worksheets and other teaching materials have been developed. A meeting for local teachers to provide feedback on this experience and further promote the availability of the tours is scheduled for April 2012.

6 Conclusions

The initial stages of creating the Google Earth tours were quite technically demanding, but once some key techniques were mastered and a structure for organising files established progress was relatively rapid. Particular benefits of the approach are that the products can

be easily revised, that they rely almost entirely on publicly available data and software, are easy to disseminate and that the existing templates could be readily adapted for other locations. There is also scope for suitably experienced users to add their own content. Evaluation of public use is still in progress, but it is clear that the products have certainly attracted interest and, anecdotally at least, generated positive feedback about both the style of presentation and increasing awareness of the local environment. Customising a virtual globe such as Google Earth in the manner described is also very cost-effective compared to more sophisticated techniques of landscape visualization (LOVETT et al. 2009) and undoubtedly has great potential for supporting initiatives concerned with public participation in landscape planning, including aspects of GeoDesign.

7 Acknowledgements

The Gaywood Valley Sustainable Urban Fringes Project is supported by the Interreg IVB North Sea Region Programme and is partly funded by the European Regional Development Fund. Data were obtained from Norfolk County Council (NCC), the British Geological Survey and the Norfolk Geodiversity Partnership. Special thanks to Gemma Clark at NCC, Tim Holt-Wilson at the Norfolk Geodiversity Partnership for geological advice and Lauren Parkin for creating initial drafts of the teaching materials.

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