Exploring Landscapes from the Lab

Harnessing the Power of 3D Interactivity to Engage students with Airborne Remote Sensing and Landscape Archaeology

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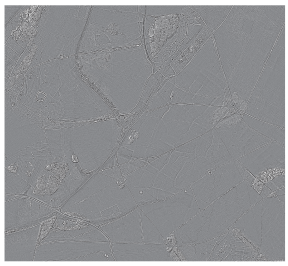
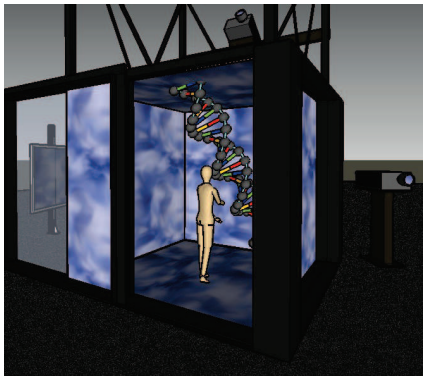
The use of 3D digital terrain models and high dimensional data (such as historic aerial photography and hyperspectral data) for investigating archaeological landscapes is becoming standard procedure in academic, commercial and curatorial contexts across the globe (Bennett 2012; Bennett et al. 2011; Bennett et al. 2012; Bennett et al. 2013).
The interpretation for this task however requires a high level of skill as users must combine their understanding of the archaeological landscape with understanding the properties of the data and sensor platform. Therefore there is a strong imperative to rapidly build understanding, teaching students and professionals how to interpret these data and access the information they contain.

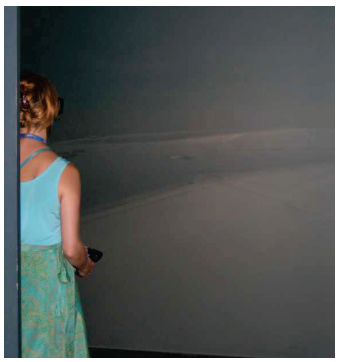
True colour Composite of airborne spectral data



Lidar derived local relief model

Traditionally airborne data have been accessed in 2D via a desktop GIS system, but in the project implemented as part of research by the Wired! Lab for Digital Humanities at Duke University brings these data off the page in order to evaluate the potential for immersive and interactive environments as an educational tool. The aim of the project is to design and evaluate two different two different modes of 3D interactivity, comparing their efficiency for exploring and understanding landscapes and data with traditional methods of instruction.





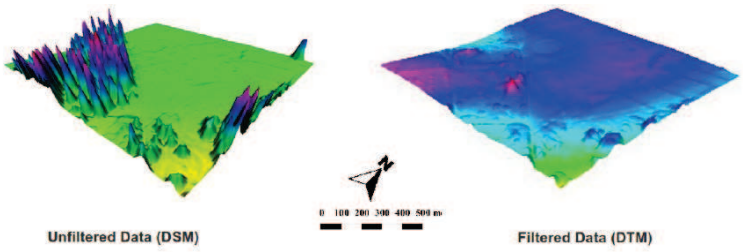
Above: A diagrammatic representation of the DIVE

Right: testing the prototype immersive landscape at 1:1 scale

The study will use the Duke Immersive Virtual Environment (DIVE), a six-sided virtual reality cave, student interpretation of various airborne datasets will be examined and compared to a X3DOM web-based application. A basic GIS interface will also be tested as a control, with participants using the same type of data for different sites within the same landscape. within the same landscape that can serve as a teaching tool in the classroom but also as a means by which to communicate the use of ARS data for management of historic landscapes to the wider public.

The experimental will take two groups of participants, one with prior archaeological landscape experience and one without, and allow them to explore each of three environments. A Think Aloud' protocol will be used along with a short recall exercise and a summary participant survey.

Participant Number (Group + Number)	Order of Environments		
	Landscape 1	Landscape 2	Landscape 3
A1 and B1	DiVE	GIS	3D Web
A2 and B2	DiVE	3D Web	GIS
A3 and B3	GIS	DiVE	3D Web
A4 and B4	GIS	3D Web	DiVE
A5 and B5	3D Web	GIS	DiVE
A6 and B6	3D Web	DiVE	GIS



Examples of unfiltered and filtered ALS data for use in the 3D environment

The research protocol was approved in June 2013 and currently work is being undertaken to refine the data models for each of the environments. Experimentation will begin in August

It is hoped that this work will give quantitative insight into the use of 3D technologies for archaeological landscape studies. In addition, by developing a workflow based on open-source software, we hope to provide a method by which GIS data can be made more easily accessible in a 3D environment for teaching and public education.

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References: Bennett, R., Welham, Kate, Hill, Ross A. & Ford, Andrew, 2011. Making the most of airborne remote sensing techniques for archaeological survey and interpretation. In D. C. Cowley, ed. Remote Sensing for Archaeological Heritage Management. EAC Occasional Paper. Hungary: Archaeolingua, pp. 99–107; Bennett, R., Welham, Kate, Hill, Ross A. & Ford, Andrew, 2012. A Comparison of Visualization Techniques for Models Created from Airborne Laser Scanned Data. Archaeological Prospection, 19(1), pp.41–48. Available at: http://dx.doi.org/10.1002/arp.1414; Bennett, R.A., 2012. Archaeological Remote Sensing: Visualisation and analysis of grass-dominated environments using airborne laser scanning and digital spectra data. UK: Bournemouth University; Bennett, R., Welham, Kate, Hill, Ross A. & Ford, Andrew, 2013. Using lidar as part of a multisensor approach to archaeological survey and interpretation. In D. C. Cowley & R. Opitz, eds. Interpreting archaeological topography – airborne laser scanning, aerial photographs and ground observation. Oxford: Oxbow Books, pp. 198–205