



Ambitious 3D animation project brings pre-historic rock art to life

Rarely seen rock carvings, known as Pitoti, which tell an autobiographical story of prehistoric life, are to be re-created for a world-wide audience using 3D animation techniques which are still in development.

The ambitious £2.9m 3D PITOTI Project, involving over 30 scientists from across Europe, is being coordinated by the Human Factors Research Group at The University of Nottingham. Dr Sue Cobb, who is a founder member of the Virtual Reality Applications Research Team (VIRART) part of the Human Factors Research Group based in the Faculty of Engineering, is co-ordinating the international team who will use the latest technology to produce images in the third dimension and explore their shape and significance using advanced graphic technology, shape analysis and digital synthesis.

The collaborators in the project are:

- The Human Factors Research Group and Learning Sciences Research Institute, The University of Nottingham, UK
- The Institute for Creative\Media/Technologies, University of St. Pölten, Austria.
- The McDonald Institute for Archaeological Research, University of Cambridge, UK.
- The Virtual Reality Systems Group, Bauhaus University of Weimar, Germany.
- The Institute for Computer Graphics and Vision and the Institute of Electrical Measurement and Measurement Signal Processing, Graz University of Technology, Austria.
- ArcTron 3D GmbH, Germany.
- The Centro Camuno di Studi Preistorici, Valcamonica, Italy

Unlike the famous prehistoric European art found protected from the elements deep in a handful of limestone caves, the simple open-air rock carvings have been left exposed to the elements for over 7000 years. They might be widespread across most European countries but they are now so badly eroded that they can only be seen when the light shines on them from a certain direction.

These simple but beguiling carvings have extraordinary graphics and appear in a vast range of forms and depictions. They aren't as well known as the prehistoric cave art because they are so hard to see. The pictures survive as slight marks on rough rocks, which you can only see clearly when the sunlight catches the shape of a figure.

Taking rock-art to the people

The 3D-PITOTI project will significantly advance both the state of the art in rock-art research methodology and the recording of flat 3D structures in general. Moreover it will not only 'take the rock-art to people' for the first time but will convey Pitoti knowledge to a much wider audience in interactive and engaging ways.

Over the next three years this international team of experts will be:

- Researching and developing an affordable and portable multi-scale 3D scanning toolkit for the high resolution acquisition of Pitoti figures and their natural context.
- They will develop and build intelligent control of micro aerial vehicles to survey complete rock-art sites using elaborate on-site structure from motion techniques.
- The project will produce intelligent data processing technologies to enrich the scanned 3D data by classification, clustering and retrieval techniques.
- They will also develop interactive 3D visualisation and presentation techniques to provide access to the enriched high resolution digital rock-art for scientists, museum visitors, school children and web users.

From analogue to digital

Over the centuries archaeologists have recorded these carving using 'analogue' methods – patiently drawing and tracing the pictures but it is slow and laborious work. What we are hoping to do is capture the third dimension – the actual cut into the rock and the contours of the rock surfaces.

With laser scanning and digital photography the international team of archaeologists, computer scientists together with experts in virtual reality and computer graphics have already reproduced these carvings in 2D in all their finesse, scale and subtlety. The trial testing was so successful the first results were shown last year in an outstanding exhibition at the famous Triennale Gallery in Milan and this year they were displayed at the Cambridge University Museum of Archaeology and Anthropology.

From two dimensions to three

The 3D images will instantly and reliably capture each cut and scrape to a fraction of a millimetre. This suite of new methods in computer vision, laser scanning and archaeological expertise will allow a world-wide audience to see these carvings as never before.

Their study area is in Valcamonica, a single alpine valley in the Lombardy region of northern Italy, which has the largest group of this 'rock art' in Europe. Tens of thousands of images there span a period from an unknown starting date a great many centuries BC into medieval times.

In the Camunian dialect, the old local language of the valley, the figures are called Pitoti. This traditional name has been used for the title of the project. The key advance is to work always and fully in the third dimension, so the project is entitled 3D PITOTI.

Dr Cobb said: "The innovations began at a 'kick-off' meeting in March, hosted by Centro Camuno di Studi Preistorici in Capo di Ponte, when the whole scientific team met amongst the rocks and amidst the pictures of Valcamonica itself. A set of photographs were taken from a flying 'camera octocopter', a miniature unmanned helicopter powered by eight tiny rotors. The digital images

were sent from Italy to the Technical University of Graz in Austria and post-processed overnight and returned in synthesized completeness. By the next morning we had high-quality imaging of a vast surface with hundreds of pitoti figures. The surface was so large that the recording attempted in the old analogue method was never even completed.

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