3D-PITOTI Newsletter

1st Newsletter 2015

Special points of interest:

- Scanner prototype testing in Valcamonica
- Valcamonica as you've never seen it before
- Innovations in virtual environments

Inside this issue:

Latest news

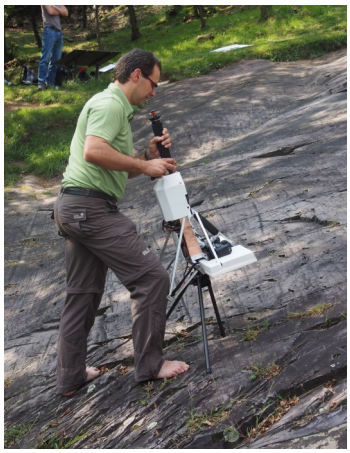
We've passed the half-way point of our project and we'd like to share our progress. We have reached our milestones and have made significant progress towards the ultimate goals of the project. In this newsletter we will explain in more detail some of the things we've been doing and highlight some of the events where we have presented our results to date. In September 2014 we held our fourth project meeting. at the offices of Centro Camuno di Studi Preistorici in Capo di Ponte, Valcamonica, Italy. This was a great opportunity for all project partners to re-visit the site of the rock art which is the focus of our project. This UNESCO World Heritage site in the Lombardy region of northern Italy has the largest group of this 'rock art' in Europe. Tens of thousands of images span a period from many centuries BC into medieval times. In this newsletter we'll show some of the work we've carried out both in Valcamonica and at our partners organisations. If you'd like to get an overview of the project and 3D-PITOTI system, please have a look at our web site. There is up to date information about the project. There are pictures taken at our project meetings and public reports. There are also videos and some interesting links. Please take a look!

Project team at CCSP, Capo di Ponte, Italy

3D-Scanner Prototype tested in Valcamonica

One of the project objectives is to build an affordable, portable, robust scanner for high-resolution recording of rock surfaces which will include operators having on-site feedback and an easily manageable software-workflow for data processing. The prototype of the 3D scanner we are developing was tested in Valcamonica during summer 2014. Project partners from Graz University of Technology are leading the scanner development and the team from University of Cambridge, one of the archaeological partners, are also involved in this work as end users of the system. Scanner development is based on requirements stakeholders including archaeologists, technology developers and technical experts. The field testing was very successful and highlighted both how far development has progressed. It wasn't only the technical side of the development that was tested. We wanted to find out how usable the scanner is for archaeologists so we enlisted the help of not only project partners but others who were working in the parks in Valcamonica to try out the scanner and see how easy it is to use. We got lots of useful feedback to help us with our development. See inside for more details.

3D rock-art scanner development



Prototype scanner testing in The Archaeological Park Of Seradina-Bedolina, Capo di Ponte, Italy

In September 2013 we hosted a workshop at Bauhaus University, Weimar where we started to collect user requirements for our new 3D-rock art scanner. Experts from a range of disciplines provided us with valuable information about the functionality they would like from such a scanner along with other information about how they could use it in the field. This was followed up with a questionnaire where data was collected from more users and the findings from both were used to define a set of requirements. During 2013 and early 2014, significant development took place and the first prototype scanner was demonstrated to the whole consortium at the project meeting in Graz in early 2014. Following on from the meeting, further testing in the lab subsequent and design changes resulted in the first protype scanner being ready for testing in the field during summer 2014. The team from Graz University of Technology travelled to Capo di Ponte with other members of the project team to test the new scanner. The requirements gathered included that the scanner be portable, easy to use, only needs one or two people to operate it, have good battery life and be affordable. The scanner also needed to provide precision to a level of 0.1mm in order to capture the 3D structured of the engraved rock art and also the radiometric qualities of the rock surface. Details of the scanner were presented at the ISPRS Technical Commission V Symposium, on 23 – 25 June 2014 at Riva del Garda, Italy.

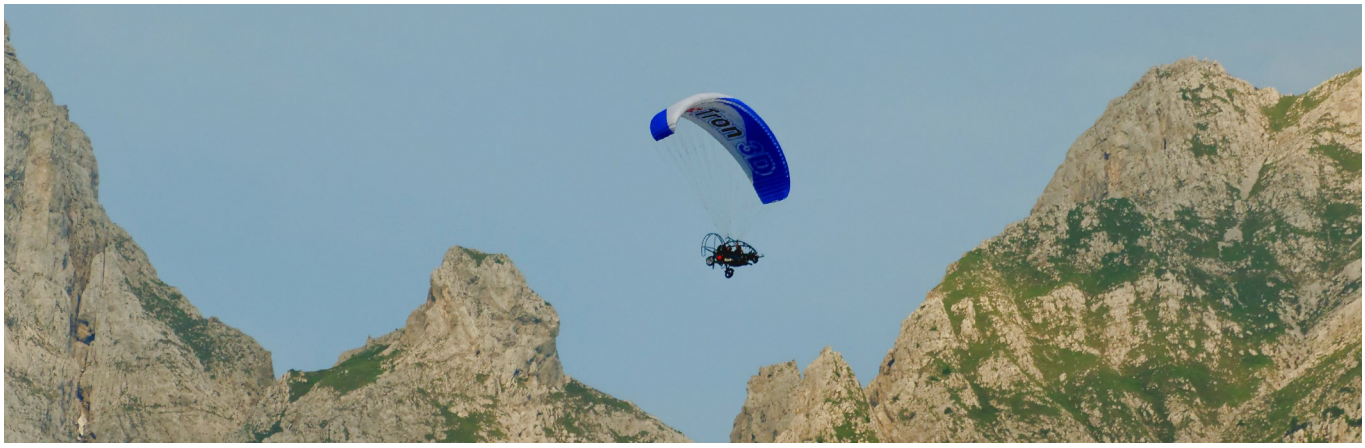
You can read more about it in the proceedings from that event here.

Our processing system gives immediate feedback to the user. They know which areas of the rock surface have been sufficiently scanned

Valcamonica from the sky

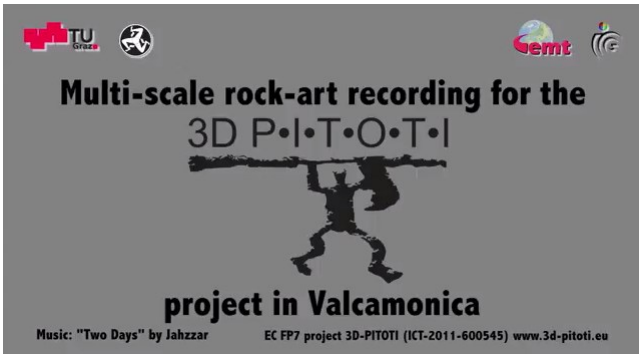
If you want to see Capo di Ponte from the sky and then zoom in to see a detailed visualization of one of the engraved images, have a look at our website. The video was created with a real-time visualization demonstrator showing the valley, individual rocks and a detailed scene at corresponding resolution levels. The full dataset used here involves four billion measurement points with 3D location and colour information. In the proximity of the village Capo di Ponte, you will see rock named Seradina 12. Approximately 1000 figures have been identified to date on the rock surface. The hunting scene has been pecked into the stone during the iron age. The lines defining the hunter's spear and shield are barely a millimetre wide. These so called *filiforms* have been made using scratching techniques. The high level data was captured by project partners ArcTron 3D GmbH using a motorized paragliding trike to generate a digital surface model using Structure-from-motion processing. The data collection, which included mid and micro-level data took place during the first year of the project and acts as our reference datasets. We use this so we can test the results of our novel scanning technologies against the current state of the art.

The initial results are looking very good!



Watch the scanning system in action!

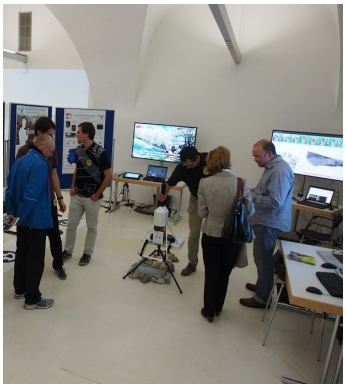
At the Conference on Cultural Heritage and New Technologies in Vienna on November 2-4, 2014, the project members from Graz University of Technology and University of Cambridge presented a video showing the 3D scanning of one of the large rock panels in Valcamonica (Seradina 12). The video shows the rock being scanned by the unmaned aerial vehicle at the mid range scale and the prototype hand-held scanner to scan at the micro-scale. The novel on-line structure-from motion pipeline provides online user feedback about already scanned areas and expected coverage by a sufficient number of images. The micro-range scanner can reconstruct surface geometry in 3D up to approximately. 0.1mm, and capture radiometric surface properties beyond phototexture using custom illumination and a novel frame differencing principle. Permission for scanning was kindly given by MiBACT-SBA Lombardia and the Parco Archeologico Comunale di Seradina-Bedolina.



Watch the video on YouTube here

Processing our data

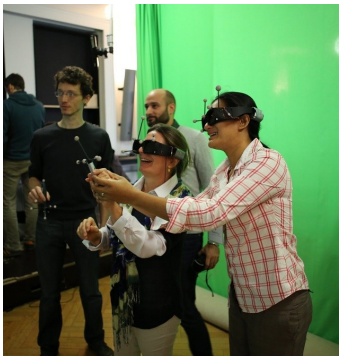
Once we've collected all the data about the rock art, we will then need to process it (and there will be a huge amount of it!) and display it to the end-users of the 3D-PITOTI system. We are working with archaeologists, museum curators, teachers and the public to find innovative ways that they can use the data collected for their research, public display and education; in fact anyone who wants to know more about rock art. One of the challenges in the project is working out how the system is going to be able to recognize the engraved rock art from the surrounding rock surfaces and also be able to classify the type of figure (animal, human, building, abstract figure etc.) that has been captured. The project partners at St. Pölten University of Applied Sciences have been leading the development work on the intelligent processing system which will use automatic and semi-automatic systems to 'segment' the rock art from the whole rock surface scans. The system needs to allow expert users to easily check the results of any automatic processing and also provide input so that the system can 'learn' for future data. The team has carried out extensive testing comparing different methods to decide which will deliver the best results and will integrate into the 3D-PITOTI toolkit. The work is showing promising results and will be continuing into the third year of the project.



Project members at the European Researchers Night, Vienna, 201

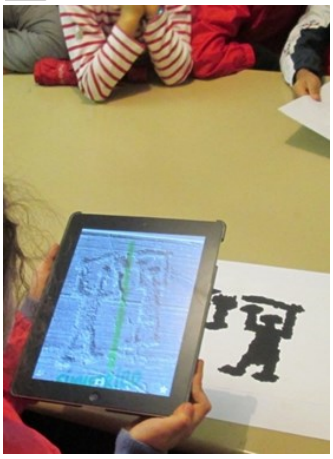
Visualization – what will users see?

We are creating groundbreaking methods for our end users to look at and interact with the 3D visualizations of the rock art and its surroundings. Project partners from Bauhaus-Universität Weimar are working on a number of systems that will enable archaeologists to experience the rock art using virtual environments to help them in their research. At the Computer Supported Cooperative Work and Social Computing Conference in Baltimore in 2014, they presented their work on Photoportals. The project is creating a 3D 'Scientists' Lab' to allow multiple users to collaborate and explore the 3D data from the micro to macro level. One part will be a multi-user 3D virtual environment where users can explore the virtual 'Valcamonica' and the rock art panels. The Photoportals technology is just one aspect of this system. It allows users to take virtual photos and videos within the virtual environment and share them with others in the virtual environment but with each person still having their own unique viewpoint of the photo. It allows the virtual images to be transferred to other 3Ddisplays, such as multi-user multi-touch tables enabling users to access the micro-level scan detail and carry out other interactions such as taking measurements.



Watch a video explaining Photoportals here

Using rock art in education



Using the augmented reality application

During 2014 we started to explore how the 3D-PITOTI data can be used by schools, museums and visitor centres. As the visualization systems are still under development and we recognize that virtual reality systems may be beyond the budget of many schools and museums, we are looking how the rock art data can be used on other devices such as tablet PCs or mobile phones. We also wanted to explore how rock-art, as a subject area, can be integrated into the curriculum in different European countries. Project partners from the University of Nottingham and Centro Camuno Di Studi Preistorici along with significant support from Archeocamuni (www.archeocamuni.it) developed a web-based augmented reality application which was used in UK and Italian schools and with children visiting the workshops at Archeocamuni. Both primary and secondary school children took part. The application was used to teach children about archaeology and life in the times when the rock art was created. We gained a lot of valuable feedback from teachers and pupils about the benefits and challenges of using augmented reality applications on tablet PCs and we were very pleased to find that they found great value in using rock-art in education. During the next phase of the project we will be looking at enhancing the augmented reality applications and looking at ways that our system can provide outputs for use in museums and visitor centres. We will be running further workshops during 2015 to test our developments and wish to thank all the teachers and children who have provided valuable help so far.

3D-PITOTI is an EU FP7 funded project which started in 2012 and will finish in February 2015. The Human Factors Research Group at University of Nottingham are project coordinators . Other partners are:

- Graz University of Technology
- ArcTron 3D GmbH
- University of Cambridge
- Centro Camuno di Studi Preistorici
- Bauhaus-Universität Weimar
- St. Pölten University of Applied Sciences

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Find out more at www.3d-pitoti.eu