

*GIM INTERNATIONAL INTERVIEWS HEINZ
RÄTHER*

Creating Historical Awareness in Africa



The cultural heritage sites of Africa are being captured by five enthusiastic Geomatics and computer science professionals from the Geomatics Division of the University of Cape Town, South Africa under guidance of initiator and emeritus Professor Heinz Rüther. The Zamani project, as it is called, has already worked on forty sites on the continent by acquiring, modelling, presenting and managing spatial data coming from 3D laser scanning, photogrammetry, GPS, GIS and photography. The database formed in this way is now already the largest collection, having been developed into 'The African Cultural Heritage Site and Landscapes Database'. Professor Heinz Rüther talks to GIM International about the achievements and challenges of this major project.

What is the Zamani Project?

The Zamani project, based in the Geomatics Division of the University of Cape Town, enables us to map historical sites of Africa, such as the Slave Fortress of Elmina in Ghana, the Great Mosques of Timbuktu and Djenné in Mali and the rock hewn churches of Lalibela in Ethiopia. The physical structures of the sites are recorded using different techniques: 3D laser scanning, photogrammetry and regular photography. The Zamani team is also developing a GIS for every heritage site. All this data are stored in a database. Appropriate government departments and museums in countries in which the sites are located are granted access to the database, as well as the research community of historians and conservationists at universities and other institutes in Africa.

Is Zamani in essence a Geomatics, a history or a conservational project?

It's difficult to say if this is a historical or conservational project. I am not a historian so I don't interpret any of the data historically, the same goes for conservational angles, and it's not up to me to judge any of this. We are just acquiring data for those communities in close co-operation with relevant experts and authorities. We are mapping as much as possible in order to be able to answer all questions users might have now or may come up with in the future. The project is highly technical, all our team members - five in total - are professionals, specialised in laser scanning, photogrammetry, GIS or Computer Science. We take on a holistic approach in the project, by not merely creating 3D models, but by creating interactive databases and GISs, supported by 3D terrain models of the immediate vicinity of the site and contextual information, such as scientific publications, historical maps and general photography of current activities in and around the site.

Why did you start this project?

The awareness of history in Africa is, in general, not as widespread as in Europe. In Africa there is a rich heritage of oral and intangible tradition, but that history is often locally or regionally tied. I think it's important to create more awareness of history among inhabitants who are most likely preoccupied with other priorities; getting a job, a house, providing for food on the table and sometimes just trying to survive. Where East Africa used to be very far from West Africa, for scientists and researchers on both ends of the continent, we are now able to hand them a tool to learn from each other through the Zamani database, just as contact among the inhabitants of the continent is now much easier as a result of modern communication. And, I know it's a cliché, but if we don't know our past, we won't be able to understand the present and plan for the future. Many of the old values of the continent are drowned in new applications like Facebook and Twitter. I think it is important to preserve them for future African generations, certainly before they disappear, endangered as they are as a result of modern developments. Equally important is the contribution our data can make, and is already making in a number of cases, to conservation and restoration interventions. And finally there is the digital long-term record of African Heritage our project is creating for future generations.

Do African countries and governments acknowledge the importance of projects like Zamani?

Yes, heritage has become one of the priorities of African governments. For example, we have been asked by the Office of the Tanzanian President Jakaya Kikwete to map the site of the hominid Footprints at Laetoli, near the Ngorongoro crater. The fossilised footprints of three hominids crossing a volcanic ash field some 3.6 million years ago are generally seen as the oldest evidence of bipedal or upright walking by our ancestors. I surveyed the footprints in 1995/96 and the partial resurvey was requested to establish the condition of the footprints after 16 years of reburial. Not only is this site of enormous significance for Tanzania, but actually for the world, for humankind. This request shows that the awareness is growing, something which is also obvious in other African countries with increasing requests for the inscription of sites in the UNESCO World Heritage lists and a not insignificant number of architectural conservation projects.

Is there something to be learned from Zamani on continents other than the African?

The one thing that possibly makes us stand out from other projects that are mapping heritage sites - and I am proud of that - is that we are creating one, consistent database with always the same metadata for the whole of the continent. We are creating a standard. Our approach is the same at every site we visit; we will always build a GIS, a 3D laser scanning model, a 3D terrain model, panoramic 360 degrees photo tour and some snapshots to capture the atmosphere at a site. There are many technically highly advanced documentation projects worldwide, and I do not claim that we are unique in this respect, but I am not aware of a single database elsewhere which covers such a large area with such consistency.

Is there any interest from other countries?

Yes, we have worked in Abu Dhabi and Jordan in the Middle East. Also the Chinese Academy of Science is very interested in our approach and may want to implement it in their policy of mapping heritage sites. At individual and organisational or institutional level we have had requests from history and Geomatics students from several countries, for instance, datasets of the Slave Forts at Elmina, Ghana and the Fortress on Mozambique Island. We had a number of requests for images of our models from authors of educational books and publications and we mapped the Valley of the Queens in Egypt for the Getty Conservation Institute, using terrestrial laser scanning and [photogrammetry](#).

What are your goals for the future?

We have mapped forty sites so far and we have identified a hundred more in sub-Saharan Africa. It is fair to say that we've finished only one third of the sites that we identified in Africa and there are hundreds more which are in need of documentation.

What are difficulties you encounter?

To be honest, we do not have state of the art laser scanners and have to hire equipment at great cost. In that sense we have difficulties keeping up with our colleagues in the rest of the world. Being somewhat isolated at the Southern tip of this great continent, we simply don't have access to the same funding. We often work in very difficult circumstances, in mangrove swamps and in deserts, coping with the ever-present threat of malaria and other diseases and convincing local populations that our laser scanner doesn't have a negative effect on mosques or churches. The Zamani project has up to now been funded through grants of the Andrew W. Mellon Foundation. But these funds are now coming to an end and I am greatly concerned about the future of a project which I believe is of significant relevance for Africa's heritage.

Which developments in general in the techniques you are using would make it easier to work on this project?

They are developments I would like to see happening anyway. We need algorithms and software to provide easier and quicker processing of data, automatic registration of laser scans, improved texturing and 3D-modelling. There is software for all these processes, but at present we have to work with a combination of no less than ten different applications in our processing pipeline and then the results are still not always perfect, nor is the pipeline sufficiently generic to cover all the cases we encounter. We are dealing with large datasets, with up to seven billion points for one structure, and we are forced to split the data into numerous subsets to avoid computer system crashes. Improved algorithms for large datasets would be highly desirable. There is also a need for a viewer which can display high-resolution polygonal datasets, multilayered texturing, allowing for overlay of multi-temporal images, with on-screen measurement and on-screen marking capabilities, as well as on-the-fly generation of sections, plans and elevations, all of which is essential for heritage applications.

Is there enough communication between the user community of historians and conservationists and the Geomatics professionals in the Zamani Project?

No. There's not enough interaction and exchange between us and the user community. We really need to know what is useful for those who are using spatial data in heritage in general and in our specific case those who are using our database. There are questions like what accuracy and resolution is needed for several purposes - they can of course differ from site to site - or, what details or which features are relevant, or which secondary products would be useful that are not currently being produced? I really would like to extend an invitation to a PhD student in historical conservation to do research and come up with a methodology for heritage documentation and a set of standards for different types of sites.

