# 05

Digital Alberti: Tradition and Innovation

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Digital Alberti Exhibition
DIGITAL ALBERTI: TRADITION AND INNOVATION

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Editor’s Note
Gonçalo Canto Moniz and Jorge Figueira

The fifth number of Joelho is the first issue in English, consolidating the effort to internationalize the Department of Architecture of the Faculty of Sciences and Technology of the University of Coimbra (DARQ), and its publisher, e|dIarq. This may happen thanks to our full professor Mário Krüger, who chose Joelho to publish one of the outputs of his most recent research project – Digital Alberti: Tradition and innovation in the architectural theory and practice. To him and to his team, we thank for this opportunity.

Digital Alberti brings the architect who personalizes the architecture culture, Leon Battista Alberti, to the contemporaneity where the digital is one of its icons. Somehow, we think that Digital Alberti is also a good metaphor to Joelho and its role in the academic journals scene – a place where the classical and post modernist architectural culture meet. Digital Alberti and Joelho, as well as DARQ, are also together on the trends for a humanistic approach to architecture, combining design with an intellectual attitude. Last November, in a lecture in Coimbra, Francesco Furlan, one of the world’s experts on Alberti, underlined this idea of a broader stand of the humanistic architect who has a vital necessity for researching, because “in the research activity, the process is more important than the results; that is the Albertian lesson”.

This duality, between tradition and innovation, may be observed in the papers presented at the Digital Alberti International Conference, selected by a peer review process, that Joelho publishes in this issue, as well as the Digital Alberti Exhibition, held in Coimbra and Lisbon in 2013.

On his return to Joelho, we would like to quote Mário Krüger (2001, p.28) and his paper published in our ecdj (Joelho first series) number 5, where he built some of the foundations of the research in DARQ – “the progress of knowledge that transforms the seemingly inexplicable in predictable result”. The Albertian girl designed by Penousal Machado and Tiago Martins for the cover is the best illustration of this beautiful idea.

References
Introduction
The technological advances that we have been witnessing in the last few years allowed the development of new and more interactive applications for all kinds of scenarios. A clear example are multi-touch devices and depth sensors like Microsoft Kinect, which allows non-intrusive and inexpensive tracking of the user’s body. In the visualization area, the vulgarization of 3D displays allows users to perceive imagery as it was getting out of the screen, providing a depth illusion. This technological advances motivate a fresh look at tabletop interfaces and to revisit on-and-above surface interaction techniques, in order to better support 3D direct manipulation and to aspire scenarios until now exclusive of science fiction.

Recently, innovative methods to use the space above the surface, in order to provide more natural ways of interacting with 2D tabletop content, have been proposed (Hiliges et al., 2010). Wilson et al. (2010) created metaphors to interact with different displays while capturing full body postures. Thus, users can interact on or above the surface with 2D content, or even between surfaces, using the body to transfer virtual content from one surface to the hand or to another surface, while moving their bodies in space.

Following the work of Hornecker (2008), who studied the effect of a multi-touch table in a museum of natural history, we exploited the aforementioned technological solutions to enhance the visitors experience in a museum exhibition. This exhibition was set out to present the architectural heritage left by the Renaissance artist, architect and author Leon Battista Alberti (1404–1472). The author, in his De re aedificatoria treatise, defined a strict shape grammar, without providing any images illustrating the architectural rules presented. Albeit difficult to interpret, this document greatly influenced several buildings spread across the world.

We developed a tabletop prototype that allows users to explore 3D virtual models of existing buildings in stereoscopy, as they were physical models lying above the tabletop. We also introduced the possibility to customize an entire model of a temple following the strict Alberti shape grammar.

Hardware Setup
To support our interactive prototype and provide a non-intrusive experience to the visitors of the exhibition, we developed an innovative setup. Our setup consists on a semi-immersive environment based on a stereoscopic multi-touch surface combined with three Microsoft Kinect depth cameras. These cameras track the user’s head, hands and fingers above the 153x88cm tabletop. The head tracking enables a personalized perspective view of the content shown on the table. A video-projector under the table displays images on the surface at 120Hz with a 1280x720 pixel resolution. A set of NVIDIA 3D Vision active shutter glasses guarantees the stereoscopic visualization.
Customizable elements of the chapels.

Such setup allows rendering virtual objects such as if they were lying above the surface. The touch enabled surface, using Laser Light Plane technology, allows the interaction with virtual models, as shown in Figure 1, and the hand tracking gives the hand position above the surface to highlight and provide more information about the displayed content.

Visualization of Architectural Models

With our semi-immersive environment, users can explore 3D virtual models of Alberti influenced buildings using both hands. To manipulate the content above the stereoscopic surface the visitor can use several buttons on the table surface, making the front of the model directly facing his point of view. With this option we offer a better visualization of the model’s front.

Customizing Alberti Models

In addition to the visualization of existing Alberti influenced buildings, we included a special model, which is a temple that supports three different types of customizations, accordingly to the shape grammar extracted from the De re aedificatoria treatise. Our prototype allows the customization of the temple columns, body and frontal parts independently and then, visualize all the parts together in a complete temple, as it is present in almost every multi-touch device nowadays.

Feedback from Visitors

Our prototype has been on display at the Digital Alberti exhibition, from April 15th 2013 to June 20th 2013, in the Museum of Science of the Coimbra University. During this two months, we were able to observe and talk with some of the visitors that attended the exhibition and interacted with our prototype, and obtain some feedback.

In general, visitors considered that this kind of setups can make museum exhibitions more appealing and interactive. This was reinforced, given the fact that visitors could even create their own temple, allowing the interest raised by this architectural exhibition to be comparable to the one raised in a science exhibition, where visitors can witness “things happening”, like making an air balloon fly with hot air. This comparison was actually made by a visitor who had previously attended a scientific exhibition that was present in another room of the museum at the same time.

We also noticed a vast interest from architects, who were fascinated not only with our prototype, but also with the possible impact it could have in their daily work. For example, such setup could make it easier and faster to present a rough model of a building to a client in a new and interactive way.

Conclusions

In order to enhance the museum experience, we developed a prototype taking advantages of the more recent technological advances, namely stereoscopic multi-touch displays and inexpensive and non-intrusive head and hands tracking using depth cameras. Our prototype allows a completely new and innovative approach for interacting with content, in the context of an architectural exhibition regarding the cultural heritage left by Leon Alberti.

While in traditional experiences visitors are only allowed to visualize physical models thought poster images or through protective glass, with our prototype they can directly interact with models of buildings. Visitors were allowed to explore five different architectural buildings with strong Alberti influence, but also to customize their own temple following the shape grammars of De re aedificatoria treatise. With this work, we reinforced the idea that it is possible to use virtual reality to improve museum experience for visitors, making it more appealing and interactive.

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Visitors are able edit the size and height of the temple, the number of side chapels and its shapes and the back chapel (Figure 8). It is also possible to modify the front of the temple, allowing the customization of the number of columns, the colonnade and the pediment (Figure 9). Temple columns can also be customized, being possible to change the base, body, shaft and entablature (Figure 10). Along with all the different alternatives for the temple elements, our prototype displays a short descriptive text, containing relevant information about the model or a specific part history.

Both in the aforementioned editing modes and the visualization of the custom model, visitors can use his hands to point at specific model parts. Thanks to our novel setup, which tracks the user hands and fingers in the 3D space above the table, the user can use his forefinger to select each part of the model. The system, after detecting a collision between the finger end and the model, highlights that model part and shows an informative label, containing that part designation.

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