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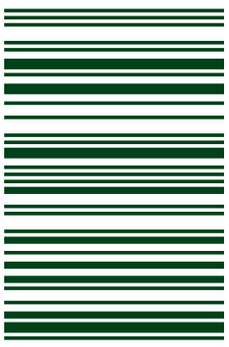

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'HYBRID REALITIES'
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INTRODUCTION
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ESSAYS
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3D SCAN HOUSE: DEVILAT LANUZA ARCHITECTS

Bernadette Devilat
& Felipe Lanuza
1,580 Words

To survey existing sites and structures is the starting point of most architecture projects intended to be rooted in a specific place. Physical dimensions, vegetation, traces of use, and prior constructions are incorporated in drawings as long as they are deemed relevant for the design and depending on the time available. However, what if all physical features and every detail of the site can be surveyed accurately and comprehensively in a short time? What if that information can be retrieved at any time without visiting the site?

In our most recent architectural project, 3D laser scanning provided all this information through a measurable three-dimensional digital model of reality. We then designed upon it and used it as a basis for images, technical drawings, and videos for a house near Santiago de Chile, designed remotely from London using a 3D laser scan record of the site. This provided an opportunity for us to reflect on the impact of this technology in our professional work while exploring its possibilities.

Gathering measurements using a laser beam, 3D laser scanning is, currently, one of the most accurate methods for surveying the built environment, capturing it as a three-dimensional point-cloud with precision of millimetres. This survey tool sets an unprecedented platform for encounter and exploration between the virtual and physical reality as it enables new modes of architectural practice, triggering different design possibilities.

Figure 1. View of the site after digitally removing the previous construction to start the design, rendered from the 3D laser scanning.

THE SURVEY

In 2013, we were commissioned a design for a guest-house in a rural plot in the outskirts of the town of Talagante in Chile. The owners live in Santiago and use Figure 1. View of the site after digitally removing the previous construction to start the design, rendered from the 3D laser scanning. the place as a weekend retreat. The project, which would replace an old, wooden structure used for storage and parking cars, responded to the owners wanting to accommodate friends and family who could visit, while not compromising their own privacy.

Because we were due to fly back to London the day after we were commissioned the project, where we currently live and work, we only had time for a brief meeting with the clients and for a 30-minute site visit, within which we 3D laser-scanned the site. Due to the time constraints, we recorded the measurements, discarding colour information (also possible to be collected with an inbuilt camera in the 3D laser scanner). We took eight scans, each one in less than three minutes of capture time.

The measurable information we drew from the 3D point-cloud allowed us to assess the previous architectural drawings provided by the clients. This process evidenced significant gaps and differences between them and what was built on-site. In addition, the overall representation of the place in those previous drawings proved to be simplistic, diagrammatic, and not up-to-date.

THE DESIGN PROCESS

We made the old wooden structure disappear from the survey model but left its pavings and the barbecue shed (Fig. 1). That manipulated model became our drawing ground. Our design process was done directly on the 3D model as if we were drawing or digitally building on the real site. The proposal was inserted with measurements into the digital point-cloud using Rhino software.

Prior to this commission, we had developed a proposal for the refurbishments of the main house a couple of years before, which meant we had collected some general photographs from our initial site visits. However, those images were a secondary reference for the design process; by using the 3D laser scanning record, we were able to carefully work with existing plants, flower beds, bushes, trees, pavings and a barbecue area at the corner of the site

Figure 2. Aerial view of the design over the 3D laser scanning of the site.
All images courtesy of authors.

In further stages, we 3D printed a model of one of the design iterations, to assess the overall geometry and form of the house as an object itself. This represented another shift between the digital and the tangible, showing how design can evolve productively in the engagement and dialogue between both. Rather than regarding the model as a final product, we used it as a step towards the consolidation of our design.

THE PROJECT

We took advantage of the accuracy and comprehensiveness of the 3D point-cloud as a means for design by inserting the proposal as tightly as possible into the context. The new building was carefully positioned within the site's elements, which determined its geometry and vistas, as well as the relation with the existing main house. This would not have been possible as a remote design without the 3D laser scan data.

The clients asked for storage, service spaces, and a parking area on the ground floor, in addition to an exterior kitchen facing the barbecue area. To a great extent, they wanted to keep the existing functions but reorganizing them in a more explicit way. We proposed independent access to those spaces according to their function. For example, the bedroom for the caretaker of the site was proposed on the east elevation. Its primary access was proposed on the north elevation, following an existing pathway coming from the main house. The barbecue area was kept on the west corner of the site.

On this floor, the house's perimeter provides a shaded space that merges into the context. The outdoor activities and the passages from interior to exterior occur between concrete walls and pillars that alternate with bushes, paved areas bordering the meadow, and ivy plants.

An exterior staircase that cuts into the middle of the house produces the transition between the public— and likely to be more active— area of the ground floor (Fig. 3) and the more private of the first floor (Fig. 4), where two bedrooms, a bathroom, and a small common area revolve around—and look into— a central, open space. The staircase, 6.5 feet wide at the bottom— designed to be used as an informal seating area— gets narrower as it reaches the foliage of the surrounding trees (Fig. 5).

As an exterior, vertical space inserted into the built volume, the staircase becomes an opening to the sky that marks a moment of difference between the two levels of the house. Once reaching the upper floor, terraces and openings to the surrounding vegetation define a relation of contemplation of both the proximity of the trees and the rest of the distant landscape, protecting privacy as required by the clients (Fig. 6).

The first floor's west elevation develops the existing barbecue area together with a vine arbour, reinforcing the spatial containment that was spontaneously produced by the pre-existing elements on the corner of the plot. In turn, the volume covering the car entrance—one of the bedrooms— and the overall geometry of the roofs respond to the formal gesture of the existing main house's roof. Lastly, the proportions and exposed roof structure of the guesthouse's common area resemble the characteristics of the main house, from which we drew experiences of spaces, materials, and the proximity of vegetation.

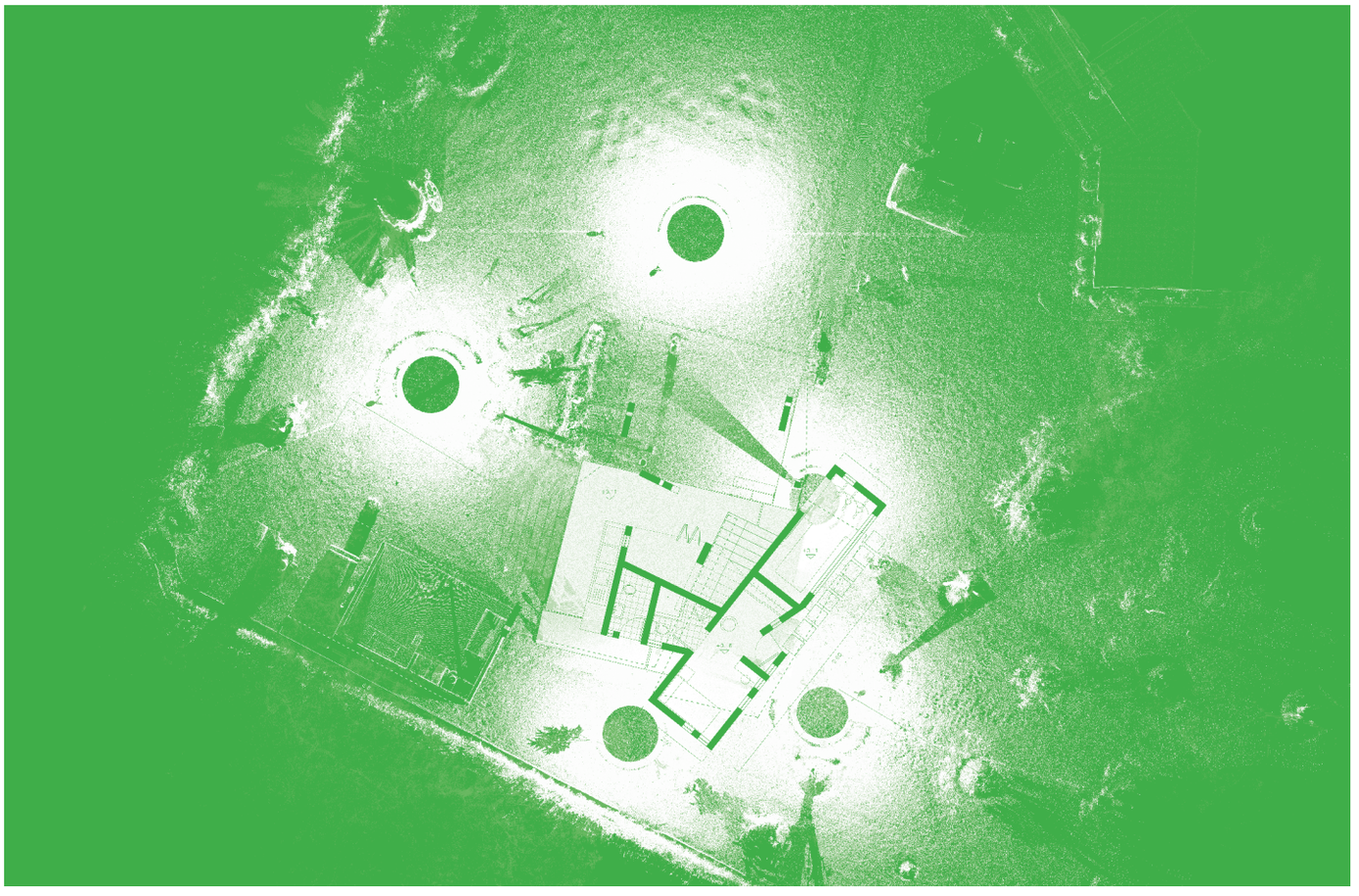

Figure 3. Ground floor plan on top of the 3D scan data.

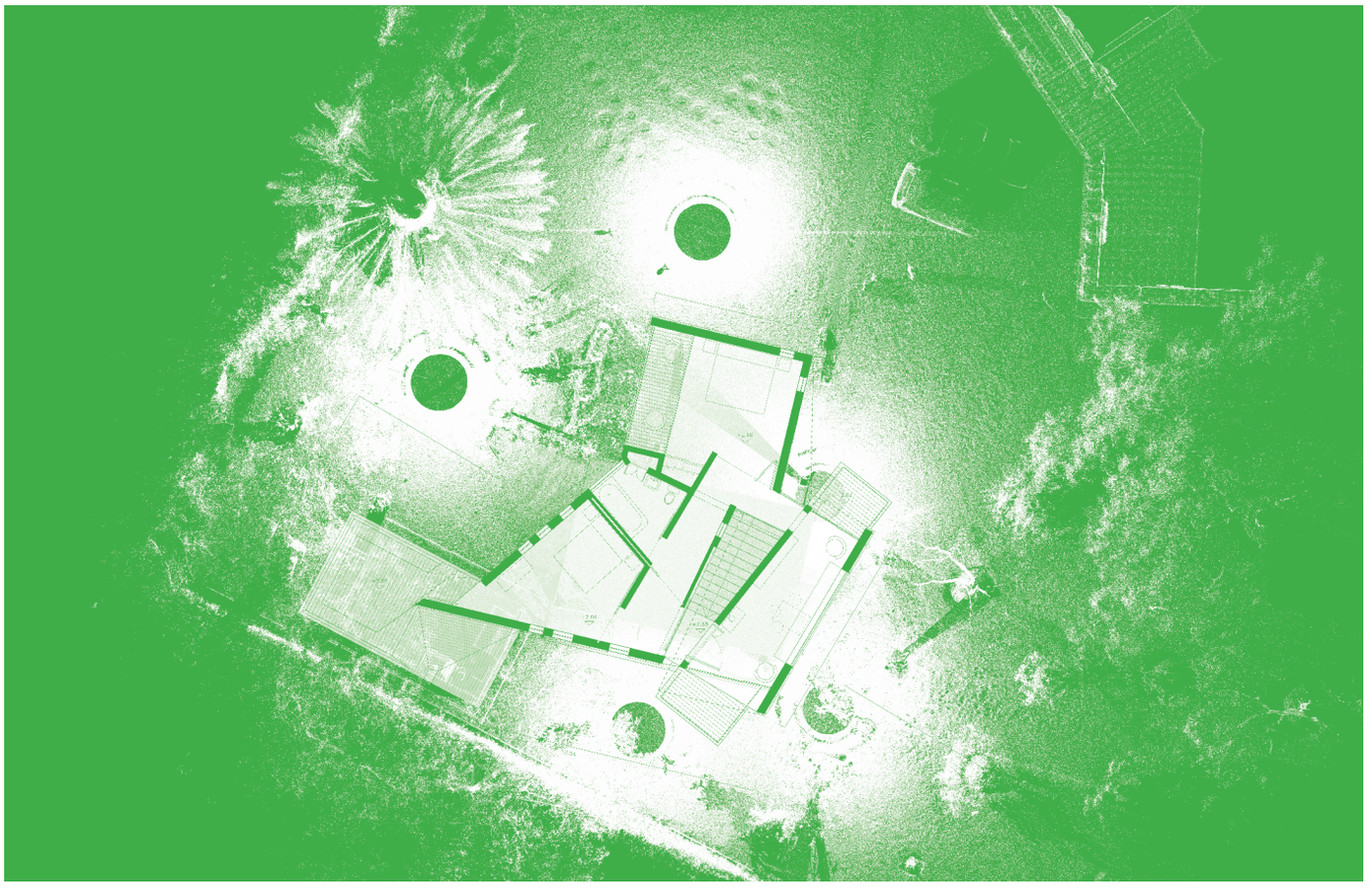

Figure 4. First floor plan on top of the 3D scan data.

Figure 5. Photograph of the open roof at the top of the staircase in October 2017. Photograph by Andrés Vargas.

Figure 6. Photo of the built house in December 2017 taken by Bernadette Devilat.

FURTHER CONSIDERATIONS

The guesthouse was finished after a protracted process of construction that we monitored from London, with the support of professional supervision on-site. We only visited the construction twice: the first time, at the very beginning, when its footprint was traced on the site; and the second, halfway through the process, with the walls of the first floor almost completed. These visits coincided with our family visits to Chile.

While a 3D laser scan survey allows for a remote design process done with precision, the translation of such work into a building requires a close follow-up and on-site conversation involving contractors and clients.[1] Like many other construction processes, the house was not built as accurately as the initial design, producing gaps and deviations, which added to other minor changes done to the project during the construction phase. Nonetheless, this project has opened up new ideas for us regarding the role of 3D laser scanning for architectural design, which can be tailored and carefully adjusted to the context even when done remotely. It gives us the chance to reflect back and forth between the design and the experience of built architecture, and the possibilities and limits of this method.

1 This would have prevented the construction of a big shed that covered the barbecue area and the implied removal of the vine plant, among other issues and details.

ACKNOWLEDGEMENTS

This house was built thanks to the on-site supervision and help of Fernanda Vargas. Also thanks to the clients Isabel Riquelme and César Oyarzo for their patience and support.

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NOTES

Figures 3 and 4, shown here, were displayed as part of an exhibition at the *Drawing Millions of Plans* Conference, held at the KADK in Copenhagen, November 2017. Some passages of the text correspond to a paper delivered in the context of that conference. The photographs presented here show the last stages of the process of construction in October and December 2017.

A video exploring the design inserted on the 3D laser scan point-cloud site is available on: www.devilat-lanuza.com.

Fig 1 View of the site after digitally removing the previous construction to start the design, rendered from the 3D laser scanning.
Fig 2 Aerial view of the design over the 3D laser scanning of the site.
Fig 3 Ground floor plan on top of the 3D scan data.
Fig 4 First floor plan on top of the 3D scan data.
Fig 5 Photograph of the open roof at the top of the staicase in October 2017. Author: Andrés Vargas
Fig 6 Photograph of the built house in December 2017. Author: Bernadette Devilat.

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Joseph Altshuler is co-founder of Could Be Architecture, a Chicago-based design practice, and the founding editor of *SOILED*, a periodical of architectural story-telling positioned between a literary journal and design magazine. He teaches architecture at the School of the Art Institute of Chicago and the Illinois Institute of Technology. Joseph recently curated The Unsolicited Sideshow at the Chicago Architecture Biennial. Journals publishing his writing include *Log, MAS Context, CLOG, Pidgin*, and *PLAT*. His winning entry to the international Fairy Tales competition is published in the book *Fairy Tales: When Architecture Tells a Story*. Altshuler holds a Master in Architecture from Rice University.

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Laura Bravo holds a PhD in Art History from the Autonónoma University of Madrid, and she is Professor at the History of Art Program at the UPR University of Puerto Rico Río Piedras Campus. She has been a researcher in different institutions such as the Tate Modern, MoMa (New York), and the Maison Éuropeenne de la Photographie. Bravo is author of *Ficciones certificadas: Invención y apariencia en la creación fotográfica*, co-author in several books on art history and visual culture, and founder of the art journal *Visión Doble* (2013). She is a researcher and curator of art, and one of her most recent projects is *Ida y Vuelta: Experiences of Migration in Contemporary Puerto Rican Art*, recently exhibitited at the Museum of History, Anthropology, and Art at the UPR Río Piedras.

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Bernadette Devilat is a practicing architect with a Master in Architecture from the Catholic University of Chile (PUC). She is co-founder of London-based practice Devilat + Lanuza Architects and has researched and worked in the re-construction of Chilean heritage areas since she co-founded Tarapacá Project after the 2005 earthquake. Currently, she leads BScan for the support of research and teaching of 3D laser scanning at The Bartlett School of Architecture, UCL, where she also obtained her PhD in Architectural Design. There she explored the role of the latest recording technologies in the context of built heritage affected by earthquakes. Bernadette´s work has been awarded, presented and exhibited internationally.

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Mrinal S. Rammohan is a writer with a keen interest in architectural history and theory. He completed his Master in Architectural History from The Bartlett School of Architecture (UCL), and is now working as Written Communications Manager at Foster + Partners in London. His previous research has been exhibited at prestigious venues including the Royal Institute of British Architects (RIBA) and the Venice Biennale 2014. He is also one of the founding editors of *LOBBY* magazine. A sharp storyteller, his current research interests include exploring the boundaries of satire and using fiction as a tool for critical thinking.


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