WANDERING ARCHITECTURE THROUGH THE LOOKING GLASS OF DIGITAL REPRESENTATION

AN EXPEDITIOUS TEACHING EXPERIENCE IN UNDERSTANDING AND MODELLING MODERN ARCHITECTURE

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LE CORBUSIER
COROMANDEL ESTATE
CURUTCHET HOUSE
JOOSTE HOUSE
RENDERING

The present work focuses on an expeditious teaching experience of Architecture and 3D modelling aimed at the 'Architectural Drawing II' and 'Computer Graphics'students of the Building Engineering-Architecture Degree Programme of the University of Salerno, Italy.

The students, involved in the 'Italy-South Africa Joint Research Programme, ISARP 2018-2020 – A Social e spatial investigation at the Moxomatsi village, Mpumalanga' (SSIMM), were supported in the digital reconstruction of three iconic examples of modern architecture located in South America and South Africa, i.e., the *Curutchet House* (La Plata, Argentina), the *Coromandel Estate Manor House* (Mpumalanga, South Africa) and the *Jooste House* (Pretoria, South Africa).

Through an Alice-in-wonderland-type of voyage, they had the chance to first analyse the complex inner space of these architectural assets that both emerge from and fade into the landscape and then propose their own interpretation through rendered and post-processed imagery.

INTRODUCTION

Nowadays, much like the prisoners of the cave of the well-known Plato's allegory[1], we are every day more convinced that the digital reproduction of the phenomenal world can become itself the reality. If not, at the very least, it can flawlessly mirror it. Consequently, it is not to forget that the whole experience of the world is just not equal to the objective reality, may this even exist, but a version of it mediated by our observation, thus a discretisation of it, no matter how faithful it may come to be, should never propose as the absolute truth. Borrowing Werner Heisenberg's words "We have to remember that what we observe is not nature in itself but nature exposed to our method of questioning"[2] (Heisenberg, 1958, p. 38). Especially newer generations, such as the digital natives, are exposed to digital content without having the proper tools to discern truth from well-packed lies. Thus, the role of educators is to provide them with the tools to understand and thoroughly analyse the physical world before adding their layer of imagination. Narrowing down the issue to Architecture, the best way to understand it is by being able to read the flux and the balance of the space it creates (Docci et al., 2019). And what better way to understand a place than wandering around?

In the past, architects travelled around Europe with a sketchbook in hand, documenting ancient ruins, details, objects, and the people that inhabited them to find inspiration. Le Corbusier was one of these innovative architects that understood the value of history and tradition in order to become a better designer, founding a connection between history and contemporary architecture. Indeed, many architects still use the act of drawing –via schematisation and geometrical representations– as an exercise to understand an architectural asset or, rather, an urban space to break it down into its elemental components, i.e., its lemmas (Docci et al., 2019; Ferraris et al., 2014).

Here the concepts of 'drawing' and 'design' starting as synonyms, become antonyms; while the former present itself

as a means to analyse architecture, the latter represents the act of creating it (Barba et al., 2012), as Norman Foster stated in 2007 (Santo, 2005), "architects design for the present, with an awareness of the past, for a future which is essentially unknown"[3]. It is then mandatory to reconcile this dichotomy by leading the students through a process of awareness by rediscovering the past in order to build a solid foundation for their future work life. Unfortunately, not all students have the opportunity to walk the buildings they study in books, therefore, new pedagogical strategies need to be thought of in order to achieve this ideal learning experience.

Particularly during the last couple of years, having physical access to cultural heritage was not always an option; thus, both innovative methods of digital surveying (Barba et al., 2022; Palestini & Basso, 2021) from a distance and experimental reconstruction techniques (Apollonio et al., 2017; Picchio & Galasso, 2022) have been tested, which have led to the engagement of academic communities and research institutions in the creation of knowledge. Moreover, it fostered a democratisation process that hopefully will reconcile the scientific community and the vast majority of end-users, through digital storytelling (Lo Turco et al., 2021).

Within this general framework, then spurred the idea of involving both second-year (*Architectural Drawing II*) and third-year (*Computer Graphics*) students of the Building Engineering-Architecture Degree Programme at the University of Salerno (UNISA), into an immersive *Alice-in-the-Wonderland-type of approach* (Ibañez, 2011) to reconstructing an architecture from scratch while also learning how to use different pieces of software for 3D modelling (Garagnani & Cattoli, 2015). Seeking to simplify their work, the students realised that, albeit time-consuming at first, the most effective way of approaching the task was to break the asset down into elementary units, the so-called architectural generators, thoroughly studying their typological nature and the constructive relationship between them, and then synthesising them into a *not-so-empty b-rep* (boundary

representation) volume (Brusaporci et al., 2021; Calvano et al., 2020). Although the students mainly worked with Trimble *SketchUp* they were faced with collaborative work and object-oriented modelling by defining components and piecing them together by performing simple Boolean operations. They aimed to develop a model based on shared knowledge for the subsequent post-processing phase.

MATERIALS AND METHODS

As Marcel Proust said, "the real voyage of discovery consists not in seeking new landscapes, but having new eyes" (Proust, 2002, p. 236). Therefore, second and third-year students of the 2020-21 and 2021-22 academic years—involved in the *Italy-South Africa Joint Research Programme, ISARP 2018-2020 – A Social e spatial investigation at the Moxomatsi village, Mpumalanga* (SSIMM) (Ferreyra et al., 2020)– virtually explored some iconic examples of modern architecture located in Argentina and South Africa and all having Le Corbusier as underlining connection: the *Curutchet house* (La Plata, Argentine) (Almeida Curth, 2003; Broadbent, 2014; Conenna, 2014; Massini & Rodriguez, 2012), the *Coromandel Estate Manor House* (Mpumalanga, South Africa) (Peres, 2013) and the *Jooste House* (Pretoria, South Africa) ("House Jooste Waterkloof Ridge, Pretoria, Gauteng," n.d.; "Karl Jooste: House Jooste, 1965D-1967," n.d.; Swart & Proust, 2019).

In joint collaboration with the team from the *Laboratorio Modelli* of UNISA, professors from the Tshwane University of Technology (TUT), South Africa and the Universidad Nacional de Córdoba (UNC), Argentina, we worked together to study and understand how European architects influenced the design process of South African and Latin American architects. After a brief theoretical introduction, the first steps into the analysis of the proposed artworks were taken together by directly jumping into the rabbit hole (Carroll, 1993b). In a collaborative way, we faced the realistic three-

dimensional reconstruction from the available material, which was mainly composed of 2D drawings, photographs and the personal experience of the places by the teachers involved. Indeed, we tried to convey our first-hand knowledge by helping the students to analyse the shapes (geometry, size, spatial position), then the appearance (surface features), and, finally, defining the constitutive elements (physical form, stratification of building/manufacturing systems) (Apollonio et al., 2017). Once they had mastered the tools and understood the built heritage, we invited them to cross the 'looking glass' (Carroll, 1993a) and feel free to experiment with objects, textures, and graphic effects employing real-time rendering plug-in (*Chaos Enscape* for *SketchUp*) and 2D and 3D post-production tools, with the sole clue of finding the best way to communicate the modelled architecture (Parrinello, 2021; Parrinello et al., 2017).

RESULTS

For the 2020-2021 academic year, the *Coromandel Estate House* was chosen as part of a shared experience between the involved universities. During the sanitary emergency that took place, distance learning as well as the impossibility of physically visiting the buildings became the perfect opportunity to work as a team in a project for a new teaching experience within the *Computer Graphics* of the Building Engineering-Architecture Degree programme. After studying the work of Marco Zanuso, and the concepts of Critical Regionalism (Peres, 2013), a cooperative model in *SketchUp* was built, that was followed by a rendering phase developed by each student with the *Enscape* plug-in (Barba et al., 2022; Sanseverino et al., 2021) (Figure 1).

After the successful experience of 2020, for the academic year 2021-2022, we decided to involve both *Computer Graphics* and *Architectural Drawing II*'s students. This time the courses took place in presence during professor Victoria Ferraris


PIANTA TERRA SCALA 1:150
PIANTA PRIMA SCALA 1:
PIANTA SECONDA SCALA 1:150
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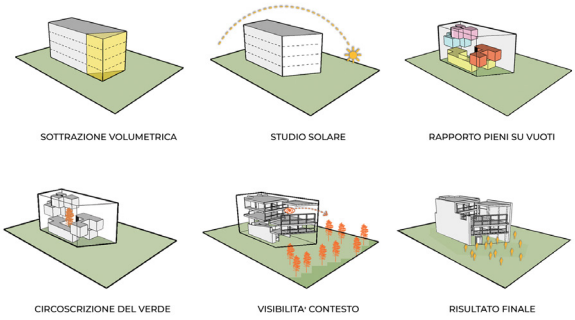


Fig. 1 Sanseverino, Ferraris, and Ferreyra, *Rendered images of the Coromandel Estate produced by 2020-21 Computer graphics students*, 2021.

Fig. 2 Sanseverino, Ferraris, and Ferreyra, *Plan views and elevation of a realistic representation of the Curutchet House produced by 2021-22 Architectural Drawing II student Francisco Zubiaurre*, 2022.

Fig. 3 Sanseverino, Ferraris, and Ferreyra, *Analysis of the design process of the Curutchet House produced by 2021-22 Architectural Drawing II student Nella Pagano*, 2022.

of the Universidad Nacional de Córdoba visit at UNISA. In this opportunity, as a continuation of our projects on both South African and South American architecture and in order to relate it with other parts of the world we introduced different case studies, with a focus on Critical Regionalism. As part of this new exercise, Arch. Marinda Bolt gave a seminar in which she briefly summarised the 5 points of new architecture design by Le Corbusier in 1928 and further explained the way they influenced architecture around the world (Azpiazu, 2003).

During the first part of the course, the concepts of modernism and the theory behind the design process of the new age of architecture were introduced and served as starting point for the students to understand the construction mechanism of the proposed case studies before giving them

Fig. 4 Sanseverino, Ferraris, and Ferreyra, *Re-imagining the Curutchet House with 2021-22 Architectural Drawing II student Palmira Montella*, 2021.

Fig. 5 Sanseverino, Ferraris, and Ferreyra, *Storytelling of the Jooste House by 2021-22 Computer Graphics students Iolanda Sepe, Giuseppe Ruggiero, and Salvatore Giugliano*, 2021.

Fig. 6 Sanseverino, Ferraris, and Ferreyra, *Storytelling of the Jooste House by 2021-22 Computer Graphics students Antonella D'Ambrosio, Ilaria Di Nucci, and Emanuela Santoro*, 2021.

Fig. 7 Sanseverino, Ferraris, and Ferreyra, *Storytelling of the Jooste House by 2021-22 Computer Graphics students Mariafrancesca D'Andria, Del Valentino Vecchio, and Rosa Maria Pierri*, 2021.

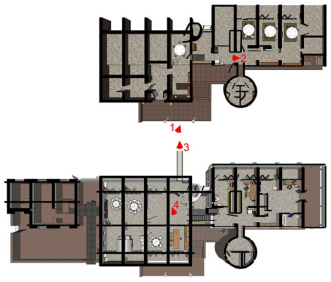
a digital life. In particular, second-year students verified their ideas upon the *Casa Curuchet*, designed by Le Corbusier in La Plata, Argentina (Figures 2, 3, 4). At the same time, third-year students worked with the South African *Jooste House* (Figures 5, 6, 7). Students managed not only to learn how to model a house from scratch but also to understand the theory behind

AFRICA - SOUTH AFRICA - PRETORIA - JOOSTE HOUSE

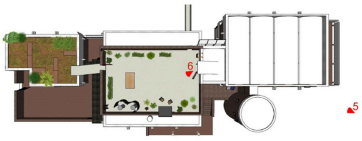
La Jooste House, che è stato uno degli ultimi progetti di Karl Jooste, è un eccellente esempio di architettura modernista ed è ampiamente considerata uno dei progetti più innovativi di Pretoria. Essa nasce dal design meticoloso ed è influenzata dal lavoro di Le Corbusier ma, subisce una forte influenza di stile africano e fa ampio uso di materiali e artigianato locali. Camminando per la casa, si è incuriositi dagli archi creati da intricati lavori in mattoni e dall'uso di cemento, vetro e pietra per creare un'estetica attraente e sorprendente.

Karl Jooste

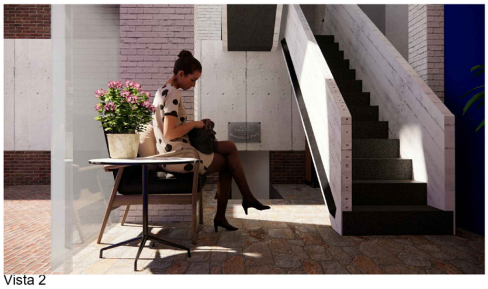
Jooste House, Pretoria (Africa) | 1965/1967



La casa Jooste è situata nella parte alberata della città di Pretoria, in Sud Africa. Con questa struttura Jooste vuole allontanarsi dall'interpretazione purista del movimento moderno, preferendo un design profondamente radicato al contesto nel quale la casa sorge. Inoltre, l'architetto si ispira anche alla figura di Le Corbusier per la realizzazione dell'edificio. L'abitazione è rimasta per molti anni nelle mani della famiglia Jooste, ma ad oggi ospita uno studio di architettura al primo livello, appartenente ad uno dei figli del progettista, mentre un ristorante – La Brasserie de Paris - occupa il resto dell'edificio.



Vista 1



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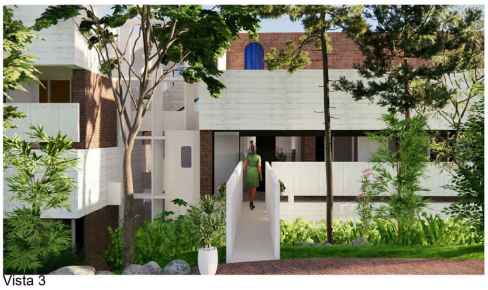
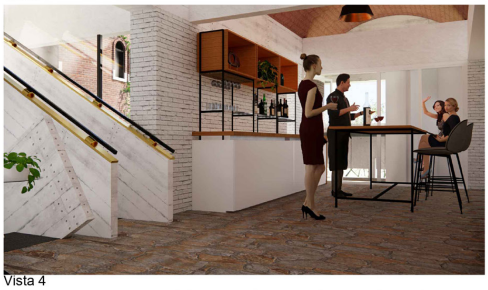
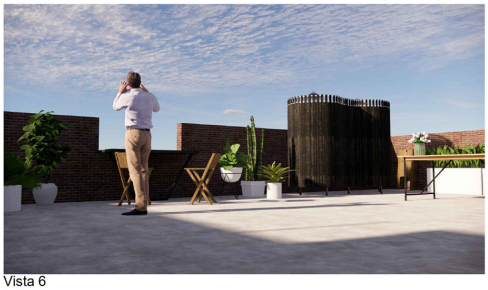


Vista 3



Vista 4

Vista 5



Vista 6

UNIVERSITÀ DEGLI STUDI DI SALERNO

DIPARTIMENTO DI INGEGNERIA CIVILE
CORSO DI LAUREA IN INGEGNERIA
EDILE-ARCHITETTURA

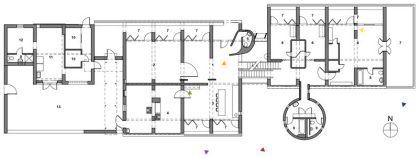
Corso di Informatica Grafica
A.A. 2021 / 2022
Docente: Ferraris Victoria
Tutor: Ing. Anna Sanseverino
Ing. Caterina Gabriella Guida

Modellazione in ambiente SketchUP

Tavola 1

Gruppo 4:
D'Ambrosio Antonella - 0660100837
Di Nucci Ilaria - 0660100826
Santoro Emanuela - 0660100833

JOOSTE HOUSE



Proggettista: Karl Jooste

Tipologia: Edificio residenziale, poi pubblico esercizio 'Brasserie De Paris'

Luogo: 381 Aries Street, Waterkloof Ridge, Pretoria, 0181, Sudafrica

Progetto e realizzazione: 1965 - 1967

La casa è uno degli ultimi progetti elaborati e realizzati da Karl Jooste. Ha progettato la casa nel 1965 e ha completato il progetto nel 1967. Lui e sua moglie vissero nella casa fino alla sua morte.
Il design della casa imita il lavoro di Le Corbusier nel contesto regionale africano. Possiamo notare l'uso di grandi sporgenze per creare ombre profonde per moderare il sole africano; l'uso di materiali locali; proporzioni modulari; il predominio della griglia in muratura.
Infine gli archi curvi in mattoni creano un'esperienza spaziale e architettonica unica.

Università degli Studi di Salerno
Dipartimento di Ingegneria Civile
Corso di Laurea in Ingegneria Edile-Architettura

Corso di Informatica Grafica
A.A 2021/2022

Docente: Dott. Ing. Davide Barbato
Victoria Ferraris
Tutor: Ing. Anna Sanseverino
Ing. Caterina Gabriella Guida

Gruppo n° 6
Mariafrancesca D'Andria 0660100828
Valentino Del Vecchio 0660100834
Marta Rosa Pierri 0660100844

Fig. 8 Sanseverino, Ferraris, and Ferreyra, *Perspective sections of the Curutchet House and the Jooste House, respectively produced by second-year student Palmira Montella and third-year student Piersabato Bruno, explaining the complexity of interior space*, 2022.

its design, the relationship with the urban context, and the construction methods. In the second part of the course, once the students had gained the know-how to model in *SketchUp* and managed to use all the tools, they once again had to work in groups to build a cooperative model, texturise it and reimage the Houses. In the final renders produced by the students, we were able to verify not only the skills acquired in terms of a model building but also their ability to work in teams, share knowledge and understand the importance of the cultural context in architecture (Parrinello et al., 2016). The renders show the impact of orientation in the design process, the responses to climate, culture, and local construction methods, as well as the influence of European architects all over the world (Parrinello, 2015).

DISCUSSIONS

The houses posed unexpected challenges for the modellers working with two-dimensional drawings; in fact, although seeming diametrically opposite, both case studies proposed have remarkable similarities based on the complexity of inner space and the adaptations required to fit within the environment (Figure 8).

While the original design of the *Curutchet House* belongs to Le Corbusier, it was the Argentinian architect Amancio Williams who translated it into the local lemmas (Carbonari et al., 2022) to suit the client's desires. He performed so many changes that, among the many of the reported blueprints of the house, none corresponds one hundred per cent to the actual configuration. On the other hand, upon building his own house, the Architect Karl Jooste never really had the necessity to publish the original design, and the only one available correspond to later modifications. This South African architect, friends with Le Corbusier took the principals and ideas of *Villa Sarabhai* and applied them in his own house in Pretoria, South Africa. His house, the way materials were used, and how he adapted the design to the site, context and weather is a clear example of Critical Regionalism and the influence of European architects in other latitudes.

To quote what Winston Churchill said in 1943 (Volchenkov, 2018): "We shape our buildings: thereafter they shape us"[4]. Both houses are built for the man and his necessities (the Modulor), then both revolve around an internal staircase that shapes the space and the structure itself. In fact, they seem to be the results of a sincere dialogue between the opposite: Mathematics and Perception, Reason (the objective) and Psychological Experience (the subjective), Geometry and Plastic Irregularity, Restriction and Freedom, Unity (assemblage) and Breakage (dematerialisation and detachment), Fullness and Emptiness, Opaque and Transparent, Luminosity and Shadows, Open and Closed, Structural Order and Visual Variety, Orthogonality and

Obliquity, Dynamism and Staticity, Real and Virtual, Expressive and Phenomenal (Conenna, 2014). On a deeper level, the very discovery of these examples of architecture represented for the students a voyage across the wonderland, experimenting with odd shapes, unconventional proportions, and even unusual textures.

CONCLUSIONS

The possibilities offered by digital practice, from virtual reconstruction to the three-dimensional environments and the interaction with digitised heritage, constitute new frontiers for digital design (Parrinello & Dell'Amico, 2019). It is crucial to study digital narrative methods to involve the end users and thus bridge the gap between academia and the community, also in light of the current challenges posed by the European and international goals of inclusiveness and educational quality. Among the priorities of the *Digital Agenda for Europe*, the digitisation of public information and cultural assets highlights the urgency of designing innovative solutions also for remote use and education (NEMO Report, 2021) (Parrinello et al., 2022).

In *Vers une architecture* Le Corbusier said.

> But all of a sudden, you touch my heart, you make me feel good, I am happy, I say: this is beautiful. This is the architecture. The art is here. [my translation from French[5]] (Le Corbusier, 1925, p. 123)

As architects and engineers, we have the chance to constantly create new scenarios, imagine new futures and develop images to represent them, using digital drawing tools. It is, therefore, our responsibility to build this awareness in the next generations and the presented experience showed us how (Luigini & Panciroli, 2018). Upon understanding the past, the students produced new imagery, recreating the sketches that Le Corbusier once did during his travels using novel methods of representations

and finding a new way to visit and experience buildings and different cultures.

This experience was part of a series of workshops and exchanges between the universities and opened once again new possibilities for research and teamwork. The interaction between lectures and students and the cultural exchange became the foundation for the construction of shared knowledge and further strengthened the collaboration and understanding between the different countries that were involved in this experience.

ACKNOWLEDGEMENTS

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NOTES

1 An Athenian philosopher living in ancient Greece, Plato is famous in part for penning the Socratic dialogue The Allegory of the Cave, one of the most significant pieces of work in literary history (Gill, 2021).
2 The quote arose in a series of lectures delivered at University of St. Andrews, Scotland in the 1955-1956 academic year and published in *Physics and Philosophy: The Revolution in Modern Science* (Heisenberg, 1958).
3 In this TED Talk originally delivered at the DLD 2007 Conference, Norman Foster delves into the topic of green architecture and how his own work has

utilized computer modelling to create green and essentially 'pollution-free' buildings (Santos, 2015).

4 Excerpt of Sir Winston Churchill's speech held at the meeting in the House of Lords, October 28, 1943, requesting that the *House of Commons* bombed out in May 1941 be rebuilt exactly as before (Volchenkov, 2018).

5 The original text of the quotation is as follows: "Mais tout á coup, vous me preñez au coeur, vous me faites du bien, je suis heureux, je dis: c'est beau. Voilà l'architecture. L'art est ici" (Le Corbusier, 1925, p. 123).

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