Digital Process: environment analysis of intermediary spaces in the context of Brazilian modern dwelling.

ABSTRACT HEADING

Europe of the beginning of the 20th Century: the desire to break away from the past and transform domestic spaces following the modern movement was clear. But there was a part of this production which sought to project the dwelling space based on traditional ideas. There are attributes of vernacular architecture, will be considered in the production of this time.

In this context we gave the focus of the study, looking at the veranda within the domestic environment of modern architecture in Brazil.

The veranda, as an intermediary space, was present in distinct eras of Brazilian housing, and together with this transformed itself of form, use and meaning.

The proposal of this investigation is to study the veranda as an architectural element, intermediary space and domestic living area, with the intention of identifying the distinct interpretations, from the formal and the principal elements from an environmental point of view. The analyses also look in which the domestic environment was incorporated into modern architectural production.

The second part of this investigation deals with the object of the study: the veranda as an intermediary space. This is undertaken by the presentation and analysis of case studies selected to represent the distinct compositional resolutions of the intermediary space in the modernism period (1930-1965). This study cases were also redraw, using digital tools which simulate incident solar radiation, thermal and lighting analysis. This helped to identify the solutions related to the comfort thermal and luminous of internal areas and observe the veranda as a step between interior and exterior, always considering different environments in this context.

INTRODUCTION

The Europe of the early twentieth century presented a panorama of major changes in different areas of life and knowledge, especially when it came to scientific and technological advances that eventually influenced, by new theories and concepts, the artistic production.
Among other issues, modernity sought to change the way of think and project dwelling space, which in this research will be discussed from the point of view of the intermediary space of the veranda. At the same time, Brazil was looking to find their own ways in the artistic and architectural production.

Although it was clear the desire to break with the past and transform the domestic space guided by the ideals of the modern movement, there was a part of this production that wanted to design and build the living space based in tradition. There are a number of attributes of vernacular architecture, which will be taken into account in the architecture of this time.

**BASIC TYPES AND VARIATIONS**

Separate by typologies the intermediary space conformed by the veranda was appropriate from the beginning, when reduce to one type the complexities of an arquitectonic object it is not perceived yet.

That is why the expression compositional resolution appears as a synonym for explaining these works, considering not only the intermediary space but other transition spaces from the home environment.

For this research, it was necessary to establish a selection criterion that could better represent each study case. Examples are sought in the major mass media of the time, looking at the theoretical and practical production of architects considering its importance for Brazilian architecture in this context. With this, it was proposed to look at these selected houses, from the point of view of the intermediary spaces.

Nine modern houses made between 1930-1965 are chosen to represent each compositional resolution.

After an initial reading and considering the before mentioned methodology, five basic formal design structures for the veranda in the contexto are established:

1. Veranda by Horizontal Plane extension
2. Veranda by Horizontal / Vertical Plane extension
3. Veranda by Subtraction
4. Veranda by Addition
5. Veranda by Pilotis

Identify and synthesize into five basic types allow us to separate case studies by groups of similar formal structures (with its variations).

With this, an understanding of the works is done, not only analyzing its formal qualities, but also the relations between the interior and the exterior, the permeability between these two environments and consequently the privacy levels.

Classify the works by typologies also help to identify when the veranda is designed with reference to tradition and (or) when is innovation.

At first, a look at the vast repertoire of modernity is done to find examples that accurately approach to the compositional resolution in its most essential form (or that could be "conceptually reduce" to one type). From this idea, the Mendes House by architect Oscar Niemeyer and Spartacus Vial by David Libeskind were selected to represent the way to design the veranda in their respective type.

On this same reflection, Osmar Gonçalves House by Oswaldo C. Gonçalves is chosen because of its formal simplicity and clarity to identify separately the volume of the main house ant the intermediary space.

Guilherme Brandi House was a little different, because there were other houses that might better represent the idea of typology by extension of the horizontal and vertical plane. But although the house has a simple volume, some items such as the facade composition, awakened some curiosity to study.

Another reason for study this Sergio Bernardes house would be the variety of how this architect works the intermediary space in the domestic architecture.

It was slightly different the decision to choose Beira Mar residence. Being the typology that is closer to the traditional architecture (and this has never ceased to be part of the modern repertoire),
traces of modernity in both function and formal composition were sought to find in the examples. This work of Oswaldo Bratke was the most appropriate to represent the compositional resolution of the veranda, from a floping extension of the roof.

Trying to approximate (reduce) to one type, I realized that there were other reasons that led us to study these spaces, and is for that, that other reasons were considered appropriate for the selection.

To represent the compositional resolution identified as horizontal plane extension, an easy reading was pretended. But looking at some Oscar Niemeyer works (both Canoas house and Dalva Simão house and another house build much later in France following the same concept), a different way to conform the intermediary space from the prolongation of the curved roof is perceived: the curve that characterizes the Brazilian architecture should be contemplated here.

Other reasons that led me to define the election were the different purposes of the veranda in the same house, like in Saavedra House, besides being clearly appropriate to represent the space generated through the inverted roof.

Magalhães Gouveia House would be the example more difficult to fit in a typology, but because of being an unusual roof design for the time (and that it is a proper addition) was choosed to do the analysis under this point of view.

Finally, we have the well known Carmen Portinho house by Reidy, for the way the architect incorpores (later) the veranda in the space liberated by the pilotis (without having the original function of pilotis).

Using Ecotect software, we intend to analyze the works considered as representative of the different typologies for the varanda, pretending to find some answers related to both thermal and lighting, from the viewpoint of the presence of the intermediary space.

The analysis will be divided into five main points:

a) Shadow analysis

In this analysis we will proceed to simulate the cast shadow by the intermediary space in itself and
the adjacent room. With this analysis, it is intended to reach some conclusions as to verify if the situation of the veranda is determined by the solar orientation or because of terrain conditions.

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**Figure 1. Saavedra house veranda shadow analysis**

This house has 3 verandas (1-SO 2-SE, 3-NO). Each receives direct sunlight at different horaries due to its orientation, so each one can be enjoyed at its moment.

Dalva Simão house – The north facade is the only one that is connected to the exterior through big openings and it only receives direct sunlight during the winter, while in summer the roof extension that conform the veranda protects the interior from the direct sun.

Guilherme Brandi house - Receive the solar incidence relatively constant throughout the whole year, during the afternoon.

Mendes house - Receive morning sun, and is during the summer the highest exposure.

Osmar Gonçalves house – Incidence during the afternoon but the presence of the protection makes the veranda suitable to use.

Carmen Portinho House- The internal veranda receives the sun in the afternoon, and is in winter when the exposure is lower, while the external veranda (pilotis), that has the same orientation, receives direct sunlight in the early hours of the day too.

**b) Solar radiation analysis**

It will proceed to calculate the solar radiation in the intermediary space and the contiguous room, in the four year seasons between 7:00 and 18:00, expressed as average daily values. With these results we try to see the influence of the varanda on the adjacent rooms and its solar radiation.
We can observe that all of the houses receive more solar radiation during the spring and summer, except Dalva Simão house, that is because its orientation and roof design that makes autumn and winter when the higher levels of solar radiation (as we can see in the figure above).

c) Daylighting analysis

For the calculation of daylighting factors the Ecotect uses a geometric version of the Split Flux Method (BRE) and Design Sky values that are derived from a statistical analysis of outdoor illuminance levels. They offer a worst-case scenario that you can design to and be sure your building will meet the desired light levels at least 85% of the time.

This simulation will be made at 0,75m from the ground level, to see if the adjacent room to the veranda achieves the lighting levels established by the brazilian standard NB-57.
All of the residences achieve good levels of daylighting, making them suitable even for reading, except Osmar Gonçalves house, and Mendes house, because of the protection.

**d) Sun incidence on facade analysis**

With this analysis we try to see when the façade under the veranda receive the direct sun.

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<th>House</th>
<th>Stereographic Diagram</th>
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<td>Dalva Simão House</td>
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<td>Saavedra House V1</td>
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<td>Saavedra House V2</td>
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<td>Carmen Portinho House</td>
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**Figure 5.** Stereographic diagrams on facade

**e) Sun protection on facades analysis**

For this analysis, we propose to analyze the residences that have some kind of enclosure in the veranda to protect from the solar incidence. The simulation is done with the enclosure and without, so to compare the two situations, and verify the most efficient for each context.
Figure 6. Solar radiations on facade

Considering the Brazilian weather and the orientation of these spaces, we can see that the election of the architects about putting a protection is a good solution, achieving a solar radiation reduction between 60%-70%.

CONCLUSIONS

Being a quite extensive study, we can confirm that in the architectonic production of the modern Brasil there was a search for a design diversity of the intermediary space, as so the variety in functions. The design of this space was also to work with a second skin for the building, and in this way adapt the international language to the climatic context.

REFERENCES

SERRA F., Rafael; Arquitectura y climas. Barcelona: GG. 2002.