Evaluation of the OSLD System

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> "Architectural methods, on occasions, resemble scientific methods; in architecture you can adopt a research process similar to those used by science. Research in architecture can become more and more methodical, but its essence will never become exclusively analytical. In architectural research you will have more instinct and art." [Alvar Aalto]

Introduction

Venezuela, as most of Latin-American countries, tries to develop proposals for low-cost housing, adaptable to geographic and climatological diversity, as well as to the different requirements and characteristics of its inhabitants. One of the factors that influence most in obtaining low-cost units is building in large scale, it is therefore important that any proposal for a particular system should go through exhaustive studies and research. For this reason, it is convenient to test proposals in order to obtain prototypes with best performances. For these tests, full-scale modeling has simulation potentials comparable only with those of actual building, becoming a more powerful instrument to visualize spaces than drawings or even computer graphics.

Object of Research

In a *National Competition* of low-income housing, carried by INAVI (National Institute for Housing) in 1993, our office [Otero, Sanabria, Luchsinger, Denjoy Associate Architects] won the first price competing with 30 other participants. The solution offers the users the possibility of satisfying their basic family requirements and allows the expansion of the unit when the family composition grows. The system proposed is based on a unit of 36 m2 in two floors which can be expanded to 72 m2 as part of a multiple dwelling building. The unit is contained in a cube whose side is 6 m, defined by an structural module of 3 m. Initially the house uses 75% of the ground floor and 25% of the upper floor. The unoccupied areas function as terraces or double heights that can be incorporated as internal spaces when needed. Expansions are carried using light structural slabs and wall panels. This basic unit can be joined with other units in many different positions to solve multifamily buildings of different sizes and shapes, depending on the availability of lots. One can build detached houses, town -houses, multiple story buildings, either in flat surfaces or in slopes, according to the topography or you can also build an homogeneous organization of units one on

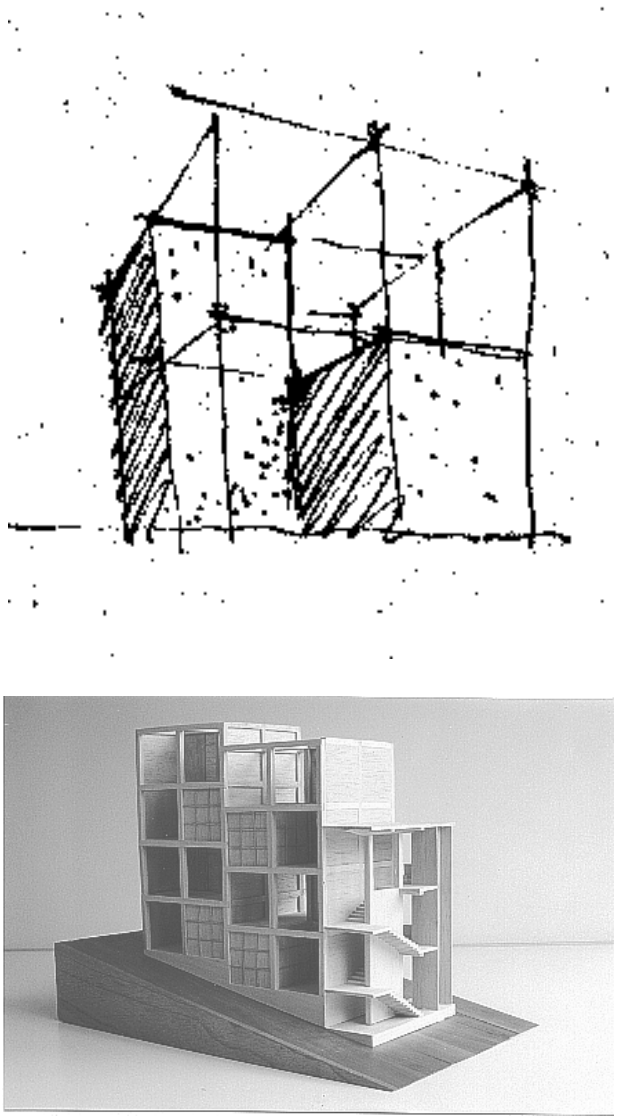

Fig. 1a-c The main concept.

top of the other to form apartment blocks of six stories high, built by superimposing three apartments, without the use of elevators. The proposal can be built either in concrete, steel, wood or any other material or technology available, depending on the region and particular requirements of each problem. This research consists on the evaluation of this basic housing unit that can be expanded, both on single or multiple-story buildings. This unit was designed for people with very low income, so that cost is a top priority in design decisions.

Before INAVI actually started building these units using the OSLD System, it was considered necessary to simulate the basic unit using the full-scale model in order to:

- Test spatial and morphological characteristics of the unit by measuring their spatial quality;
- Experiment different options of windows and furniture in regards to the influence of the variable height: 3 m, which has never been used in Venezuela for this type of housing;
- Experiment different options of expansions, from 36 to 72 m2 and to test how they affect their spatial quality.

This research has three main objectives:

- To identify spatial characteristics of the basic unit and evaluate its spatial quality;
- To determine the capability of the unit to be expanded or modified, by using different types of walls, windows, furniture, objects and plants;
- To inquire about the influence of the level of realism in the perception of the different spaces.

It is necessary to define first the *variables* that need to be tested:

Spatial Quality: It is an opinion of many architects that it is a subjective construct which reflects, among other things, the psychological impact that spaces produce on observers and users, as well as judgment about the character of space, their proportions and their adequacy for intended activities within specific contexts.
Spatial characteristics: It refers to dimensions and space relations such as order, rhythm and spatial configuration.
Possibility of change and expansion: It refers to the options allowed by the geometry of the basic unit and its structural and spatial module.

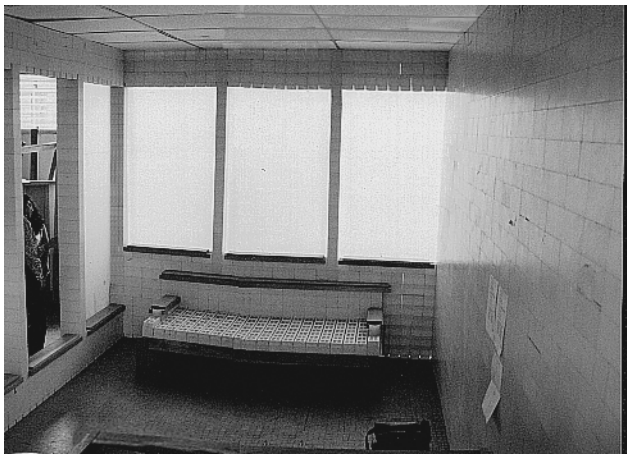

Fig. 2 Ground floor without plants: The space was appraised as open (5), pleasant (5), Clear (5.5), roomy (5.5), warm (5.5) ordered (5.5), welcoming (5.5) vacational (6.5) and tropical (6.6). Only two adjectives had negative connotations: small (2). and normal (2.5). People liked the apartment (5).

Fig. 3 Ground floor with plants: Most of the adjectives improved their ratings: open (6), happy (6), pleasant (6.5), clear (6.5), Interesting (6.5), roomy (6), warm (6), ordered (6.5), welcoming (5.5), vacational (7) and tropical (7). People liked the apartment very much (7).

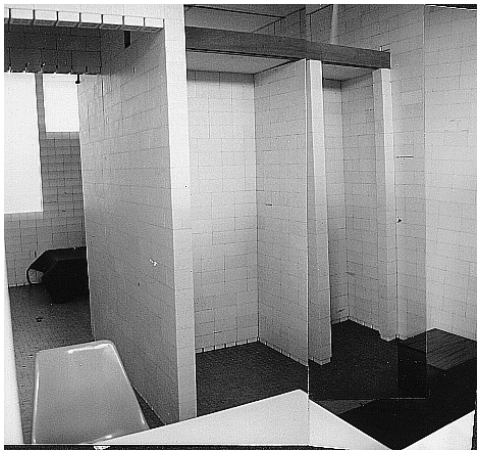

Fig. 4 Upper floor: The following adjectives were appraised on extreme ratings: pleasant (6), clear (7), ordered (7), vacational (7), tropical (6), static (1.5) and normal (1). People were not sure whether they liked the apartment or not (4).

Design Research

The strategy chosen was to:

- Simulate on the real scale model the housing unit;
- Evaluate the spatial quality of its component and analyze results;
- Modify the model in order to improve negative appraisals and evaluate again their spatial quality;
- Build three units at 1/10 scale to show expansions and modifications of windows and furniture;
- Compare the three models using the same group of judges;
- Analyze results and derive conclusions.

In order to carry on the design research, first it was necessary to build an instrument that could measure spatial quality. It was based on the Instrument for Measurement of Psychological Impressions (IMIP) developed by Luis La Scalea [2] and used in most of the evaluations in our Laboratory. The IMIP consists of a semantic differential instrument [3] of 11 pairs of adjectives grouped in three factors: affective, dimensional and social. The new instrument introduces 10 new pairs of adjectives chosen by a representative sample of architectural students and staff. It was believed that they allow more ample and specific value judgments. The adjectives are:

Affective factor: It refers to emotive responses produced by the perception of the space. Sad-happy, pleasant-unpleasant, boring-interesting, cold-warm, beautiful-ugly, welcoming-rejecting.

Social factor: It refers to beliefs and values socially shared. Ordinary-refined, elegant-tasteless, vulgar-distinguished, sensual-martial, normal-special, rural-urban, permanent-vacational, Nordic-tropical, pagan- mystic, static-dynamic, ugly-beautiful.

Dimensional factor: It refers to the way attributes such as shapes, sizes and pressure, affect people. Close-open, oppressive-spacious, confusing- plain, big-small.

Besides the three factors described the constructs were also used: I like it, I do not like it, as a mean of providing an overall evaluation. The sample was chosen between students of architecture of different grades. Forty five subjects participated in the selection of the extra 10 pairs of adjectives. For data analysis a group of students registered in one of the subjects of the Laboratory ("Spatial Design Ability") were chosen and trained in the use of the instrument and on basic statistical analysis.

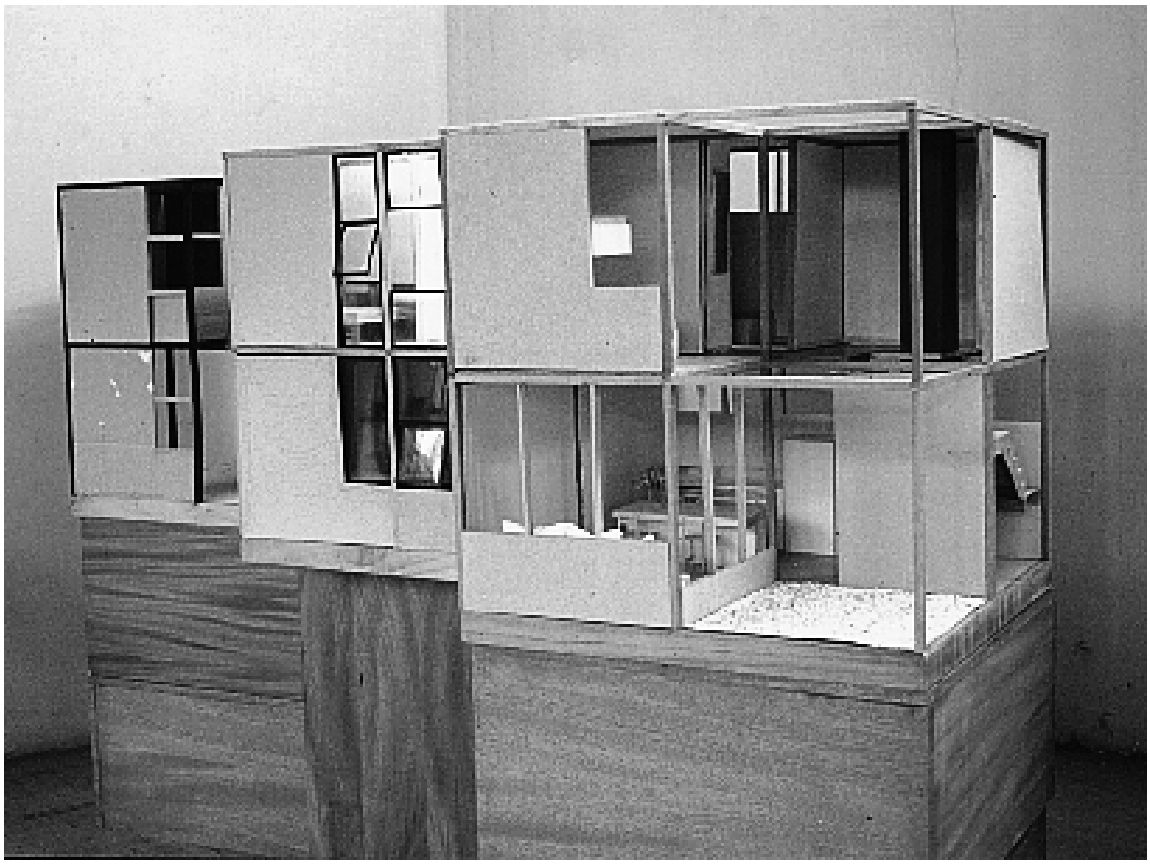

Fig. 5a-b.

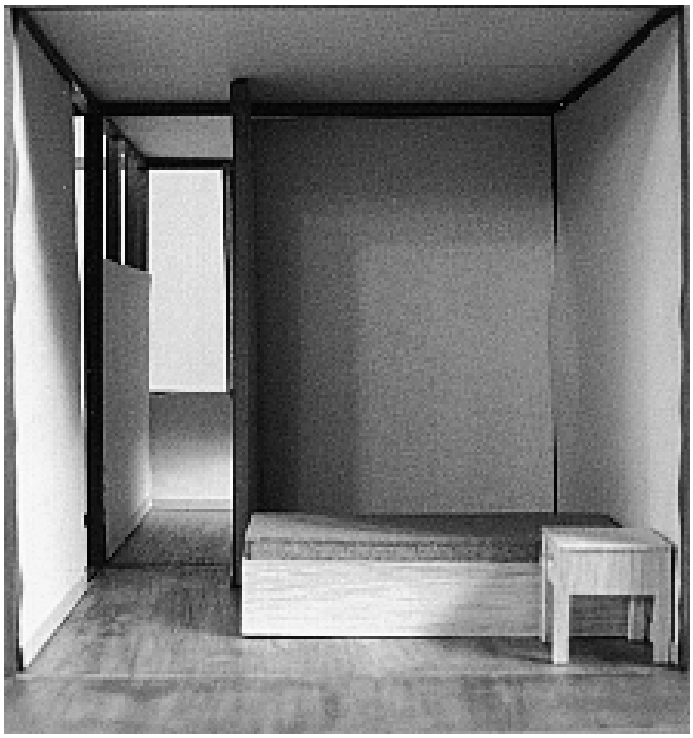

Fig. 5c.

Procedure

First of all the ground level of the unit was built by a group of students, departing from the original plans of the apartment. Our laboratory does not have sufficient height to allow the construction of the whole unit (6 m) at a time. Then the upper level was built. The simulations showed the initial stage of the ground floor and the expanded stage of the upper floor. It took about 6 hours to build the two levels of the unit.

Secondly groups of 8 students evaluated the spaces at a time; they were instructed on the use of the instrument and were asked to walk through each level and evaluate it. These sessions lasted 15 minutes and they evaluated first the ground floor without plants, then with plants and finally the upper floor without plants.

Thirdly three group of students built one model each at a 1:10 scale, following instructions about which elements would remain unchanged. Walls should be removable in order to allow visualization and possibility of taking photos. Models were built in one week, then the three groups redesigned the unit in order to obtain specific intentional character. Thus, group A tried to build a unit that could be read as austere and simple; group B, roomy and clear and group C, elegant, actual and vacational. Discussions about results and possibilities of the unit were drawn and important recommendations came out to improve both the unit and the System.

Adjective	Related to
Open	Height of the spaces, large windows, space configurations on L enclosing the patio, fluency of the space due to the double height
Clear	The structural order of the unit. The module can be read either horizontally and vertically
Interesting	Variety of the elements and viewing possibilities of the space
Warm	In spite of the apparent coldness of the materials of the RSM, the proportions of the space and its relation with the patio, rated them as warm spaces
Dynamic	Possibilities of movement by user: between floors and through the patio as well as the suggested multiplicity of the social area
Tropical	The height of spaces, the large sizes of windows and the patio. Even higher once a hammock and palm trees were added to the scenario

Table. 1.

Simulation of the upper level of the housing unit: It had high ratings in the adjectives pleasant, clear, orderly, vacational and tropical. Probably they are consequences of the proportions, height, size and location of windows, and the easily understandable structural module used.

Adjective	Related to
Pleasant	Lighting, balance, coherence, proportion and order
Clear	Fitting between function, form and spatial relations
Ordered	The orthogonality and the geometrical arrangement of the spatial elements
Vacational	The absence of personalized elements on the arrangement
Tropical	Windows and space height are bigger than those usually used
Static	Due to these spaces are designed as permanence one, terminal spaces
Normal	The conventional typology of spaces

Table 2.

Conclusions

The simulations of the lower level of the housing unit with and without plant showed that the spaces in themselves were evaluated with positive ratings in spite of the small size of the unit. Those evaluations were enhanced by the use of adequate furniture, colors, objects, specially in the adjectives (table 1).

About the usefulness of the RSM: A house is perceived as a series of space sequences which give personal overall impression of the whole. RSM simulations allow the possibility of carrying activities experience impressions similar to those of real space. In spite of all the information available of the OSLD System, their spatial characteristics and qualities had not been experienced or evaluated. There are components of the space perception that can only be simulated at real scale: the sound reflected in walls and ceiling, the atmosphere, the actual pressure walls, objects and furniture produce; and specially the possibility of having real people carrying on activities and giving real scale to the space. We also think it is a most valuable tool for the process of learning about architectural space.

About the usefulness of the 1:10 scale models:

- It was adequate for representing the two levels of the house particularly to reproduce the double height that links them;
- It allows to record spatial characteristics through the use of video and photos;
- It allows quickly for economic changes;
- It allows the use of color, special furniture and styles;
- It does not allow the possibility of experience sequences or use of space;
- It is not easy to perceive the volume of the space, even if there are reference elements as furniture.

About the behavior of the OSLD System:

- Evaluations showed that size of space were not perceived as small;
- It adapts to different levels of requirements and from different social and economical status;
- Changes in colors, design materials of walls and windows, yielded substantial changes in the image, style and character of the proposal;
- The structural module used, both in plants and elevations, give order to the whole and allow enormous possibilities of coherent combination to group the units or to solve façades;

- It seems interesting to overhang in the façade the cupboard of the bedroom in the upper floor in order to increase the area of the main bedroom.

We believe that direct observation of the behavior of users in particular spaces completed with particular questions, can offer reliable and interesting results, as compared with the use of specific instruments of evaluation, partly because people are not conscious that they are appraising a space and also because you do not have to deal with the correctness of the understanding of the adjectives of the instrument. In this research we used both methods complementary of the other with excellent results. Another important finding of this research is that students can derive spatial grammar concepts from the analysis of the spaces designed or modified, opening new lines of research with direct implications for architectural education.

References

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