

# ATRIUM-HOUSE: AN EXERCISE IN SELF-ANALYSIS

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## Abstract

Commenting on the “way ahead” in researching domestic space, Hanson points to the importance of both the “insider’s” and “outsider’s” views of home configuration: “Both views are likely to be flawed, and so each can in principle inform the other”. An exercise is presented here, in which “insider” and “outsider” are superimposed: the researcher is also a member of the family who inhabits the house, and the designer of the building. Techniques are applied to *objectively* describe the configuration of the building, and data is available concerning how people label and re-label different bits of spaces in different occasions, and how they *subjectively* evaluate the performance of the building *vis-à-vis* their expectations.

The design experiments with the millenary *atrium*. Modern architects have speculated with atrium houses, but the subject has not been present in Space Syntax Symposia.<sup>1</sup> Data from this house is compared with data from buildings produced by “professional” as well as “social” knowledge. Analysis is carried out in two levels: 1) spatial configuration; 2) deployment of activities in space-time.

The difficulty in assessing a particular configuration – as far as ethic values are concerned – *independently* of the mode of life of the people living here is commented upon. Integration and visibility constitute a key aspect at issue. The atrium implies “panopticon effects” that may be differently interpreted: authoritarian surveillance of some agents over others, or, on the contrary, easy access among people, enhancing possibilities of exchanging opinions and experience in the interior of the place, in a rather egalitarian micro social system?

## Introduction

The house was built on a plot of land measuring 20m x 60m, in the satellite city of Sobradinho, Federal District, Brazil. The nuclear family has four members: husband (myself), wife, a 30 year old daughter and a 29 year old son – thus no children. Only the parents live permanently here; daughter and son are living in other cities and stay in Brasília for some weeks each year. There are no permanent servants; still, according to city building codes, servant premises had to be provided. They are used by occasional servants (e.g., the gardener) and when we have a large number of guests. A cousin of the wife is employed to help with daily chores, but does not live in the house.

The house was designed after I made a second visit to pre-Columbian Mexico (1997). I then knew the atrium houses of Teotihuacan (*Fig. 1*), which in turn recalled our affections for the *Alhambra*, Granada, Spain, almost 20 years before. Open spaces inside buildings in Brazil are common, but rather in the form of courtyards in convents or other institutional buildings. “L” or “U” shaped houses were built from colonial times, forming gardens towards the back of the plots; however, such spaces are rarely completely enclosed and permeable to their contiguous rooms as an atrium is. In modern domestic Brazilian instances, internal open

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<sup>1</sup> The subject has nevertheless been present in MSc Theses at the Bartlett School of Graduate Studies, London.

spaces are also ill-defined. Our house is closer to Teotihuacan's model; *Alhambra's* and Roman examples have also been a source of inspiration.



Fig. 1. Archeological remains of atrium houses of Teotihuacan: (a) model; (b) remaining atrium.

I suspected the atrium would match our expectations in various aspects: bio-climatic, functional, aesthetic, co-presential. I report on how we assess the house after inhabiting it for three odd years now (2003), and I comment on how it fits into present architectural panorama. Studies by Hanson (1998), Amorim (1997) and França (2001) are considered.

### Atrium and axis

A building performs in many dimensions, but only one type of expectation will be dealt with here: we expected the house to provide enhanced possibilities of co-presence and co-awareness of people.

Two spaces constitute the main elements of the *partis*: the atrium and a long North-South visual axis adjacent to it – henceforth NS-axis (Fig. 2, 3, 4 and 5). The atrium opens wide to adjoining spaces by means of sliding glass doors, except to the Southern side, closed by a panel of decorative tiles; it is covered by a barrel-vault metal pergola, allowing for the passage of sun, moon, rain, but controlling the passage of people - humming-birds often enter the space to enjoy the flowers (Fig. 6). Atrium sliding doors are opened ajar day and night, except in circumstances of heavy/windy rain.

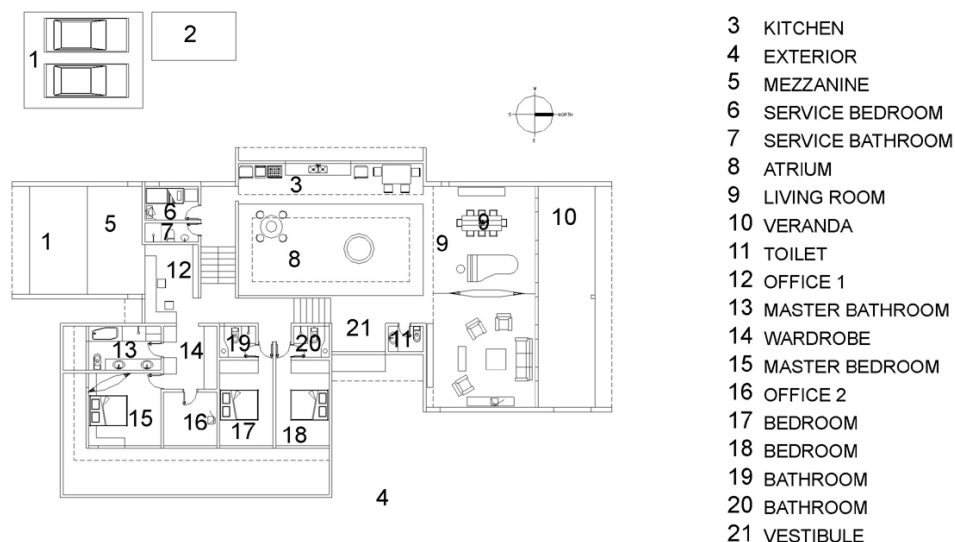


Fig. 2. Plan. Garage (1) and laundry (2) are in part underneath mezzanine (5), service bedroom (6) and service bathroom (7).

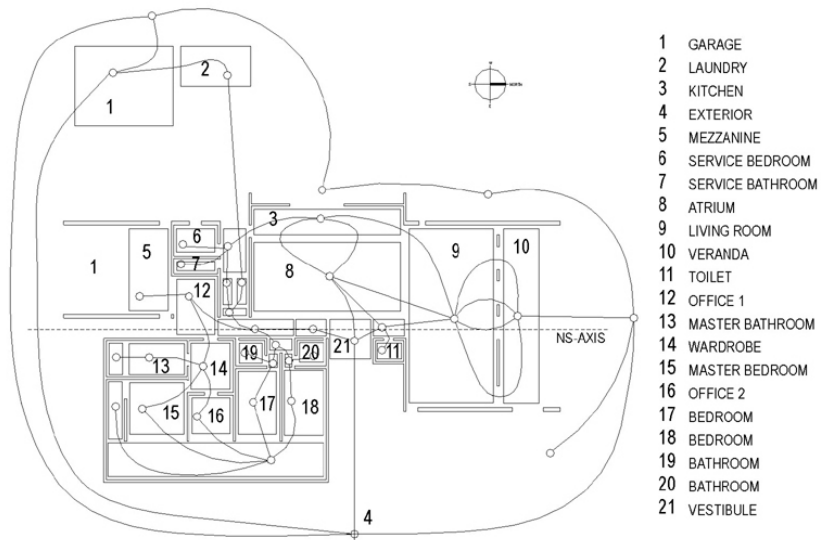


Fig. 3. Plan, showing convex decomposition of internal space and permeability graph. Garage (1) and laundry (2) are in part underneath mezzanine (5), service bedroom (6) and service bathroom (7).

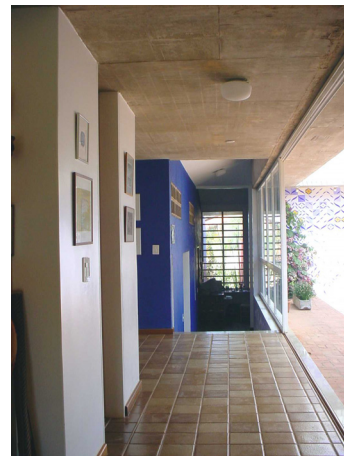
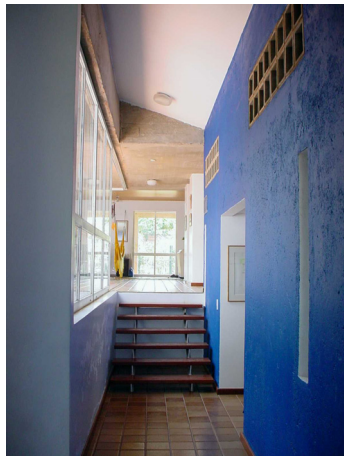


Fig. 4. (a) NS-axis from office 1; (b) NS-axis from living.



Fig. 5. (a) NS-axis, atrium and kitchen – reinforced concrete allows elimination of traditional peripheric columns, thus stressing spatial continuity; (b) kitchen (left), living and doors to veranda (right).



Fig. 6. (a) Atrium: pergola and decorative tiles panel (by Brazilian designer Petronio Cunha); (b) atrium in the *Alhambra*: a source of inspiration.

The NS-axis crosses the house from the backyard lawn (North) to exterior space in the street (South); it goes through veranda, living/dining room (henceforth living), vestibule, some circulation spaces and office 1. The living (72m<sup>2</sup>) includes a sitting area, a professional piano - the daughter is a classical pianist - and a large table used in daily meals as well as special occasions. Ideally, all spaces should turn around atrium and axis; it did not turn out completely so because of economic, environmental and functional limitations: plot dimensions, room surface and number, required functional positioning, the need to adapt the house to the plot slope (*circa* 5%) without severe earth cuts and in-fills etc. The idea was to maximise accessibility/visibility by means of “synchronising” space (Hillier & Hanson, 1984) in both two (atrium) and one (axis) dimensions.

### **Domains, not sectors**

We should not talk about “sectors” in this house – social, service, private – in the way we traditionally do (Amorim, 1997 - *Fig. 7*). Insulation between activities subsumed under such labels does not exist here: bedrooms (“private”) open independently to “social” spaces; so does the kitchen (“service”) to the atrium and living (“social”); links between “service” and “private” cross circulation between “social” and “social” (*e.g.*, between living and office 1). Relations of accessibility and visibility among elements of different “sectors” are usually direct, without intervening circulation spaces. In contrast with traditional evidence, strings of elements of a same “sector” may be interrupted by elements of another “sector”. In traditional modern *partis* this would constitute a “functional mistake”. Here, it is a strategy of organising social categories in a different way.



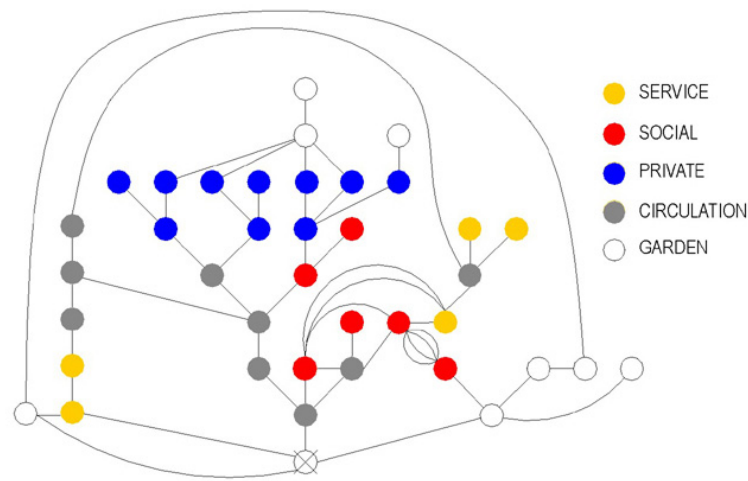


Fig. 7. Justified graph from exterior – spaces classified according to traditional “sectors”.

We should rather speak of two “domains”: *non-restricted* and *restricted* (Fig. 8). The non-restricted domain is constituted by spaces in which people may interact for purposes which do not involve intimacy: talking, watching TV, listening to music, preparing and eating meals, washing clothes or dishes, receiving friends etc. These spaces are open: no doors ever shut them off from the rest of the house. This is the domain of the atrium, living/dining room, kitchen, office 1, laundry, garage.<sup>1</sup>

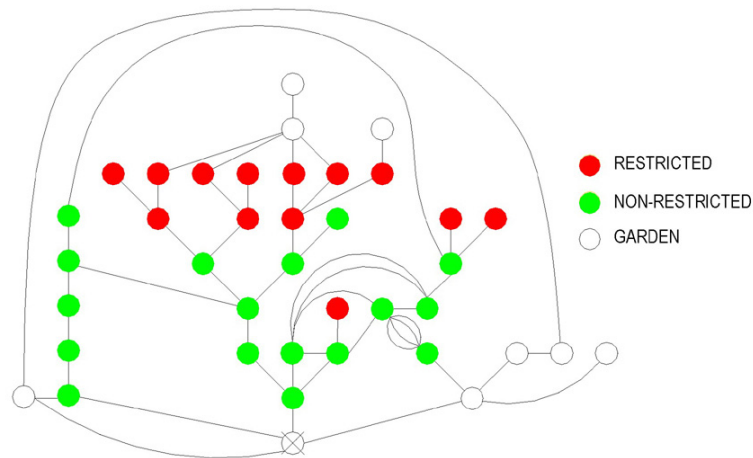


Fig. 8. Justified graph from exterior – spaces classified according to “domains”.

The restricted domain is constituted by spaces for intimacy, for inhabitants or visitors: personal hygiene, talking confidentially, sleeping together, making love. All such spaces are closed: they may be shut off from the rest of the house by doors - no exception. This is the domain of the suites, bedrooms, bathrooms/toilets (including the one adjoining the living room). This classification mixes social categories, cuts across usual dichotomies – inhabitant/visitor, owners/servants, older/younger, male/female.

Boundary/convex ratio<sup>2</sup> (0.28) captures well such characteristic. This house is much more open than modern architects' houses studied by Amorim (1997): they average 0,41, and only 2 of his 8 houses are more open than this one. London's sample of architects' houses studied by Hanson (1998) presents an even greater degree of closure (average = 0,42) and only 2 out of 18 are more open than this.

França's sample of middle class "social knowledge"<sup>3</sup> houses in Brasilia is very close to both Amorim's and Hanson's examples: average boundary/convex ratio is 0,40, and only 2 (out of 27) invest in higher openness than this house. Still, this is rather surprising: I would expect "vernacular" houses to present less spatial continuity (França, 2001).

### **Integration and inversion**

The overall measure of integration<sup>4</sup> also distinguishes this house from others designed by architects, but differences from the vernacular are more peculiar. Average integration is 0.84, including exterior space.

Architects generally prefer deeper schemes. Average integration in Amorim's sample is 0.76; only 1 of his houses is more integrated than this: 1.13. The strategy replicates with Londoner architects: a sample of 18 instances presents 0.70 as average integration, and only 2 examples are shallower than this house. When we turn to some houses designed by "architectural stars", average integration varies from 0.50 (Loos' Muller House) to 0.72 (Meyer's Giovannitti House). (Hanson, 1998)

The picture changes when we turn to vernacular. França's sample presents average integration of 0.85. This poses this house closer to "social knowledge" than to "professional knowledge", in this variable. However, uniqueness is revealed as to integration of specific spaces.

Consider the "main spaces" of a house: living-room, kitchen, main bedroom, exterior<sup>5</sup>. The order in which they are organised from least to most integrated says a lot more than average integration. In França's sample, *no house* presents exterior space as the most integrated one. In almost half the examples, integration rank order is: living > kitchen > main bedroom > exterior; in 70.7% of cases the exterior is the *most segregated* space<sup>6</sup>. In Amorim's sample, exterior space is always among the most segregated nodes of the house. In this house, it is the *most integrated* one: rank order is exterior > living room > kitchen > main bedroom.

Amorim has also experimented with "visual integration": relations of *visibility* among spaces, not physical *accessibility* as in traditional integration measure. Visibility brings this house closer to his sample: it is still more visually integrated (2.63) than Amorim's average (2.03),

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<sup>2</sup> Two peculiar spaces constitute exceptions to the rule: the veranda and the bedrooms' garden. I have considered the veranda an extension of the living, thus belonging to the non-restricted domain, although it may be cut off from the house by closing the living doors. The bedrooms' garden may also be cut off from the rest of the house, when all bedroom doors to it are closed. It belongs to the non-restricted domain, although collective interaction here is subject to negotiation among those who control doors to it.

<sup>3</sup> "Social knowledge" or "vernacular" in a wider sense: buildings not necessarily produced by architects.

<sup>4</sup> Integration: the degree in which a space is topologically accessible to all others in the system; it may be considered for the system as a whole and for its parts. Literature sometimes uses RRA (Real relative asymmetry), sometimes it's reciprocal. I have preferred the latter. (Hillier & Hanson, 1984 and Hanson, 1988, for basic concepts)

<sup>5</sup> Hanson has considered these to represent the main "functions" of a house and of the way it is related to the public realm. (1998, p. 267.)

<sup>6</sup> Segregated exterior spaces seems to be a transcultural middle class house attribute. (e.g. Hanson, 1998, p. 129)

but now 3 out of his 8 cases are more integrated than this house. As in the reasoning above, more peculiar attributes appear when we consider specific spaces.

Accessibility integration, compared with visual integration obtained by the *depth-map* software, illustrates this (*Fig. 9*)<sup>7</sup>. We have run the program: 1) for interior spaces only; 2) including exterior spaces of the immediate surroundings (*Fig. 10*), in order to capture the way relations of visibility happen between inside and outside worlds, by means of glass surfaces<sup>8</sup>. Notice how atrium, living and NS-axis belong much more strongly to the integration core in visibility integration than in accessibility integration. Another specificity of this house is revealed: its transparency towards exterior space, against the opaqueness of atrium buildings cited above – Teotihuacan, Alhambra, Rome.

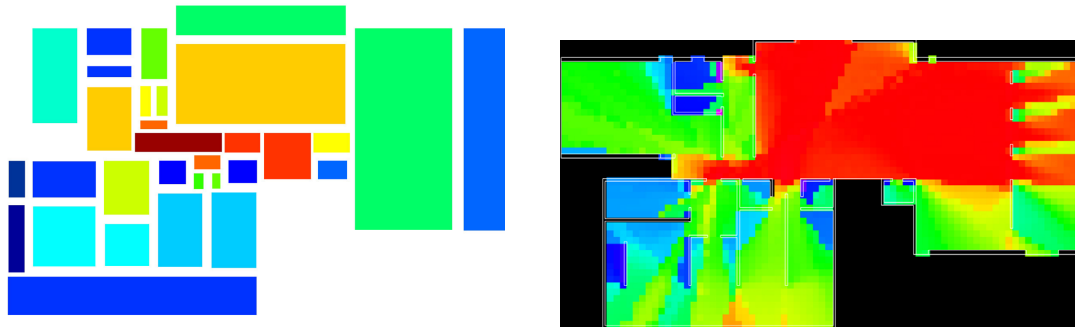


Fig. 9. Accessibility integration (a) compared with visual integration (b) – interior only (garage and laundry are not included).

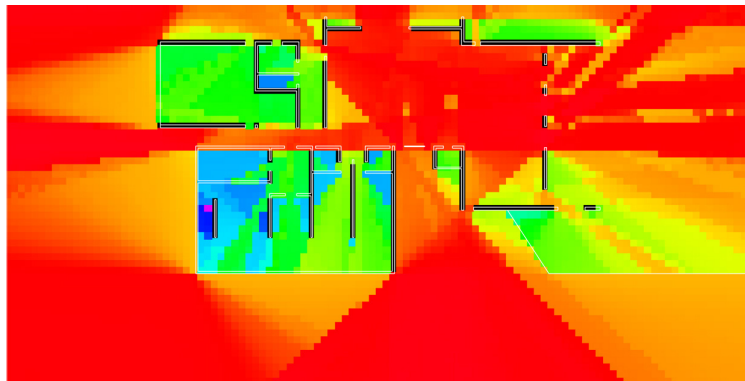


Fig. 10. Visual integration, including exterior spaces.

<sup>7</sup> I lack comparative evidence using this software in domestic space instances.

<sup>8</sup> The limits of the “outside world” are always rather conventional: you have to decide where to stop. In this case, limits were: 1) to the West, the line separating the house from its neighbour; 2) to the North, a fence which, allowing the view through the lawn, somehow blocks it to the orchard; to the East and South, plot limits across streets, thus including public space immediately surrounding the house.

## Co-presence and co-awareness

Co-presence is considered here the simultaneous presence of people in any convex unit of the system; co-awareness is the perception of people in other spaces than self is, either by sight or hearing, in places directly accessible physically or otherwise<sup>9</sup>.

In daily usage, the most intensely occupied space is the living, in reading, listening to music (both preferably in a hammock positioned almost exactly along the NS-axis), or watching TV in the sitting area. Daily meals are also made at the table in the living. We are far away from Brasilia's middle class intense use of the kitchen as the place *par excellence* for family daily interaction, that goes together with a formal living exclusively used for receiving guests<sup>10</sup>. The second most intensely used space is office 1, by both me and my wife, for work (more usually), writing letters, or leisure - all involving computers.

Opposite ends of the NS-axis within the house – places of longest stay – are privileged positions concerning both visibility (more) and accessibility (less) (*Fig. 9* and *10*). It is also easy to listen to what is going on in the house, and to talk to people located in any bit of the non-restricted domain - even if you are not seeing him/her. Here is a quasi-problem: in this domain there is no acoustic privacy: volume on the TV set or sound equipment has to be negotiated in order to allow, e.g., for simultaneous watching TV (living) and work (office 1). Metric distance helps. Negotiation usually succeeds...

When we receive guests, the most used place depends on the number of people involved and the weather – quite dry from May to September and mild all year round. The usual picture is: small numbers = atrium; medium numbers = atrium + bigger table at the living; large numbers = atrium + all living (table + sitting area).

Receiving guests often involves meals, prepared by inhabitants or friends who also enjoy doing so. During preparation, presence splits between kitchen, atrium and living; contiguity/visibility /openness allows for easy talk among everybody. In the meantime, visiting children enjoy intersecting spatial rings in hide-and-seek games (bedrooms are kept open) or play with computers in office 1.

## Conclusion

Comparative analysis reveals both similarities and differences between this house and present architectural panorama, professional or otherwise<sup>11</sup>: 1) average integration brings this house closer to “social knowledge” (higher integration) than “professional knowledge” (deeper schemes); 2) integration rank order (*e.g.*, high integration of exterior space) differs from both “social” *and* “professional” domains, in middle class houses, here and abroad; 3) distributedness of “private sector” is also unique, at least concerning Brazilian domestic space - vernacular or erudite (tree-like schemes abound); 4) spatial openness is not unique to this house but places it in the top layer of most open schemes; 5) non-existence of formal living distinguishes it from common middle-class houses in Brazil.

Plastically, this house may be said to be “modern” without great controversy: pure volumes, primary colours, generous glass panels made possible by use of reinforced concrete etc.; syntactically, relationships with modernity are to be qualified according to specific attributes.

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<sup>9</sup> This amplifies the concept of co-awareness as it is found in the literature (*e.g.* Loureiro, 1999, for whom only the sense of sight counts). I consider hearing conversation in normal voice also characterises co-awareness.

<sup>10</sup> The “guest room” is a long-lasting tradition in middle class houses in Brazil. (França, 2001)

<sup>11</sup> Admittedly, the evidence so far is limited. More transcultural work will allow for more rigorous conclusions. Brazilian modern architecture should be considered more widely.



Its strongest peculiarity is: enhanced relations of visibility/accessibility among diverse categories of spaces.

The house responds well to the expectations we had; openness in the non-restricted domain and the possibility of reclusion in the restricted domain allows for the desired balance between co-presence/co-awareness and isolation. If this is perhaps the house's greatest quality, it may be its major flaw: the building does not seem robust enough to support other ways of behaving.

For one, the house is not "children-proof": openness in the non-restricted domain, with corresponding visual and acoustic attributes, makes it untenable for simultaneous work and the playing around of kids; the open kitchen may be dangerous, for it is not always possible to keep surveillance on kids and stop them from having access to dangerous equipment (e.g. stove).

Isolating the kitchen from sight/access by walls/doors would be rather easy, construction-wise; creating a formal living (and a corresponding intimate one), or implementing a tree-like scheme in the "private" sector would be impossible without major structural changes.

Some expectations towards architecture are more universal. Others are culturally determined or very specific. Family expectations concerning domestic space may be strongly idiosyncratic. This house responds well to desired social interfaces. For us, it has a high *use value*. I am not that optimistic about its *exchange value* in present market conditions...

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