Of dwellings and streets that connect: a brief honey-moon

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Abstract

This study explores spatial properties across successive urban scales – street grid, plot division and building footprint – which tend to be associated with certain patterns of use and perception.

The adoption of the modernist formal repertoire in Brazil in the early 1930s spread from major cities to achieve nationwide scale in the late 1960s. In Natal, capital city of the state of Rio Grande do Norte, this phenomenon coincided with a period of intense urban expansion and housing construction in the 1950s. Many of these buildings displayed not only a nouveau physical appearance, more or less faithful to the formal canons of the international style, but also new relationships of permeability and visibility respecting the street, which parallel spatial properties found in the town's global grid structure at the time, and appear to be associated with the socio-cultural context that framed that stage of urban development in Brazil.

This argument is based on findings from distinct studies in which syntax analysis procedures, as developed by Hillier and Hanson (1984), were used to investigate space configuration in diachronic perspective: that of Natal's urban grid, and that of middle-class housing in various north-eastern towns. They revealed a turning-point in the global-to-local relationship of Natal's urban spatial structure around 1955, when the potential accessibility of the grid achieved maximum level and newly-built residences were highly permeable and visible to the public space. Drawing from Hillier's (1996) principle of *natural movement,* that peak in accessibility points towards a configuration that was more movement-orientated than ever before or after. Those highly street-exposed dwellings seem, therefore, to have been designed to take part in that animation.

As the notorious averseness between dwellings and streets in the 18th and 19th centuries, recurrently stressed in the literature re-appears in the heavily walled and gated condominiums of the present era, the panorama of residential neighbourhoods presented here evokes the idea of a brief, bygone honey-moon.

Keywords: Urban Form, Building Form, Space Syntax, Modern Dwellings, Visibility / Permeability Relationship.

1. The problem

1.1. "Urbanity" versus "disurbanism"

This paper draws from findings of previous studies, which showed that the spatial configuration of modernist dwelling were the apex and also the turning point of a pattern – unique in the history of Natal, as well as of most Brazilian towns – of strong interface between the public space of the street and the private space of the dwellings, and that such architecture coincided with a stage of urban occupation in which the grid structure achieved high potential accessibility. It was motivated by the acknowledgement that a once expressive ensemble of modern residential buildings is about to disappear from the built environment at a time when the overall urban structure is breaking up into multiple layers of fragmentation.

Our contribution is, therefore, to highlight morphological aspects that, unfolding across successive urban scales – street grid, plot division and building footprint –, facilitate certain patterns of use and perception which are considered essential to define the very idea of *urbanity* (Holanda, 2002) and are becoming rare in an urban milieu where transpatial forms of solidarity (Hillier and Hanson, 1984) find increasing material expression in patchwork-like urban grids bordered by long lines of the blank walls of shopping malls and gated condominiums, whose combined effects promote "(…) the breaking of the relation between buildings and the public space; the breaking of the relation between scales of movement; and

the breaking of the interface between inhabitant and stranger", which defines, according to Hillier (1996) the notion of *disurbanism*.

The urgency to address the issue of fragmentation is evidenced by the recent volume of publications that seek to explain the causes and consequences underlying the move towards a splintering urbanism, from the role that globalisation plays in the discourse of fear of heterogeneity that support cross-cultural choice for segregated inhabitation (Low, 2005) to the extra-mural effects resulting from strategies to privatise urban spaces (i.e. the increasing use of private vehicles) that go hand-in-hand with the wish of insulation against risk and unfolds into time-space trajectories of segregation (Atkinson & Flint, 2004).

It seems ironical that urban policy prescriptions for regenerating central areas and creating animated public spaces in Brazil towns, as in cities worldwide, should be based on the discourse about the benefits of mixed use, universal accessibility, social and functional diversity, encounter-rich street/open spaces, and participative decision processes, at a time when gated communities are becoming the preferred housing type and neighbourhoods in which some of the spatial and land use attributes that help to promote those properties still remain are being refashioned into the strip model of "main street" commercial enclaves surrounded by huge blocks of walled apartment towers.

By focusing on physical attributes of Natal's spatial configuration, which are thought to encode accessibility and visibility potentialities that facilitate urbanity we seek to raise awareness, especially among students and planners, about the need to conceive instruments that might help, if not to overturn, at least to delay the process of disurbanism.

1.2. Modelling urbanity

Syntactic modelling and GIS techniques were used to investigate the urban expansion of Natal, following a series of analytical procedures that have been applied in studies of Brazilian urban settlements by the DIMPU/UnB and the MUsA/UFRN research groups. Analyses were based on existing axial maps that have been studied elsewhere (Medeiros, 2002; Medeiros et al, 2002; Trigueiro, Medeiros and Rufino, 2002), which represent Natal's spatial expansion in a diachronic perspective, according to the available cartographical data from 1864 to 2002.

Grid modelling techniques, as recommended by Hillier (1996) and Holanda (2002), were utilized for the study of the street grid structure, which explores two variables – grid integration and form of the integration core.

The main proposition underlying the investigation procedures is that configuration is a set of interdependent relations in which each is determined by its relation to all the others and that "(...) the fundamental correlate of the spatial configuration is movement" (Hillier, 1996:152). Hillier and Hanson (1984) propose linear representation (axial representation or axial maps) to investigate movement patterns as well as a whole range of factors associated with or dependent on movement.

Axial maps are obtained by representing each street or street segment (Figure 1A) by the least number of longest interconnecting straight lines that may be inserted within the open space between buildings and/or blocks (Figure 1B). Specific computer applications build a matrix of connections to calculate the access value – *integration value* – of each segment in relation to all others in the complex. These values are then translated into a chromatic scale from red to blue[1] (Figure 1C). The set of most accessible lines, called *integration core*, (corresponding to the red band) is assumed as those spaces – roads, paths – that are likely to attract more movement from a spatial structure perspective. These areas tend to coincide with the most active urban centres, i.e., places in which people, movement and diverse activities concentrate.

[1] Space syntactic analysis is extensively exposed in the books referred here as well as in various academic papers, some of which available at www.spacesyntax.org/symposia.

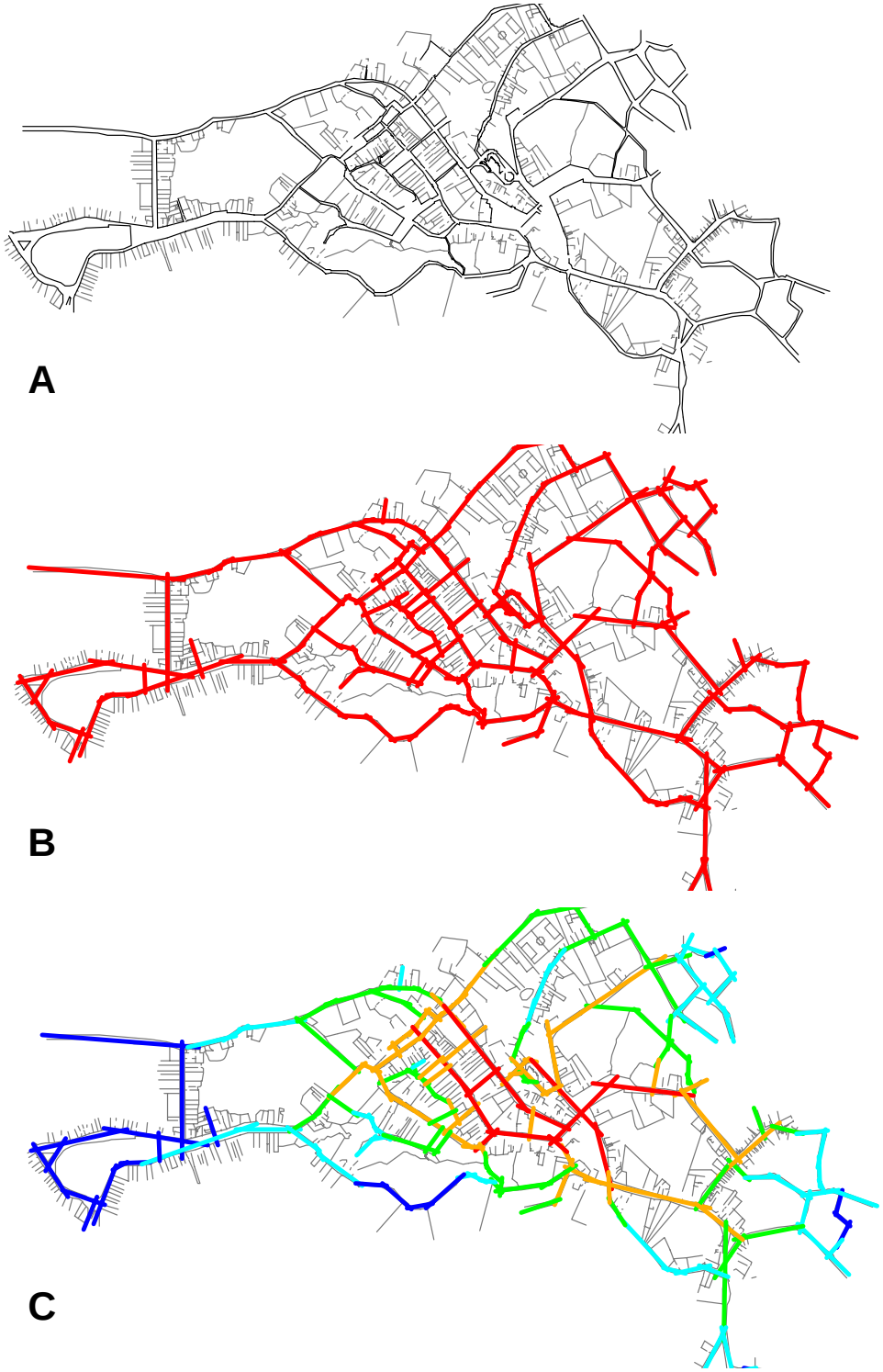


Figure 1: Constructing an axial map for the city of Tiradentes/Brazil..

The analysis presented here considers the urban system as a whole, i.e. globally or *Radius n - Rn*, implying that the radius of connexions accounted for includes all possible routes from each line (or axis) to all other lines until the furthest axis is reached[2].

Studies of urban settlements in various countries reveal strong correlations linking high integration values to movement potential and to movement-dependent functions (i.e. commercial activities).

[2] The radius – defined as the topological distance from a given line, or axis, to any other line – may be calibrated to account for a certain topological distance according to what is being investigated. For pedestrian routes, for instance, the most usual radius is *Radius 3*, or *R3* analysis that considers the axes positioned as far as 1, 2 and 3 turns of direction only, from each axis.

GIS techniques were also used to juxtapose grid modelling and building footprint in order to allow for a graphic reading of the relationship between differing levels of street accessibility and the links from the public to the private spaces of residential buildings.

It is argued that a period spanning the transition from the colonial to the contemporary city has brought about a temporary relief to a long-term strong opposition between the public and the private milieus, and that such state took the form of a potentially highly accessible urban grid, that signals a movement-orientated urban structure, predominantly abutted by highly street-exposed dwellings, apparently designed to take part in that animation.

2. Modelling the potential accessibility of Natal in diachronic perspective

2.1. Integration Values

Natal, the capital city of the state of Rio Grande do Norte/Brazil (Figure 2), in the Northeast of Brazil, has only recently reached metropolitan status, now accommodating over one million inhabitants. It was founded in 1599 as per orders from King Felipe II of Portugal, to strengthen the colonial defence system, on top of a hill near the estuary of the river Potengi, where a fortress had been settled the year before.

Although officially designed as a "town", Natal remained little more than a hamlet surrounding a central quadrilateral void overlooking the Potengi until the last years of the18th century – when the settlement spread out a little farther beyond its foundation site over the plateau referred to as *Cidade Alta* (*Upper Town*) by the Portuguese early settlers.

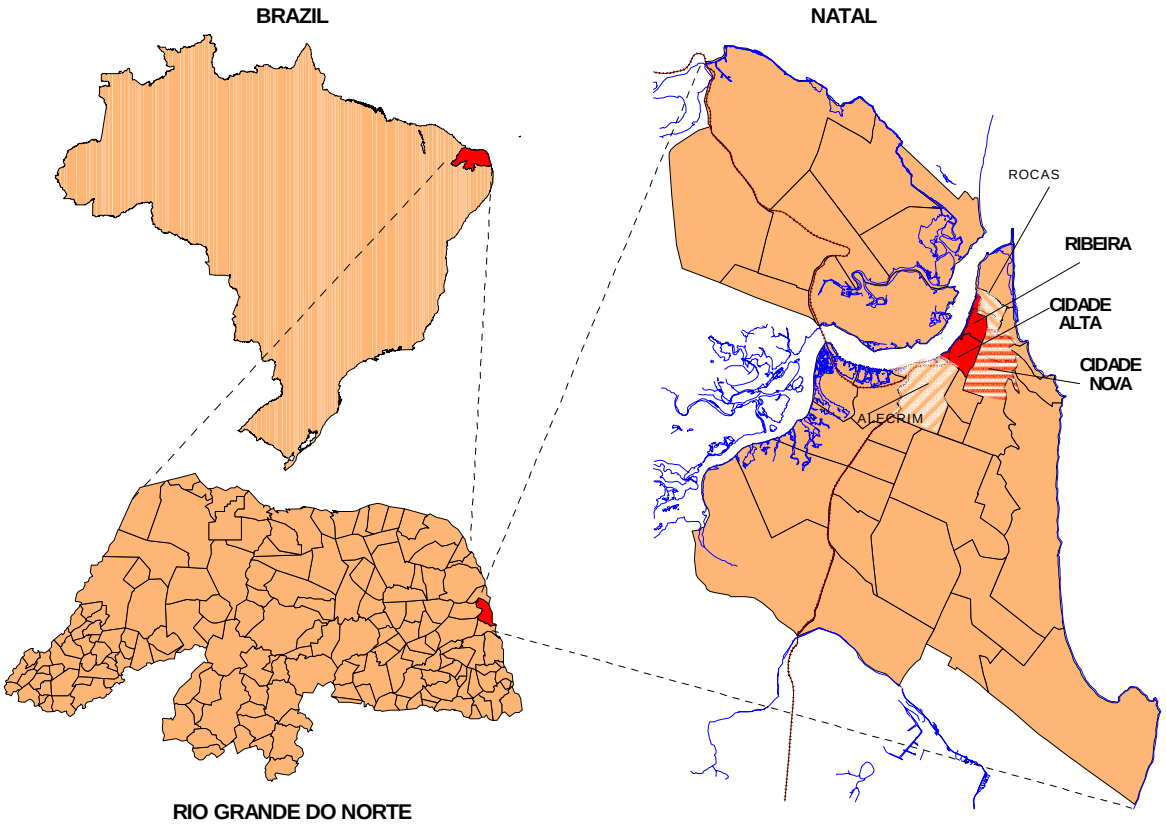


Figure 2: Natal in Brazil.

A slight but continuous growth occurred along the 19th century, especially around the harbour located in Ribeira – meaning *riverside*, also referred to as *lower town*, (*Cidade Baixa* in Portuguese), in opposition to the earlier *upper town* site (Figure 2) – to which occupation expanded. This was followed by a series of growth booms along the 20th century: in the 1940s, during World War II, when Natal served as an important base for Brazilian and American troops, in the 60s and 70s following the intense urbanization process that reached a peak in Brazil at the time; in the 90s when Natal achieved metropolitan status.

That urban growth was modelled, in previous studies (Trigueiro e Medeiros, 2001; Medeiros, 2002) by applying space syntax techniques to seven successive stages of the urban occupation (Figure 3) as recorded in period maps and/or historical references: 1864; 1924; c. 1940; 1955, 1970s; 1990s; and 2002.

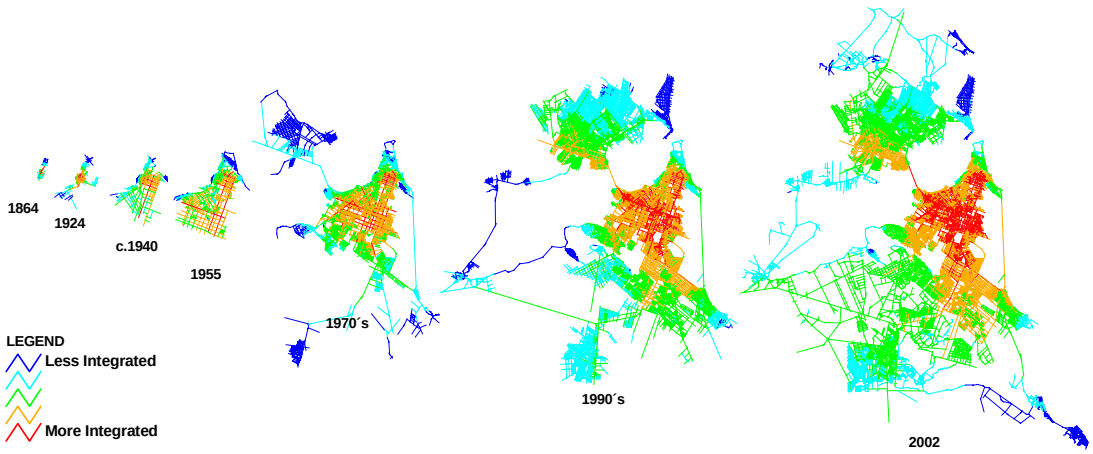


Figure 3: A diachronic approach – axial maps from 1864 to 2002.

In 1864, boosted by the growth of commercial activities, Cidade Alta and Ribeira are alternatively described as active centres, especially after the consolidation of the harbour at *Cidade Baixa*, on the river Potengi. As a consequence new neighbourhoods sprouted around the earlier contours of the town.

In 1924 the grid hierarchy is consolidated into *bairros* (neighbourhoods), Cidade Alta and Ribeira acquire a highly integrated configuration, thus becoming potential movement magnets, whereas Alecrim and Rocas, new lower-class settlements situated beyond the borders of those *bairros*, present varying levels of segregation.

From 1924 through 1940, the grid structure was altered by the development of *Cidade Nova* (part of the present neighbourhoods of Petropolis and Tirol), and of new roads built to connect the military bases to the town centre and the harbour during the Second World War. The integration core was displaced from its initial location, the old centre, towards southeast. In spite of this, various factors have concurred to retain the character of an active centre in the old town, specifically, in Ribeira, which sited the port, a hydro-airport dating from the early times of aviation, and the bulk of Natal's business and service facilities, comprising bars, shops, warehouses and entertainment centres, boosted by the presence of Brazilian and foreign troops in the war time.

Little by little, from the 60s on, in consonance with the displacement of the integration core and the town's expansion southwards, Cidade Alta surpassed Ribeira as the active centre becoming the site where the best shops and service outlets were located, while a certain decadent and nostalgic atmosphere began to pervade the neighbouring Ribeira.

In the 70s, however, a new situation emerged as massive public-funded housing developments sprawled around the urban area. The integration core seems to have reached its maximum displacement point, then stabilised and reshaped, as can be verified in the axial maps that represent Natal in the 70s and the 90s.

From the 70s through the present day, the integration core carried on expanding and has engulfed the axes in the old centre, its borders at first, then most of Cidade Alta, now reaching the limits of Ribeira. These results support the empirical evidence, represented in the land-use data, of a robust commercial centre in the area. This has, however, become secondary in relation to new centralities that have emerged along the BR 101/Salgado Filho/Hermes da

Fonseca Avenue[3], the main access strip into town, where shopping centres, chain supermarkets and a vast mix of facilities cater for a high-income population.

Within this expansion process, findings suggest that the 1950s were a sort of "morphological-turning-point" in terms of Natal's global-to-local relationship, insofar as the axial model of 1955 (Figure 4) shows some unique relations between the spatial form of the global urban factory and the functional nature of certain areas. This pattern predominated in the next decades and then slowly disintegrated as Natal approached metropolitan status in the 80s.

Figure 4: Axial Map of Natal in 1955.

In the 1955 model, the set of best connected lines, or *integration core* (red band), spreads throughout most of the city's contour. All the area corresponding to the regular grid of *Cidade Nova* – planned and developed in the first half of the 20th century and the privileged site of the modernist residential surge – was engulfed in the core, thus signalling a strong movement orientated configuration diffused all over the neighbourhood.

2.2. Form of the Integration Core

The study of the form of the integration core is useful for understanding transformation processes affecting a city's active centre over time and to ascertain whether this city's global integration core coincides with the urban idea of centrality. In this kind of analysis, various

[3] The BR-101 is also the longest road in Brazil, stretching for over 4,000 kilometers, from the state of Rio Grande do Norte to the state of Rio Grande do Sul. Part of it corresponds to the wartime road built to connect the military bases to the port. It is, therefore, an impressive movement generator for both incoming and passing-through visitors.

historical aspects interface with and help clarify factors underpinning the transformation of the spatial structure.

There seems to be no consensus about the number of lines to be considered in determining the size of the integration core. A brief review of the literature reveals the adoption of diverse calculation procedures according to specific study purposes. Holanda (2002) reports references ranging from 10% to 25% of most integrated lines for large (over 100 axes) to small settlements, respectively, as well as cases in which the researcher chose to adopt a 10% rate throughout the study, regardless of the object's size. In a recent study, Hillier (2001) refers the "integration core" as a set of "red, orange and yellow lines", thus taking into account the chromatic scale resulting from the electronic handling of numerical segments rather than from some specific percentage of most integrated axes.

Aiming at extracting the very structural feature from the axial map, it was established here a specific procedure to identify the integration core. In an axial map, there is a numerical interval in which the minimum value refers to the most segregated line and the maximum to the most accessible (integrated) axes in the system.

For instance, if the minimum value is 0.1 and the maximum 0.6, the interval between poles is 0.5. In order to translate the numerical values to colours, the interval (0.5) is divided into 5 subintervals, each one corresponding to a colour, in the following sequence, from the most integrated to the most segregated: red (0.51-0.6), orange (0.41-0.5), green (0.31-0.4), light blue (0.21-0.3) and deep blue (0.1-0.2).

The distribution of the number of lines in each subinterval *varies according to the form of articulation of the urban system.* Systems intensely articulated will be more integrated and will have comparatively more axes in the red band. Reversely, systems which are less articulated will have less number of lines in such a band and more in the deep blue band.

Therefore, the investigation of the red band, considered as *the integration core* in an axial map, may reveal relevant aspects, highlighting how the grid structure can promote a system that is more or less articulated.

The diachronic approach (Figure 3) reveals that, in 1864, when the occupation of Ribeira is starting, the integration core polygon, though still located around Natal's foundation square, is spreading north-eastwards, following the formation of the new grid. The only thoroughfare joining the two urban nuclei becomes the most integrated axis. The form of the integration core derives from the three axes that connect the central nucleus to the edges of the settlement and seem to propel the urban growth – towards northeast, southeast and southwest, as later defined and clearly perceived in the map of 1924.

In 1924, the polygon that outlines the integration core again embodies the streets around the square, and the road that links the square to Ribeira but also spreads towards the new regular grid of Cidade Nova, the residential suburb planned in 1901. The core shows signs of being about to spread towards the three expansion directions although it does not reach the settlement fringe.

The situation that begins to be outlined in the 20s, consolidates around 1940 when the regular grid of Cidade Nova is fully developed, thus establishing a design pattern of orthogonal axes that is to be reproduced throughout future developments. The integration core sprawls from Cidade Alta – now occupying its border – towards Cidade Nova. The regular grid of the new neighbourhood will then concentrate a large portion of most integrated axes.

The resulting configuration resembles that referred to as a "deformed spiky wheel" (Hillier, 2001) in which the polygon forms the central wheel attached to long axial roads (Hermes da Fonseca Av., Prudente de Morais Av., and Cel. Estevão St.) that make up the spikes, thus connecting the central nucleus to the settlement fringes. An integration core that propagates through extended orthogonal axes is then configured.

This configuration is further reinforced in 1955 when new roads are constructed and old roads – including the ones that connected the town centre to the American air base in World War II – are engulfed within the urban complex (Figure 4). The integration core spreads throughout most of the city's contour, from the geometrical centre to the extreme southern border, the longest possible distance, considering the town's natural limits – the ocean to the

north and east, the river to the west. Its shape almost coincides with that of Natal's global complex. This pattern is viewed as highly inductive of universal accessibility, maximised co-presence, a movement-orientated grid and, as its consequence, potentially generator of mixed use, ingredients considered essential to enhance the public animation which underpins the quality of urbanity.

In the 70s the configuration analysis reveals three important trends: the continuing expansion southwards; a new expansion north-westwards, across the river; and the initial symptoms of a metropolitan scaling. A radical and quick shift seems to have occurred then, sending the integration core to a position as far away from the old town centre as it ever had been before or would be hence. Whereas in the 50s the core covered Natal's whole urban complex, in the 70s it appears to have become encapsulated within that complex, firmly tied up by the long orthogonal axes whose roots sprout from the regular grid of Cidade Nova. The shape referred to as *Natal's integration cross* (crossroads connecting Hermes da Fonseca and Bernardo Vieira Avenue) is thus configured.

Another aspect that calls for attention is that, at this moment, a polynucleated centrality seems to emerge: a small compact square integration core remains anchored upon the grid of Cidade Nova whereas a larger cruciform irregular core sprawls around the integration cross, pointing towards the new occupation of the so-called *Zona Norte* (North Zone) in the northwest bank of the Potengi.

The configuration of the now greater Natal (2002) strengthens the formal attributes originated in the previous decade thus confirming the "spiked wheel" pattern. However some alteration in the shape of the polygon that outlines the integration core is worth mentioning, as one of its vertexes advances southwards covering an area situated along BR-101 and Eng. Roberto Freire Avenue. This area is now becoming a major shopping magnet, at a metropolitan scale, and sites six of the largest shopping units in town – three chain supermarkets and three shopping centres.

The analysis of how the grid integration and the form of the integration core altered over time revealed the traces of evolving urban phenomenon imprinted on the spatial fabric. The above mentioned "morphological-turning-point" in the 1950s corresponds to the consolidation of Cidade Nova as an upper-class residential neighbourhood and the spread of modernism in Natal.

3. Of streets and homes in Brazil: a history of strangeness and an apparent honey-moon

In this study buildings are considered as a structure of specific interlinked spatial categories of use and users, separated from the global continuum space by a system of barriers and controlled accesses (Hillier and Hanson, 1984). Barriers and accesses calibrate the degree of insulation between the private space of the home and the public space of the street in differing levels, with the exterior private spaces of the plot usually exerting a key role in that calibration.

This study focuses especially on the topological position of the exterior, here considered as two distinct entities – (1) the link (or links) between the interior and the public space of the street by means of a formal route expected to be used by visitors, and (2) the private grounds of the plot, viewed as a "carrier" entity that may be linked to the interior by various access routes open to the inhabitants who exert control over the boundaries.

We argue that during a brief period in Brazil's urban history, residences were highly permeable and visible to the public domain by means of their exterior spaces which also functioned as an important integrator of the interior spatial structure. As this configuration parallels spatial properties found in the town's global grid structure at the time, described above, it can perhaps be said that that period witnessed the apex and the turning point of a spatial structure that fulfilled formal criteria associated with the notion of *urbanity*, never to be achieved since, in Natal, whose development is representative of various middle-sized Brazilian towns. This phenomenon also seems to parallel a certain socio-cultural atmosphere,

the *spirit of the times* perhaps, often referred in the media as *the golden years* (*anos dourados*), an epoch of intense urbanization accompanied by a general perception of a consolidated national identity soon to melt away into *the lead years* (*anos de chumbo*) of the military dictatorship.

Morphological properties presented here have emerged as consistent regularities in the analyses of several distinct samples of Brazilian homes. This paper discusses some of those regularities in diachronic perspective, by pointing out the role of the exterior in reshaping the way key domestic spaces are structured, according to the way diverse members of the household (and their visitors) approach the domestic spatial complex.

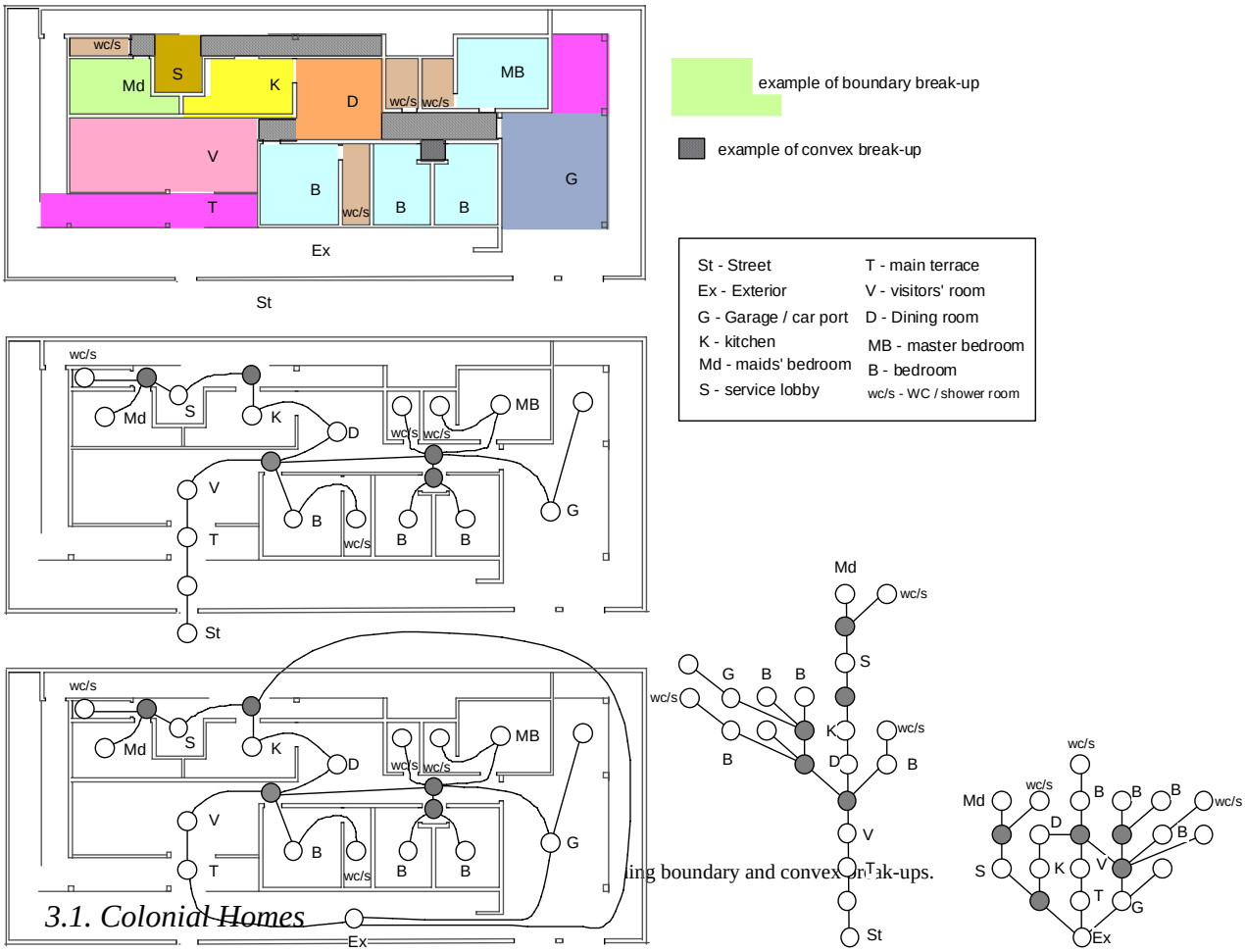
When spaces that accommodate certain essential functions relate to one another and to all others in a building in a consistent and recurrent way, a *genotype*, or a set of "(...) *abstract rules underlying spatial forms*" (Hillier & Hanson, 1984) is identified. These rules can be retrieved from a plan by analytical techniques of which graph representation (*access graphs*) is used in this study. Access graphs are plannar graphs that describe a matrix of interconnected spaces in a building with each space (within a boundary or a convex dimension) represented by a node, and their links (doors, passages, adjacencies) by lines, as shown in Figure 5. Justified access graphs are plannar graphs developed from a certain space (or root) so that the spatial structure made up of accesses (doors, passages) and barriers (walls) is expressed by the form of the graph and the topological distance, from that root (that represents uses and users) is revealed. Access graph representation allows for rapid and multiple readings of the spatial structure and also for quantifying topological relations. The topological matrix of relations may be calculated manually or by computer applications to be translated into numerical values of integration that express how each space articulates with all others in the complex, from more integration to more segregation. Numerical integration values, which will not be considered in this paper, have been calculated in all the studies reported here and helped to reinforce and complement graphic findings.

Here, access graph representation has been applied, according to the nature of the plans, by means of diverse break-up procedures: rooms were represented as one node according to their boundaries (walls, doorways) whereas transition spaces (corridors, halls, passages) were broken into convex spaces, defined as the lump of space in which all points can be viewed from all other points. The reason for this was that the rooms, regardless of their shapes, are usually conceived for certain uses (as labelled in the plans) to be carried out by certain users to whom access is granted beyond their boundaries; on the other hand, transition spaces are often elaborated into narrowed, enlarged and bent sections to increase or reduce topological distance and visibility, thus the need to consider these manoeuvres, which reveal ways that the laws of space are being used to serve the laws of society.

In this study, access graphs were worked out manually and by the application NetBox[4].

Morphological properties of a geometric rather than a topological order – i.e. front/back, above/below, centre/sides arrangements and area proportions – were also considered. *Visual graph analysis – VGA* as worked out in the application Depthmap[5] was used as a complementary analytical tool to demonstrate that accessibility properties often unfold into visibility fields. *VGA step depth* procedures were applied here to enhance hierarchical differences in terms of the levels of potential visibility perceived from certain key spaces. It represents the topological distance of visual fields that unfold from a certain point within a matrix of points covering a spatial structure, much in the way that a light beam would, by spreading throughout a house so that it can shine strongly in the area immediately illuminated but dims gradually away as it finds sequences of barriers – i.e. walls.

[4] By Nick Dalton (Sheep), UCL.
[5] Developed by Alasdair Turner, UCL



ing boundary and convex break-ups.

3.1. Colonial Homes

Patterns of strong insulation between homes and streets, now a recurrent theme in housing studies, have not been strange to the history of Brazilian domestic and urban space. The "patriarchal stronghold for keeping women and assets" found, according to Freyre (1981), full material expression in the 19th century town houses of the middling and upper classes – the urban *sobrado* – where the family quarters retreated into upper stories accessed by stairways and passages, often containing carriages or sedan chairs, which could be boarded indoors to prevent foot contact with the earth and mud of the slave-ridden streets.

Henry Koster (1817:11/12), on his first visit to Brazil, gives a vivid account of the kind of "urban activity" with which the upper classes tried to avoid having direct interface:

> (...) *an acquaintance of my fellow-passenger obtained some temporary rooms for us, and supplied us with what we wanted. We are therefore at last quietly settled in our new habitation, if I may be allowed to call it quiet, whilst some twenty black women are under the window bawling out, in almost all tones and keys of which the human voice is capable, — oranges, bananas, sweetmeats, and other commodities, for sale.*
> (…)
> *Some few of the windows of the houses are glazed, and have iron balconies; but the major part are without glass, and of these the balconies are enclosed by lattice-work; and no females are to be seen, excepting the negro slaves, which gives a very sombre look to the streets*

However, the urban *sobrado* was also thought to represent a turning point towards a less rigid domestic type, soon to predominate in the new residential neighbourhoods at the end of the century. Although erroneously considered to be a "seen-one-seen-them-all" representative of Brazilian urban middle and upper class homes (Vauthier apud Freyre, 1960), the urban *sobrado* described here has been considered an archtype of colonial dwelling in the literature

(Grahan, 1824; Freyre, 1960 / 1981; Jurema, 1971; Smith, 1975; Pinto, 1980; Oliveira & Galhano, 1986; Lemos, 1989; Verissimo & Bittar, 1999). Displaying volumetrical, geometrical and stylistic similarities throughout the country, these dwellings comprise a ground floor used for commerce, storage, and male slaves/servants accommodation, and upper floors displaying the traditional layout of a front room, a corridor bounded by windowless dormitories (*alcovas*) and a back room for eating and daily living, to which a kitchen could be attached in cases where there was not a second floor, or loft, used for various service-related activities and as female slaves/servants quarters.

However, in their apparent sameness, it was found that these dwellings present at least two distinct patterns of spatial organization that point towards distinct modes of social behaviour, particularly concerning the interface among inhabitants and between inhabitants and outsiders. One crucial configuration aspect is responsible for this distinction – the presence or absence of alternative accesses through the exterior, or the way the existing alternative accesses integrate the spatial structure (Trigueiro, 1994), so that it becomes considerably less rigid. The two versions tend to coincide with location in distinct types of settlements, the town centre and its surroundings.

Chroniclers – foreign and native – have it that in the surroundings of the town centres, that had special natural amenities (i.e. riverside) and were temporarily turned into summer resorts for spending the *festas* (Christmas, New Year and the period preceding Lent, as of the present-day Carnival), people indulged into a break in the seclusion and austerity of the urban life. Koster (1817:21-22), who enjoyed one of these seasons in a village near Recife reports:

> *Here the ceremonious manners of the town are thrown aside, and exchanged for an equal degree of freedom. Our mornings were filled up, either in riding to the* [sic] *Recife or in conversation at the houses of any of the families with whom we were acquainted; and the afternoons and evenings with music, dancing, playing at forfeits, or in dining with some of the English merchants, a few of whom had also removed to this place and its neighbourhood.*

The spatial logic of the urban *sobrado* may be summarised in a tendency to minimise the role of alternative outdoor routes; to centre the logic of encounters around the main reception room and to segregate the kitchen (and ancillary spaces) as much as possible, thus defining a social sphere diametrically opposed to that of service-related activities. Because the main reception room of colonial times is generally reported in the literature as a place predominantly used by the master of the house, often controlling access and/or visibility from the main entrance to all other spaces, it can be said that the urban *sobrado* is a male-orientated spatial complex designed to shield the family from contact with strangers.

The case represented by Vauthier (apud Freyre, 1960) in his letters about houses of Recife to his friend architect Cesar Daly illustrates the argument (Figure 6a). The access graphs translate the spatial structure accessed from the public space by the main entrance at the front facade and by alternative entrances. When the graph is re-worked to account for the structure perceived by different agents as they enter the house, very little is altered. The graph extends but one level deeper for a formal visitor. When the graph is quantified into integration values (not presented here) the exterior is always very segregated regardless of which entrance – front, back or both – is being considered.

In the *sobrado* situated in Olinda (b), another icon of colonial upper class residence in Brazil, distinct readings emerge from the redevelopment of the access graphs, when alternative routes to inhabitants – visitors, family and slaves/servants – are considered. When all accesses to the exterior are added, in the family route, the configuration alters with graphs becoming shallower or more compact than when the routes through the front or the back doors are worked out. The whole spatial complex becomes more accessible from the outside which becomes in itself a fairly well integrated space, whereas the average mean integration increases. This configuration flexibility was found to predominate in the analysis of a sample

of similar residential buildings, located in the outskirts (*sítios*) of Recife (c), then referred as *casas de sítio*.

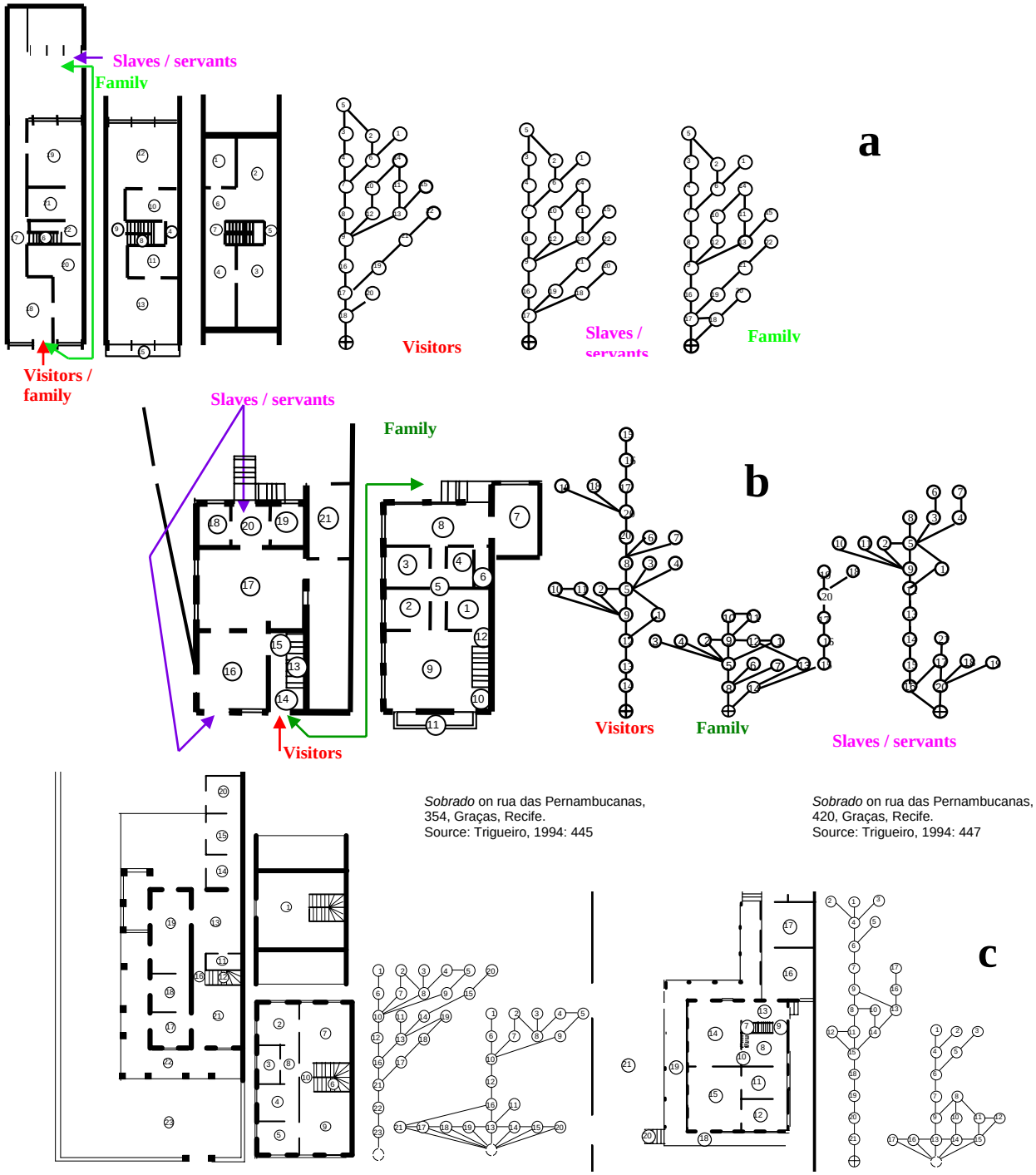


Figure 6: A comparative description of domestic spatial configuration as approached by diverse users in: an *urban sobrado* (a); an archetypal case of colonial living (b) and two *casas de sítio* (c) in the outskirts of town.

Nothing of the sort happens in the *sobrado* of central Recife. The addition of the exterior improves only minimally the integration in quantitative terms and the topological distance from the outside remains almost unchanged.

The acknowledgement of these two models of interface in colonial dwellings – one rigidly hierarchized, another allowing for distinct spatial "readings", regarding inhabitants and outsiders – settled the perspective for the analysis of patterns of change in post-colonial and modernist homes.

3.2. Post-colonial Homes

It seems that the type of interface prevailing in *casas de sítio* found full expression in the garden-city inspired suburban homes of newly developed residential neighbourhoods, now no longer temporary refuges for the *festas.* Encircled by terraces and gardens, all well protected by railings – some of which elaborated into art nouveau motifs made possible by the availability of wrought iron – these innovative building shells allowed for new modes of interface between private and public spaces, and not only in visibility terms.

The topological structure of a male/guests centrality versus a hidden-away women/children sphere seems to have become history, thus proclaiming the victory of one of the two coexisting modes of familial-social interface over another, here represented by the triumph of the *casa de sítio* over the urban *sobrado.* However, the old model, or else, the lighter side of the old model although present, does not exhaust all that is changing. A sketch of a new type of interface, not yet fully outlined, seems definitely in the air.

In apparent radical opposition to the homogeneous look of colonial houses, post-colonial, pre-modernist dwellings of the late 19th / early 20th century are multi-volumed, highly-ornamented, eclectic styled (displaying motifs affiliated to formal expressions that range from French neoclassical to Brazilian neocolonial through Alpine chalets and Victorian villas – Figure 7). This diversity of built shells often encapsulate a recurrent layout of two distinct sequences of cells (most intercommunicating), one of day rooms, the other of bedrooms along a central axis. They encapsulate two modes of articulation: (1) one that can be referred to as of *lateralité* (as found for Normandy farm houses by Hanson, 1998), with day and night activities developing in spaces located at different sides along a central axis; and (2) another of the front-back type, with the front day rooms accommodating the interface of inhabitants-visitors (adult family members of either sex), and the back day rooms accommodating that of inhabitants-servants.

They subscribe to an integration system centred on the dining room, with alternative routes playing a crucial role on the way the complex is permeated and contributing to level hierarchy among day rooms. The way these routes are organized seems to define a polarity between a family-plus-visitors versus a servants sphere, in some cases, and a three-partite structure of well defined sectors for each of these communities in others.

A subtle move towards smaller, more compact spatial arrangements is in progress not implying in less structuring nor in less opposition between the private world of the home and the public world of the street. Outdoor areas, shaped into gardens, patios, yards and a multiplicity of terraces, are firmly embedded within the private boundary, although they contribute to knit the whole system together, often presenting some of the most integrated spaces.

Outdoor routes and, in a lesser degree, the indoor circulation network are thus, crucial elements for achieving this increasing versatility and ingenuity in the articulation of the spaces used predominantly by some members of the household, which point towards the need not only to define the spatial interface among inhabitants and between these and outsiders, but also to restructure the family zone into day/night, company/privacy poles.

However, this model, although found in several post-colonial instances has still some way to go before reaching its fully fledged development, which will occur in the modernist domestic production of the 1950s and 1960s, which is thought to have played a decisive role in the building of a national identity by associating local traditions to the latest trends in the international urban scene of the developed world.

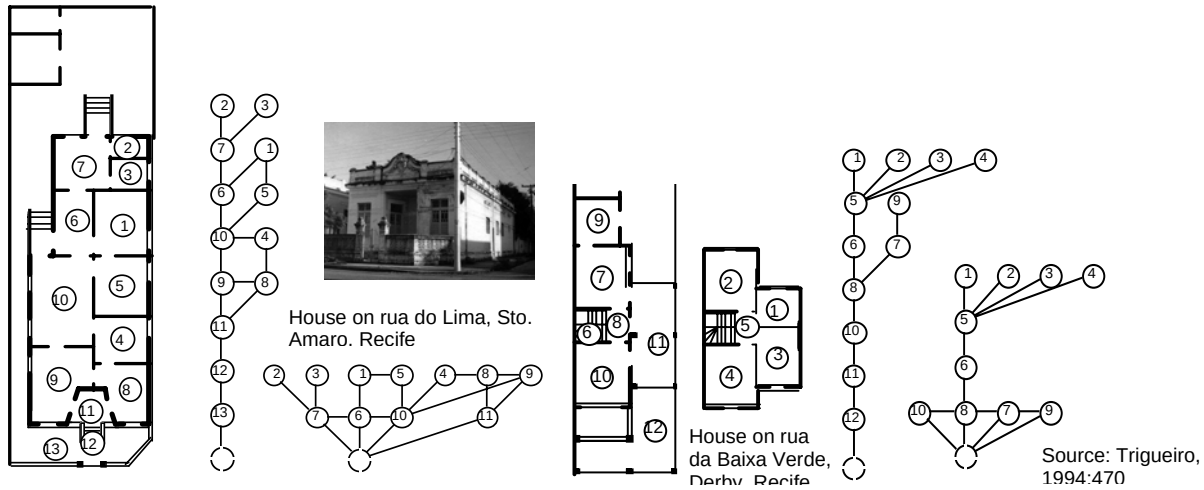


Figure 7: Spatial configuration in ost-colonial dwellings.

Despite national differences and the pervasiveness of traditional models it can be said that modernity brought about dramatic changes within the Brazilian home even if these changes did not go far beyond the social sphere of the "masters of the house", as has been discussed elsewhere (Marques and Trigueiro 2000)[6].

3.3. Modernist Homes

In Brazil the ubiquitous acceptance of the modernist formal repertoire, or at least of elements that derive from the basic formal principles of the International Style, is often referred to in the architectural literature. Contrarily to what happened in the countries where that movement originated, Brazilian built scenery began to alter fast as soon as the first icons of modernist architecture started to gain national visibility in the 40s and especially in the two following decades.

In most Brazilian towns – even the oldest urban centres of remote regions – the architectural ensembles retain, to the present day, unequivocal vestiges of a somewhat rapid self-devouring process evidenced by modernist bits and pieces added to built shells of colonial/eclectic constructions that appear mutilated in their original integrity in a sad 'frankensteinian' fashion.

Early republican times saw the first impetus towards an urban-orientated society that only found concretization after the 1930 coup that overturned the landed oligarchy in favour of new socio-economic forces, chiefly led by the interests of urban sectors.

Adopted by the architectural avant-guard, encouraged by progressist intellectuals and highly sponsored by the then dictatorial Vargas regime that had overthrown the First Republican period under lemmas based on fighting corruption, prizing labour and setting pace with the industrialised world, modernist cultural manifestations – from music to town planning – were regarded as means to achieve a new national identity, to which modern architecture and especially the international visibility of the Brazilian modern architecture is thought to have been crucial. The period also signals the impetus towards urbanisation that was consolidated in the 70s when the rural-to-urban population rate became inverted as compared to that of the early 20th century.

[6] The maintenance of a relatively segregated service sector with very segregated servants' quarters goes in the opposite direction of the radical re-structuring of the social and service spheres that happened in Europe and North America. Evidences of this process have been identified in British houses, as early as in the years following World War I (Trigueiro, 1997), with kitchens, previously situated in a segregating topological position, becoming the focus of the domestic scene.

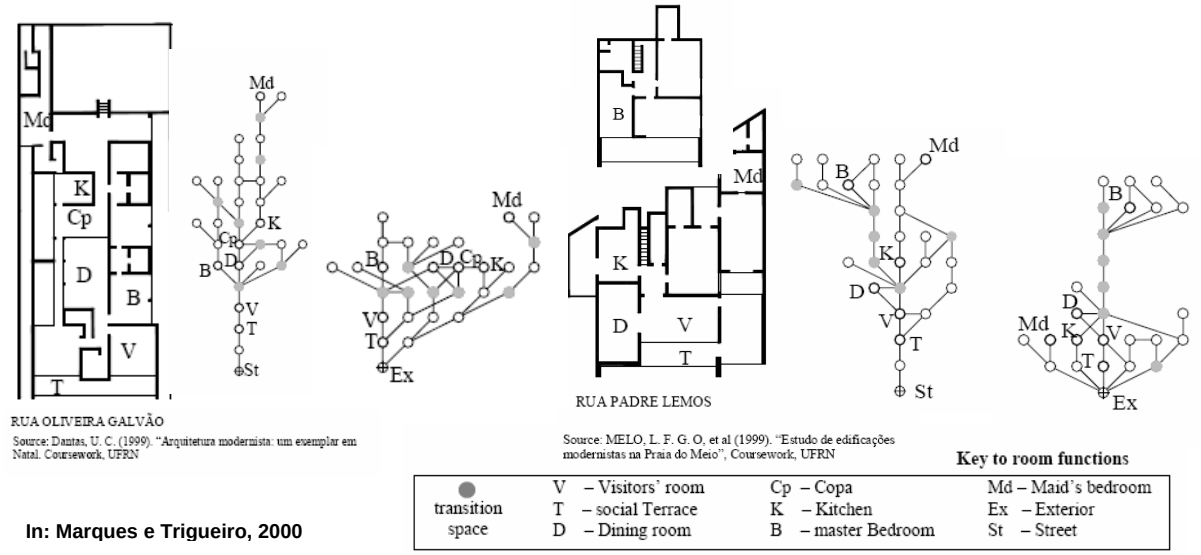


Figure 8: Spatial configuration in modernist houses.

This *look of modernity* – with its geometrical volume composition, naked surfaces, horizontal windows and fake flat roofs – goes little beyond skin surface, its true face being unveiled in the realm of domesticity, which preserves spatial relations that refer back to 19th and early 20th century, and even to colonial times and constitutes, in some aspects, quite the reverse of what had been prescribed in the early modernist discourse of the twenties.

Among the most resilient is the relative position of the servants quarters that had formerly occupied outer buildings and were then brought up inside to be accommodated under the same roof, but remain as segregated spatially as ever, insofar as they do not link to any other part of the domestic complex except through the service lobby that usually connects to the kitchen. The need to preserve the presence of family and visitors from that of servants determines, of course, the existence of a service entrance.

Recurrent patterns suggest that space continues, by and large, to be organised in ways that reproduce old types of interface among the communities of home users – masters, servants, visitors and the others. However, here and there, the emergence of certain spatial articulations points towards changing ways of life.

Among the novelties, three especially relevant aspects characterise early modernist domestic architecture and seem to be associated with: (1) environmental comfort requirements; (2) increasing demands for privacy; and (3) desire to manifest the house to the street (figures 8, 9 and 10).

Salubrity improvement and raised comfort standards made possible by the advance of technological and environmental knowledge is, of course, a feature of modernist architecture worldwide and shall not be discussed here. Discussion will therefore focus on the apparently contradictory moves towards more privacy and, at the same time, more openness of the house to the street.

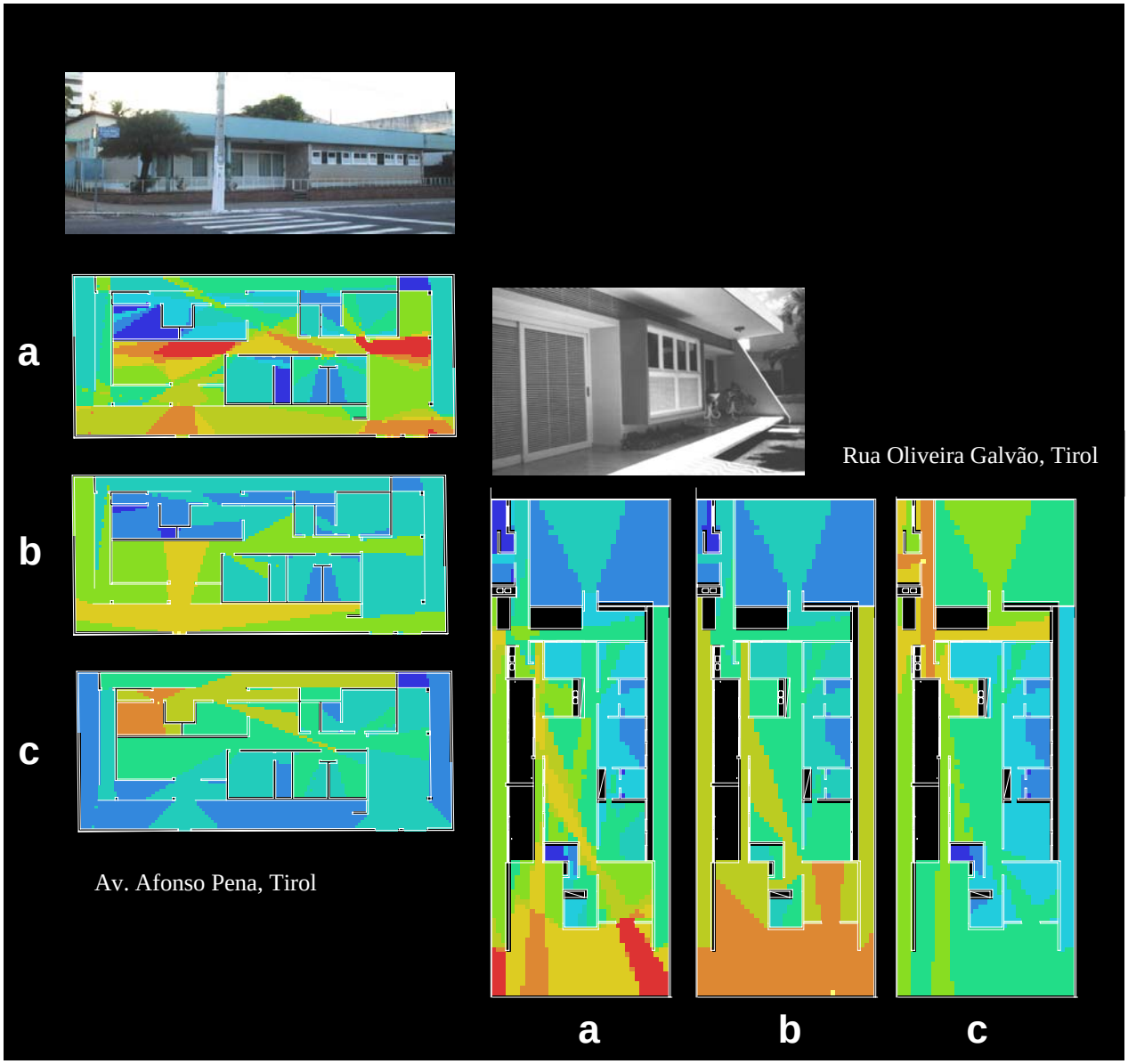


Figure 9: Visual fields in modernist houses: from all points (a), from the front door (b), and from the servants' quarters (c).

The move towards privacy is linked to the subdivision of layouts in sectors – social, service and private – which predominate in modernist houses and have inspired the notion of 'the sector's paradigm' (Amorim, 1999). In the private sector, bedrooms no longer intercommunicate, as had happened throughout the history of Brazilian domestic architecture, but become terminal spaces. These also tend to be self-contained units with private en-suite bathrooms and dressing closets. In the social sectors living rooms intercommunicate thus maintaining a traditional double role of functional and transitional space, inherited from pre-modernist residences but now the connections to the bedroom quarters are often permeated by halls and passages. Day living rooms, along with terraces, 'varandas' and 'pergolas', that multiply as compared to houses of previous times, play an important mediating role in the interior/exterior relations. Part of this social sector is directly or indirectly manifested to the street by opening completely onto the front garden and by way of large glass planes that allows passers-by to overlook interiors. Walls delimiting the borders between plot and sidewalk simply disappear or are reduced to a symbolic 50cm-high fence or railing structure. Contrarily to what happens in many societies (i.e. English), terraces, porches and similar open front spaces were then fully equipped with sitting – and, sometimes even lying (hammocks) – furniture to be used on a daily basis.

Figure 10: Modernist houses of Tirol and Petrópolis (former Cidade Nova).

The paramount role of the exterior can be perceived by the attraction it exerts in the whole complex, which becomes clustered towards the root of the access graph when all the entrances are considered, thus reinforcing a tendency sketched in the summer resorts of colonial times, and in the suburban residences of the early 20th century (figure 8), but also in the visibility graphs developed from all points to all points (figure 9a) and from the main entrance (figure 9b). In the former *VGA* display, the red, orange and yellow points show that visual integration concentrates from the “social” entrance to the exterior (besides the main circulation spaces); in the latter the strongest beam (orange) develops throughout most of the front façade overlooking the street. On the other hand, the visibility graph developed from the servants room (c) shows that the extension of highly visible spaces is encapsulated mainly in the service area, kitchen included, as well as in the open spaces of the back yard, again signalling a powerful role of the exterior, although only the hidden side of it.

4. An elusive honeymoon

In Natal, the nouveau relationship of direct and open interface among the building, its plot and the public space seem to bear interesting analogies with some spatial attributes identified in the grid configuration of around 1950, discussed earlier on in this article. A large proportion of these new morphological types were built on the most "integrated" streets. It, therefore, looks as if a newly-born "movement-orientated" configuration corresponded to a new "street-orientated" dwelling type designed to contemplate that movement and to take part in it.

However, this mid 20th century apparent honey-moon between the public milieu of the streets and the private sphere of domestic life seems to mark a new stage in a society eager to leave behind outdated built expressions of backwardness, without seriously compromising inherited social practices within the household. The desirable racket of society – in its mundane expression – and street life could be safely enjoyed with the family well protected in the private sector and the servants carefully hidden behind the kitchen back door.

The outward look of urbanity granted by the adoption of the modernism formal repertoire openly manifested to the street seems then to associate more with the need for status display than with expectations of a richer social life in terms of diversity and general opportunity, from a growing and prospering middle class that was rapidly turning urban (figure 10).

This was, however, a short-lived episode. The already deep social gap between "haves" and "have-nots" that would drive Brazil, at the end of the century, into the top rank of unbalanced wealth distribution, soon rendered streets dangerous places to be avoided whenever possible.

Modernist houses disappeared behind high walls or were demolished to give way to tower buildings well protected by bunker ramparts, electronic apparatus and security guards into which the upper classes have been moving to this day. The well-integrated grid structure of the area also stimulates the transformation of remaining houses into commercial/service units.

Few of the cases illustrated here are still being used as residences, most have been disfigured in re-use conversion or flattened to the ground to give way to tower bocks. Those few are, therefore, some of the very last survivors of an extinguishing lineage and, as empirical observation of other Brazilian towns suggests, of an ephemeral national dream of *urbanity*.

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