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R. Canuto, M.L.C. Nóbrega, A. Sena*Catholic University of Pernambuco, Brazil, Recife-PE**e-mail: robsoncanuto.arq@gmail.com, lourdinha_@hotmail.com, andreynasena@gmail.com***CAMPUS AND CITY: THE ROLE OF PILOTIS
AS A SOCIAL INTEGRATOR AT THE CATHOLIC
UNIVERSITY OF PERNAMBUCO, RECIFE, BRAZIL**

Abstract: *This study aims to investigate space configuration factors that promote patterns of pedestrian movement and social interactions in the campus of the Catholic University of Pernambuco, located in Recife, in the Brazilian State of Pernambuco. The campus consists of four large urban blocks and a number of modern buildings with pilotis, which configuration facilitates not only pedestrian movement through the urban blocks, but also various other types of activity. The methodology is based on the Social Logic of Space Theory, better known as Space Syntax. The study is structured in three parts: (1) The urban campus, which presents an overview of the evolution of universities and relations between campus and city; (2) Paths of the urban campus, which presents a spatial analysis on two scales (global and local); and (3) The role of pilotis as a social integrator, which discusses the socio-spatial role of pilotis. Space Syntax techniques (axial maps of global and local integration) was used to shed light on the nature of pedestrian movement and its social performance. The pilotis were found to play a fundamental role in integrating the city and the campus and are responsible for attracting urban rather than educational activities.*

Keywords: *public space, urban campus, space syntax, urban morphology.*

Introduction

Founded in the 1950s, the campus of the Catholic University of Pernambuco (UNICAP) is located in the city center of Recife, a city in the Brazilian State of Pernambuco. The campus acts as an attractor of people, especially during working days. The intense flow includes students, members of the staff and, particularly, vendors, who provide support services such as photocopying, restaurants and stationery in the surrounding area. The campus, thus, serves to promote commerce and services.

The area in which the urban campus is located is well served by public transport (especially buses) as well as historic buildings dating back to the first centuries of the settlement of the city. However, its drawbacks include issues related to urban walkability, mainly because it is difficult to take enjoyable, safe, comfortable and interesting walks, which according to J. Speck are essential factors in a walkable city (Speck, 2016).

In this context, it has been argued that the presence of the campus necessarily contributes to the promotion of good patterns of walkability, in particular because of its functional and morphological attributes. It is an open and permeable campus, providing pedestrian short cuts in this part of the city. In fact, the campus helps to provide a more walkable urban fabric by integrating the local street network through an open ground floor, thereby helping to foster urban life and various types of social and commercial interaction.

As a way of helping to establish a more walkable urban fabric, this article, thus, investigates space configuration factors that restrict or promote patterns of pedestrian movement through the local urban fabric. Methods for observing pedestrian movement and techniques for describing space were applied to understand the relationship between spatial configuration and patterns of movement. The methodology is based on the Social Logic of Space Theory (Hillier et al, 1984),

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so-called Space Syntax. This theory presupposes that “*a primary property of the form of the urban grid is to privilege certain spaces over others for through movement*”, which Hillier et al (1993, p.9) call “natural movement”. According to B. Hillier, “retail land uses are then located to take advantage of the opportunities offered by the passing trade and may well act as multipliers on the basic pattern of 'natural movement' generated by the grid configuration” (Hillier, 1993:16). Urban grids are thus structured to create a kind of probabilistic field of interpersonal encounters – a “virtual community” that potentially exists, even though it has not actually been realized (Hillier, 1989:29).

Space Syntax thus enables us to understand the spatial configuration of the campus, as well as patterns of natural movement through its space. The article is structured in three parts: (1) **The urban campus**, which presents an overview of the evolution of universities and the emergence of the urban campus; (2) **Paths of the urban campus**, which presents spatial analyses of the campus of the Catholic University of Pernambuco; and (3) **The role of pilotisas an integrator of space**, which discusses *pilotisas* integrators of social and commercial practices.

Urban campus. From college to urban campus and the types of university spaces in Brazil

Etymologically, the word *university* comes from the Latin *universitas*, which refers to the association of students. Over the centuries, this expression came to refer to both students and teachers. According to Kohlsdorf, “the earliest document in which the word appears with the same meaning is the *Studium Generale* signed by Pope Innocent III, in 1208, in Paris. Later, the word *university* became commonly used to refer to educational institutions for higher education in the highest sphere” (Rodriguez, 2007:8).

According to (Rodriguez, 2007), the first universities emerged in the 12th century and, undoubtedly, Bologna (1158) and Oxford (1167) were the pioneers. Between the 13th and 14th centuries, twenty-nine European universities were founded: Paris (1200), Valencia (1208), Cambridge (1209), Salamanca (1219), Toulouse (1229), Lisbon (1288), Coimbra (1308), Rome (1303) and Cologne (1389). Most of these universities merged into the urban fabric of their cities. In this period, one of the most predominant archetypal forms of university spaces was *college*, a court building composed of a cloister and a church built into the urban fabric. In the 19th century, in the context of the Industrial Revolution and the development of science, the *college* archetype was rejected in favour of isolated palatial buildings, which were better able to accommodate the various sciences. This new structure is better known as a *campus*. The University of Virginia, in the United States of America, designed by Thomas Jefferson, is considered a pioneer of this new model of spatial organization of university institutions (Rodriguez, 2007: 8). In the twentieth century, with the emergence of Modern Architecture, a new type of university space (*the modern campus*) emerged. It is clearly inspired by Garden Cities and basically characterized by enclaves of modern buildings (under *pilotis*) dispersed into large open green areas set apart from the city. Infact, the modern campus was strongly influenced by the principles of modern urbanism advocated in the Charter of Athens (1933) and gained particular ground in South American cities.

All three models of university spaces (*college*, *campus* and *modern campus*) are frequently identified in the literature. For instance, Canella (1968) also recognized three main types of organization according to the countries where it emerged: “(1) English universities, built under the quadrangular pattern which expands itself and influences the life of academic community; (2) American universities, that established the concept of an anti-urban campus with a self-sufficient structure, a clear definition of public and private spaces, and a sectorization of activities in specialized areas; (3) Latin American universities, which constructed the university space within the scope of a socially segregated system and a mentality of isolation of the university population, by locating their activities in areas of expansion of the city” (cit. Rodriguez, 2007).

In Brazil, the first institution dedicated to higher education was the Royal Military Academy, founded in 1810 by D. João VI. Thereafter, various higher education institutions were established

in existing buildings located in central areas, along important roads and public spaces of the city. As H. Segawa notes, Brazilian universities were born "from the aggregation of isolated units, each with functions usually adapted within buildings that were not properly designed to host higher educational institutions". However, between 1910 and 1930, Brazilian higher education experienced successful reforms, which significantly contributed to the foundation, in the 1920s, of the first university, the University of Rio de Janeiro, the campus of which was designed basing on modernist principles. According to H. Segawa, "with the foundation of the University of Rio de Janeiro other Brazilian universities emerged, such as the universities of Minas Gerais (1927), São Paulo (1934), Pernambuco, Bahia (1940s), Rio Grande do Sul, Paraná, Pará and Paraíba (1950s)". Likewise, "private universities of religious origin also emerged in various Brazilian capitals between 1940 and 1950" (Segawa, 2002: 174 – 175).

In fact, the spatial configuration of most Brazilian universities was heavily influenced by the principles of the Garden City, especially those designed and built between 1940 and 1960. According to Macêdo the modern campus in Brazil is fundamentally based on three types of organization: "(1) the *nuclear type*, inspired by the Garden City scheme, such as Lúcio Costa's proposal for the University of Brasília (UNB); (2) the *grid type*, in which a cartesian network is a fundamental reference for the territorial organization of the campus as a whole, as is the case with the University of Amazonas; and (3) the *linear type* based on the linear city model, which provides a central axis for circulation and support infrastructure, as proposed for the Federal University of Rondônia: (cit. Rodriguez, 2007: 11 – 12).

The Catholic University of Pernambuco as an urban campus

The Catholic University of Pernambuco is a private university, with the campus established in Recife in the 1950s, as the result of the policy of creating colleges and universities introduced by the Catholic Church between 1940 and 1950. Initially, the university campus occupied buildings belonging to the Nóbrega Lyceum and, then, urban blocks in the surrounding area. In the 1960s, UNICAP received the Lyceum of Arts and Crafts and the Archdiocesan College, which guided the direction of its expansion. Over the 1960s, 1970s and 1980s, the university structure was constantly expanding and a number of improvements were introduced, such as the construction of a central library, parking lot, sports facilities and restoration of colonial building – a cultural center known as *Casarão Rosado*. (Cabral, 2013). Like the first European campuses, UNICAP was, thus, integrated into the urban fabric of the citycenter. For this reason, it adopted the slogan "*Our Campus is the City*" (Cabral, 2013).

The campus now occupies an area which corresponds to precisely 94,498m² and houses a number of different types of buildings, which coexist within its urban structure. These include modern pavilions with *pilotis*, colonial buildings and churches.

The campus has in fact grown according to its functional demands, by occupying pre-existing building or by adding new facilities to support academic, administrative and infrastructure needs. This has resulted in a complex structure that occupies four large urban blocks, composed of buildings, patios, gardens, parking lots, leisure spaces and passages and pathways. These pathways connect different spaces of the campus and establish shortcuts through the urban fabric. There is also an interior structure of formal and informal routes, which prioritize access to numerous faculties and academic centers through internal patios and gardens, rather than streets and other public spaces, as can be seen by comparing Nolli maps (Fig.1, 2 and 3).

These observations and three models of the university (linear, mesh and nuclear) as defined by Macêdo (cit. Rodriguez, 2007: 11 – 12) thus suggest that the campus of the Catholic University of Pernambuco belongs to the fourth type of campus, a *mixed type* (or an urban campus) – much more closely integrated into the urban fabric. The *mixed type* includes some of the qualities of *mesh type* (because it takes advantage of the urban fabric to locate its spaces) and some attributes of *linear type* (because it takes advantage of the axes available for location of its buildings). It can also be said that the urban campus plays a fundamental role as an articulator of

the urban fabric and as a facilitator of pedestrian movement through the urban fabric. As a further way of shedding the light on the patterns of pedestrian movement, the present study sought to develop a configurational analysis of the campus pathways divided into two parts: (a) configured paths, which presents syntactic analysis of the spatial configuration based on Nolli maps of the campus in 1970 (corresponding to the period of expansion of the university) and 2017 (its current state); and (b) created paths, which provides an analysis of predominant pedestrians flows, captured by local observations.



Figures 1, 2 and 3. Nolli maps of the urban university blocks (1970 and 2017) and satellite image (1970)

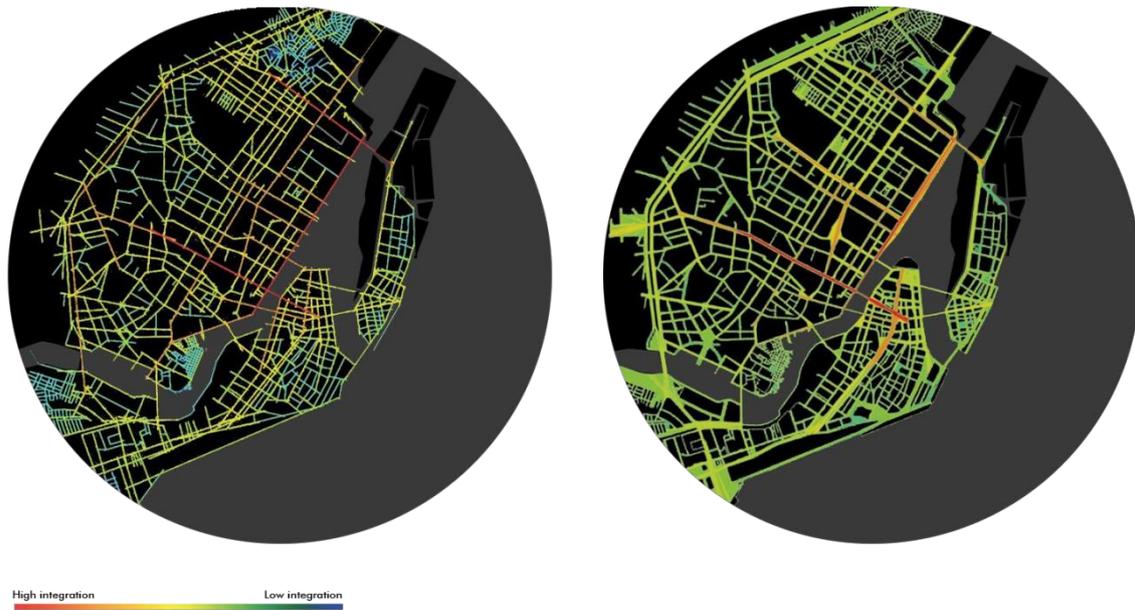
Paths in the urban campus. Configured paths: spatial analysis of the campus (at global and local levels)

At the global level, the UNICAP campus is located in Recife city center, on which public transportation in the city converges. This area is characterized by a large number of bus routes and itineraries for the Metropolitan Region of Recife Public Transport Service users. According to the PelópidasSilveira City Institute, in 2011, nearly 75% of the total number of bus routes in Recife directly accessed the city center. This produces a predominantly radial-concentric system, with a low density of bus routes on the periphery and a high density in the city center.

In view of this, a large flow of people also converges in the city center. The area is constantly full of people and is famous for this, particularly on working days (Monday to Saturday). People come from different parts of the city (districts and metropolitan region) for many purposes: working, studying, shopping or, simply, entertainment. The flow of pedestrians is intensive, especially along public transport corridors, such as Conde da Boa Vista, Norte and Cruz Cabugá Avenues.

From a syntactic point of view, these corridors are the major integration routes and comprise the integration core that contains 10% of the most integrated axial lines of the system (including the districts of Recife, Santo Antônio and São José). This core is located roughly between Conde da Boa Vista Avenue (whose integration value is 1.90934) and Miguel Arraes de Alencar North Avenue (1.77901), where the mesh demonstrates a high degree of axiality. These routes are also the main axes of articulation between the continental and insular portions of the city. The core also contains Cruz Cabugá Avenue (1.74655); Rua Gervásio Pires (1,78789); Rua da Aurora (1.88085); Rua Dr. José Mariano (1,75862); Rua da Imperatriz (1,69333); Rua Princesa Isabel (1,62804); Rua da Fundação (1, 66476); Rua João Lira (1,72567); Rua do Hospício (1,75161); and Mário Melo Avenue (1,71983).

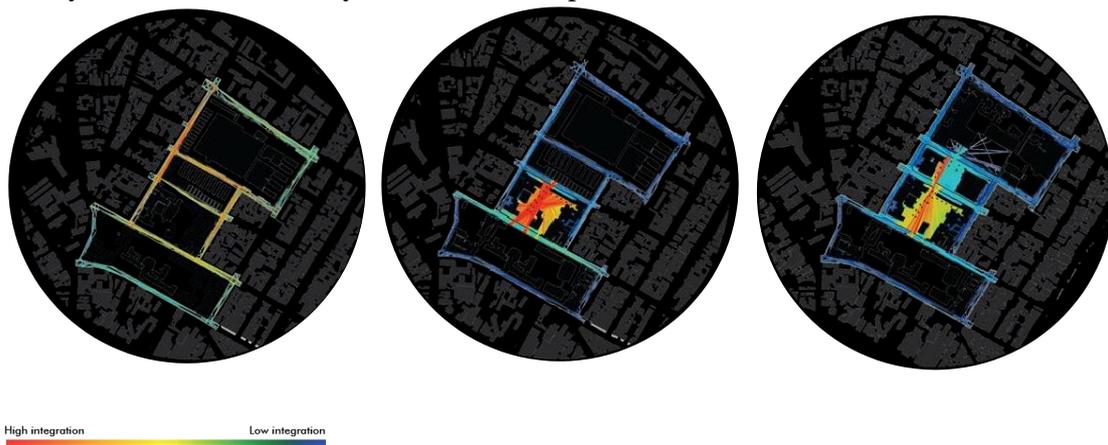
The Catholic University of Pernambuco is a part of the integrated core of the city center and plays an important role in articulating the city's urban fabric. This articulation can be seen from the global integration map. (Fig. 4 and Fig. 5). The integration level of the city center varies from a maximum of 1.9093 to a minimum of 0.6158, with a mean of 1.26025.



Figures 4 and 5. Axial map and all-lines axial global integration map

On the local level, the Catholic University of Pernambuco plays an important role in facilitating pedestrian movement through the urban fabric. Patios, squares and a wide range of empty spaces between buildings, as well as spaces generated by the *pilotis* of many modernist buildings in the urban blocks, promote internal pedestrian movement by students, university employees and passers-by.

In order to identify patterns of pedestrian movement defined by the spatial configuration of the campus, three all-lines axial maps were created using DepthmapX (Fig. 6, 7 and 8). The maps correspond to the morphological features of the campus in 1950, 1970 and 2017. The first map (1950) presents a configuration heavily dependent on the streets as agents for facilitating the accessibility of various university faculties and departments.



Figures 6, 7 and 8. All-lines axial maps of the Campus in 1950, 1970 and 2017

In this configuration, the streets are protagonists, especially those with a high level of integration: Rua do Príncipe, Rua Afonso Pena and Rua do Lazer (the streets marked red in the map). The second map (1970) shows a significant change. Open gates located at various points in the urban block allow pedestrians to cross it. Consequently, the role of streets declines in favour

of internal paths (which become more integrated and red on the map). In this scheme, spaces defined by the *pilotis* of various buildings facilitate the access to a larger number of internal spaces, which become much more integrated (or red in the map), while the levels of integration of the street diminish significantly (blue spaces in the map). The third map (2017) illustrates the current configuration, which consolidates a system highly dependent on the internal structure as the main agent for promoting access to the various spaces of the campus. In this scheme, the integration axis (red spaces) traverses two blocks and interconnects them.

It is therefore clear that *pilotis* have promoted accessibility through the internal structure of the campus rather than direct access from the street. To confirm this hypothesis, observations have been made *in loco* by capturing and registering the movement and flow of people. The purpose of this is to identify the paths created—informal paths spontaneously created by pedestrians on the campus—and, then, to evaluate extent of the spatial analyses.

Created paths – observation of socio-spatial patterns

a) Observation and registration of pedestrian movement and routes: Eighteen strategic points have been selected for observation and registration of routes. These points correspond to the places that people use to walk through the campus. Most of them correspond to building entrances or gates located at the edges of the existing urban blocks. An observation area corresponding to the immediate surroundings of the UNICAP has then been drawn up. Eighteen students have positioned themselves at the specific points on working days and followed four people. People have randomly been chosen to be followed, regardless of whether they are entering or leaving the campus. Their trajectories have been registered on the map as a way of visualizing the chosen routes. (Fig. 9 and 10). The data has been recorded at 3:00 p.m. (a period of moderate movement time) and at 6:00 p.m. (a period of intense movement) precisely. These observations revealed that, on the UNICAP campus, during periods of both moderate and intense movement, a significant number of people opt for internal routes to the detriment of the peripheral ones, with the exception of a few passers-by who appeared unaware of the existence of internal routes. These internal routes suggest a connection between Conde da Boa Vista and Visconde de Suassuna Avenues, crossing the campus.

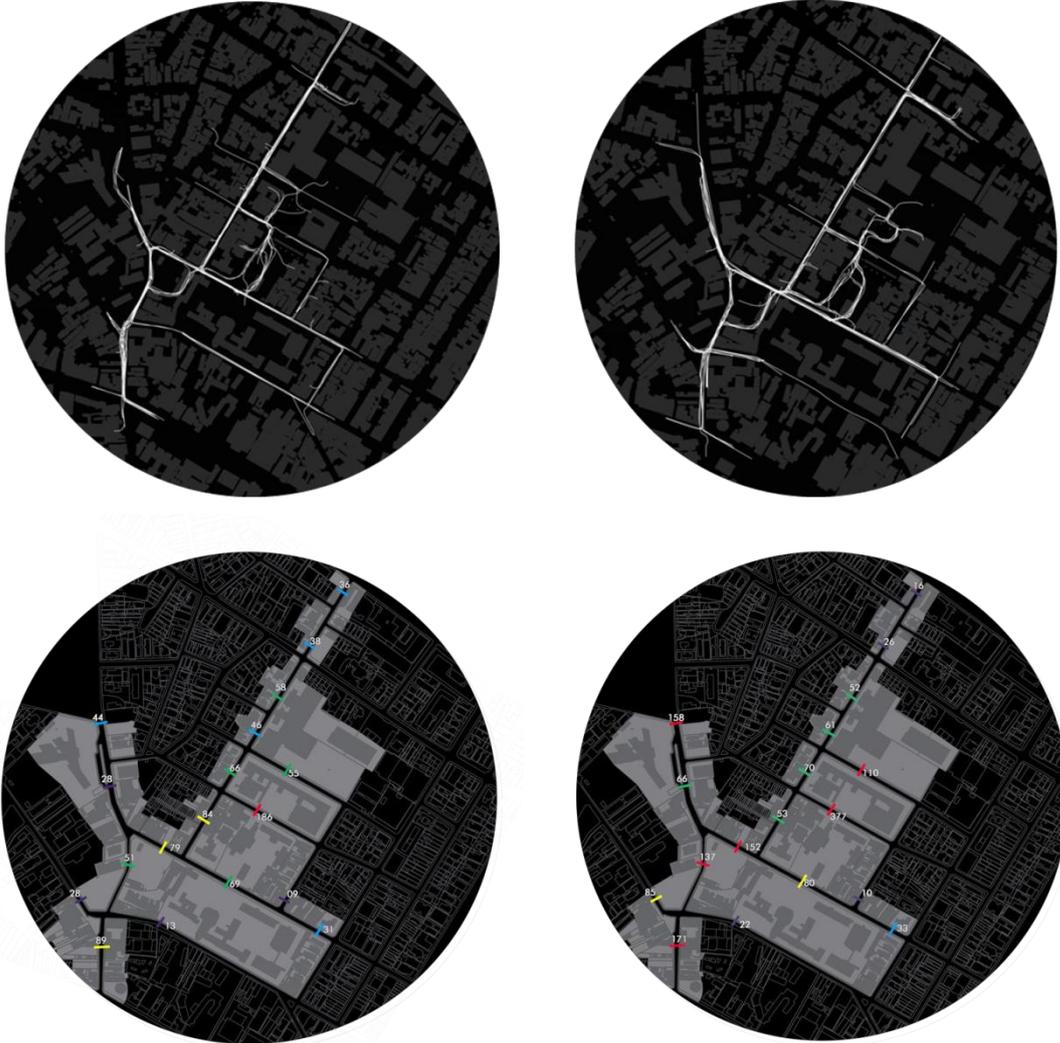
b) Observation of pedestrian flows: The observation of pedestrian flow has been based on people counts. At the same periods of time, precisely 3:00 p.m. and 6:00 p.m., for five working days, students and volunteers have been positioned on 18 strategic points (gates) to spend five minutes counting the number of passers-by who are crossing these gates. These data have then been converted into tables, charts and maps, which have revealed a huge flow of people at Rua do Lazer, approximately 40 per minute at 3:00 p.m. and roughly 75 per minute at 6:00 p.m. In fact, these figures reflect the intersection between peripheral and internal flows on Rua do Lazer. It is noteworthy that, at 6:00 p.m., the gates with the largest flow of people corroborate the internal logic of pedestrian movement. This is evidenced by the heavy flow circuit (more than 100 people per minute) running from Rua da Soledade (171 and 137), crossing Rua do Príncipe (152) and Rua do Lazer (377), and Rua Almeida Cunha (110). (Fig. 11 and 12).

The heavy cross-flow found on Rua do Lazer and Rua Almeida Cunha attests to the high level of integration of internal routes. This could, however, be improved further by strengthening the axiality of these routes by the way of interventions such as removal of barriers. The existing barriers (such as fences, walls, gates, parking lots and other types of obstacles) do not only restrict natural movement but also slow it down, since people have to walk greater distances to reach their destination. Removal of these obstacles could, thus, increase walkability and improve the city.

The role of *pilotis* as a space integrator

On the UNICAP campus, the *pilotis* provide a space that not only facilitates pedestrian movement through the blocks, but also integrates spaces for social, academic and commercial activities. Students, teachers and members of the staff are protagonists of the *pilotis*.

People are often seen talking, studying, shopping, eating or attending events such as exhibitions, concerts, conferences and bazaars. In fact, commercial activities have gradually been incorporated into the UNICAP campus, many of which are established near the *pilotis*. In recent years, they have made the university slogan "*Our Campus is the City*" a reality.



Figures 9 and 10. Maps of pedestrian movement at 3 p.m. and at 6 p.m.

Figures 11 and 12. Maps of flow of people at 3:00 p.m. and at 6 p.m.

The presence of commercial activities shows that the functions of the city and the campus merge completely in this space, making the campus much more economically dynamic and integrated. The *pilotis* make social and commercial practices (meeting and exchanging) possible. According to H. Vargas “for the establishment of commercial exchanges, meeting is necessary. And commercial exchange will not only be of goods, but also ideas, words, experiences and sensations. And this exchange... cannot be established without a physical space ...[...]...the need of meeting for the materialization of exchange will lead commercial activity to look for places that are more conducive to this encounter, which coincide with the crossing of flows of people or with places where other social activities occur for various purposes: religion, politics, entertainment and culture” (Vargas, 2001).

Things are no different at UNICAP. Commercial exchange commonly occurs along the routes promoted by the *pilotis* near them, as can be seen from the emergence of various retail outlets in these spaces, including bookstores, boutiques and a stationer's, as well as various types of services (restaurants, kiosks and photocopying services) (Fig. 14, 15, 16, 17 and 18). The syntactic attributes of space, thus, help to establish commercial exchange and value is assigned according to the logic of the flow of people and goods. Hence, the appropriateness of space is also relevant to this process. In fact, it is a necessary precondition for it.



Figure 13. Aerial view of the campus and pathways



Figures 14, 15, 16, 17 and 18. Several types of commercial activity in the campus.
 Photos: Maria de Lourdes da Cunha Nóbrega, Bárbara Campos and Marcos Vinícius

Conclusions

Spatial analysis and observation of the social use of space has identified different patterns of pedestrian movement within the campus and its relations with commercial uses. These patterns demonstrate that various kinds of access through the existing gates promote the use of internal pathways, which is a positive factor for the fluidity of pedestrian movement and the articulation of the street network. This integrates the campus and city and could be improved further.

These findings may contribute to the future development of urban design guidelines for the university space and its surroundings. One possible guideline is consolidation of more pedestrian pathways within the urban blocks and one probable alternative is to expand routes through the adjacent urban blocks, in order to establish more alternatives of movement between the campus and public transportation corridors, such as Conde da Boa Vista Avenue. This will have a positive impact in terms of the local urban space integration, as many students and members of the staff arrive via these corridors.

Based on the hypothesis that opening certain barriers can improve local walkability, the routes have been simulated by removing existing barriers to the movement of people. Three possible infiltrations of pedestrian pathways were proposed in the urban block of the Nóbrega Lyceum. These aim to consolidate the pedestrian connections between Conde da Boa Vista Avenue and UNICAP by internal routes. The results have indicated a slight improvement in levels of local integration in all three simulations.

It can be concluded that more alternative internal routes can be created to promote smoother pedestrian flow through the urban space. This strategy would integrate blocks, where existing walls, fences and other obstacles limit the movement of people. The infiltration through the blocks will not only make the circuits more efficient, but also increase urban vitality and boost local economy.

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