THE SEQUENTIAL DEVELOPMENT AND CONSEQUENT URBAN PATTERNS

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Abstract
The central objective of this paper is to understand the form and performance of a city through a spatial network perspective. The study focuses on Bucharest, a city built in distinct historic phases, facing present regeneration initiatives. The paper revisits previous hypotheses of the evolution of the urban grid, based this time on configurational differences and similarities between cities, previously studied by Hillier et al. (2001), Karimi (1998), and Jacobs (1993). On the background of the overall pattern of evolution of the city, this paper investigates the relationship of distinct central clusters: the Civic Centre, major intervention implemented in the 1980’s as a reflection of the political regime, the Historic Core and the modernist Victoriei Boulevard. The results were interpreted in light of the overall usage patterns which show a poor performance of the Civic Centre as a public space, contrasting the lively historic city centre. Recognisable urban clusters were first depicted by metric accessibility analysis. The study also examined visibility conditions and movement potentials. Syntactic analysis of their structures illustrates the functional implications of spatial modelling decisions and allows in the end to objectively question the future development potential aiming at joining together the distinct clusters with minimum change, keeping their distinct identities yet supporting the functionality of the system as a whole.

Introduction
The research was motivated by the idea that the transformation of a territory, as Bucharest is undergoing during the past decade, has stronger chances to be carried out effectively if it is guided by a prior understanding of its structure and performance. This paper aims to bring a spatial network perspective over this difficult task. The study developed a hypothesis of the evolution of the city reflected in its spatial configuration. Three different stages in its development were analyzed addressing the problem from a specific spatial point of view, based on the regional city typologies developed by Hillier et al. (2001): the medieval city (1852), the modernist period around 1935, before the communist systematization plans, and the most complete and recent record of the city from 1995. Then the analysis has focused in further detail on the relationship of three distinct central clusters

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aiming to explain their overall functionality as a product of their spatial configuration. The difference between the areas was quantitatively measured through their metric properties, visual permeability and spatial structure potentially influencing their functionality. The study was related to conjectures previously developed by Jiang and Peponis (2005), Savic (1994) and Jacobs (1993). A basic interest for solutions to improve the central area of Bucharest will be addressed at the end of the analysis.

Development Hypothesis

Bucharest was repeatedly portrayed as a city between Orient and Occident, formally and functionally. First documented in 1459, the post Byzantine city grew concentrically, without the enclosure constraint, determining a diffuse structure compared to oriental cities as Constantinopoli. The occidental model can be traced back to the period dominated by French cultural inspiration when the irregular plan of Bucharest has been systematized (1895-1899). A major change occurred in the communist period (1945-1989) when the planning reflected the main ideas of the regime: control, uniformity, density and centralised economy and big scale interventions in the city centre meant to display power and solidity.

Syntactic analysis was used to assess the evolution of the city. It has shown that until the mid 20th century the city has evolved from a more irregular, deeper, organic structure in between Oriental and UK typology, towards a shallower configuration, more integrated and more intelligible than average traditional European cities. Syntactic measurements then clearly revealed that the direction of evolution was shifted in the second half of the 20th century. The intelligibility of the city has been brought down, becoming a deeper and hierarchical structure similar to Arab cities.

Central structures analysis and discussion

The co-existence of dissimilar clusters from different periods was then investigated focusing on the Civic Centre, major intervention of the communist urbanism, Calea Victoriei, modernist boulevard realignment, and the adjacent remaining of the Historic Core. The magnitude of the change from one urban development pattern to another was discussed looking at morphologic and metric characteristics, visual experience and their syntactic properties.

In 1980-1989 an area of 485 ha was demolished, replaced by an arbitrary axis meant only to emphasize the imposed totalitarian symbol, living an urban hole, interrupting the coherence and density of the city centre. The remaining historic core is a maze of narrow routes, which has always hosted a vibrant commercial and leisure activity. Mostly in a state of disrepair, its value resides in the continuous typology of buildings with commercial premises on the ground floor and two-three residential floors. Exposed interfaces between residents give the passer-by the feeling of being in a private courtyard.

Table 1: Syntactic measures for Bucharest (1852, 1953, 1995) and average values for different regions [Hillier, 2001]

<table>
<thead>
<tr>
<th></th>
<th>Conn</th>
<th>Global Int</th>
<th>Local Int</th>
<th>Intell</th>
<th>Synergy</th>
<th>Mean Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-1852</td>
<td>3.97</td>
<td>0.73</td>
<td>2.23</td>
<td>0.16</td>
<td>0.24</td>
<td>8</td>
</tr>
<tr>
<td>B-1935</td>
<td>5.23</td>
<td>1.25</td>
<td>2.89</td>
<td>0.37</td>
<td>0.71</td>
<td>5</td>
</tr>
<tr>
<td>B-1995</td>
<td>4.16</td>
<td>1.08</td>
<td>2.26</td>
<td>0.20</td>
<td>0.50</td>
<td>7</td>
</tr>
<tr>
<td>European</td>
<td>4.60</td>
<td>0.91</td>
<td>2.25</td>
<td>0.26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arab</td>
<td>2.97</td>
<td>0.65</td>
<td>1.61</td>
<td>0.16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UK</td>
<td>3.71</td>
<td>0.72</td>
<td>2.14</td>
<td>0.23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>USA</td>
<td>5.83</td>
<td>1.61</td>
<td>2.95</td>
<td>0.55</td>
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</tbody>
</table>
The atmosphere as well as the urban form end abruptly behind Unirii Boulevard (the Civic Centre). The winding tight roads are replaced by a 100m wide, 3 km long avenue, limited by twelve storey buildings, at one end terminating with the Palace of the People in a grandiose public space which functions as little more then a car park and at the other with a large roundabout. Albeit the prime tourist attraction it lacks the typically central pedestrian activity. There is constant automobile traffic, yet the commercial spaces at the ground floor of the tall residential buildings are constantly failing and under refurbishment. On the other side of the boulevard as in a mirror image, a similar variety of the old city can be found.

The study attempted to objectively analyse the visual experiences along routes and public spaces in the central areas. The areas and shapes of visual fields in intersections and along routes in the different areas were compared showing an expected variation in scale between the Historic core and the modernist development, and a striking distance to the values for the Civic Centre.

<table>
<thead>
<tr>
<th></th>
<th>Old centre</th>
<th>Calea Victoriei</th>
<th>Civic centre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Isovist surface(m²)</td>
<td>6,017</td>
<td>19,271</td>
<td>444,718</td>
</tr>
<tr>
<td>Spreading directions</td>
<td>17</td>
<td>11</td>
<td>6</td>
</tr>
</tbody>
</table>

Lastly, combining the two previous points, the density of axial lines that each isovist area intersects was calculated for the visual fields of each intersection drawn earlier. The strength of this measurement would lie in the fact that it can describe the possibilities of movement being also influenced by the variety of angles of incidence, thus involving more then the pure connectivity of a line.

The averages are calculated to 1line/1,000m² for the area of the old centre compared to 1line/13,870m² for the isovists along Unirii Boulevard, explaining that many more directions (choices) can be seen in the spaces in the medieval street system compared to the civic centre. This attempts to explain the ability of a street to keep the passer by interested. Oppositely along the boulevard one may expect to reach a lot of destinations according to the size of the visual field, yet that is not possible.

It is known that metric characteristics of the grid are essential in the case of central areas. Streets which can be accessed at every 100m or even less afford a dense pedestrian activity [Jacobs, 1993]. Such is the case of naturally evolved centres as the Historic Core. Reversely in the case of the Civic Centre the intersections only occur at around 400–500m in the shape of large roundabouts. A totally different example, though often compared to, is Paris where Haussmann
introduced a much more successful network of major axis in a structured environment nevertheless establishing a rigorous continuity of the existing urban fabric is maintained, at the cost of the sizes and shapes of the blocks resulting in much denser intersections.

Different areas in terms of their metric characteristics could be depicted by the measure of metric accessibility at different metric radii. It was noticed that the main routes organically developed in the historic city lie inside the differentiated areas at any scale. Similarly the modern boulevards have segments that are integrated within convex areas. The Unirii Boulevard at all the scales of the analysis, but the global scale, lies in between different areas at the north and south of it. That stresses the way that the boulevard relates to all its surroundings without being able to join together in the wider system.

Amongst the syntactic measures, the destination analysis indicating the centrality potential of an area picks up at a global scale the modernist boulevards as well as the eastern part of the communist boulevard and the arteries encircling micro-districts, and secondly the historic core. As the analysis focuses on a smaller radius the communist boulevard is no longer highlighted and the integration is pulled towards the modernist boulevards and the historic core. This could mean that the Civic Centre has a potential to function as it was created benefiting representative functions that refer to the whole city and some specialised retailers. But at a more localized scale it looses its centrality potential, explaining why in its current configuration it can
not serve functions of a locally active (pedestrian) centre. This is not the case for the modernist boulevards which are working as both local and global centres, and that can be confirmed by their active usage.

The supporting structures of each of the areas were then analyzed as proven relevant by previous studies [Hillier, 1999; Campos, 1997]. The catchment areas were determined according to a two step logic known in Space Syntax theory. The investigation shows that catchment area of Bd. Unirii does not form a convex ringy system, which Hillier describes as a characteristic for all active centres. Conversely, catchment areas of Calea Victoriei and the short Lipscani Street (main commercial spine through the historic core) are forming dense ringy structures all along which may provide a spatial explanation for their vitality and success.

<table>
<thead>
<tr>
<th>Nr of lines</th>
<th>Surface km²</th>
<th>density</th>
</tr>
</thead>
<tbody>
<tr>
<td>Civic Centre</td>
<td>126</td>
<td>7.8</td>
</tr>
<tr>
<td>Calea Victoriei</td>
<td>304</td>
<td>12.5</td>
</tr>
<tr>
<td>Lipscani Street</td>
<td>66</td>
<td>1.32</td>
</tr>
</tbody>
</table>

Comparing measures of intelligibility of the three adjacent structures, the Historic Core scores higher. Moreover the characteristics of the old core seem to have decreased, with the introduction of the communist urban structure, compared to its previous state. In order to

Figure 3: Movement potentials

Table 2: Supporting structures of each areas
improve intelligibility values a logic was proposed by Shokouhi (2003), correlating syntactic analysis with behavioral studies and mental maps. It proposed that for the potential of an area to acquire a “group image” in a mental map, it is essential that it realizes the continuity of locally well integrated axes. To test that, some highly integrated lines of movement that seem to be interrupted were extended until they intersected a next local integrator. Analyzing comparatively the present situation and an amended version it can be noticed first that the potential for pedestrian movement depicted by catchment areas would be improved, more densified sections appearing along the Unirii Boulevard. Syntactic values of mean connectivity, local and global integration, also increased and finally most importantly the interface between the local and global configuration of the system is improved.

The findings could support the proposal that the intelligibility and distinctivity of the system are also relying on the continuity of the locally integrated routes and explained by their present interruption, at the same time suggesting a spatially supported method to integrate the different areas of the centre.

Conclusions

The paper tried to extract an objective measure and explanation to the discontinuity of the central structure of Bucharest based on its spatial structure. The paper has shown that metric properties of blocks were very distinct and compared to other cases they could explain the poor performance in terms of pedestrian activity of the Civic Centre. The analysis of the whole city structure based on metric properties lead to distinguishing the Civic Centre area from its neighbouring configurations. Visual permeability measures have proven once again the big difference between the communist intervention and the historic core.

The embedding in the global structure and their potential as a destination and through route added to the potential reasons for the lack of public life of the newer part of the centre. It was shown that local grid conditions that would insure the functionality of a centre were not satisfied by the communist development, but they were certifying the successfulness of Calea Victoriei and the Historic Core of the city. Syntactic measures have additionally concurred to the diagnosis of un-intelligibility of the city centre as a whole. The current study could generally suggest that the dis-functionalities of the system can be originated by the combination of segments that does not take advantage of the instrumentality of space in order to sustain social processes. Layouts that raise issues of intelligibility and local integration are imposing higher expenditure on resources and effort to overcome space, having implications on a city’s sustainability.

In light of the present study it could be stated that the city’s structure needs to and could be improved and particularly, local strategies may be developed to support the local and global structure. Stitching the city back again where previous interventions created an obstacle is required for re-establishing the economic and social potential of both of the areas of the Civic Centre as well as the historically evolved city core adjacent to it. It could finally be proposed that retaining the historical legacy/information and the development of the city in the direction of the distributed, instrumental usage of space should be one negotiating the spatial network explored by such studies.

Table 3: Comparison of current and amended axial maps

<table>
<thead>
<tr>
<th>scheme</th>
<th>conn</th>
<th>Int_R3</th>
<th>Int_RN</th>
<th>Int_RR(7)</th>
<th>Intelligibility</th>
<th>Synergy</th>
</tr>
</thead>
<tbody>
<tr>
<td>present</td>
<td>4.64</td>
<td>3.48</td>
<td>1.43</td>
<td>2.00</td>
<td>0.31</td>
<td>0.58</td>
</tr>
<tr>
<td>amended</td>
<td>4.77</td>
<td>3.66</td>
<td>1.50</td>
<td>2.15</td>
<td>0.39</td>
<td>0.71</td>
</tr>
</tbody>
</table>
References


Harhoiu, D., 1997, Bucharest: A City between Orient and Occident, Simetria, UAR and Arcub, Bucharest.


Savic, B., 1994, Sarajevo: Changing Role of Urban Space, University College London.


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i. According to Harhoiu, 1997, Though such a rigorous and holistic planning of the city is questioned by Augustin Ioan’s (2000)

ii. Romanian historic N Djuvara quoted by Harhoiu says that in this period “the Romanians were colonized by French without the presence of the colonizers”. (Harhoiu, 1997, p.59)

iii. One of its many logistics problems (ownership, finances and organisation) is that it has been heavily squatted, bringing along major problems of crime and security. Around 4500 people of the most disadvantaged groups live here, many illegally, and that posed problems for the government’s redevelopment plan for which reason currently all are evacuated and relocated.

iv. Metric accessibility represents the reciprocal of metric mean depth, which is the average metric distance from each space to everywhere in the system (within a given area). This measure will reflect the metric properties of an area, grouping the close and similar in scale spaces together.