A Meaning of Baroque in terms of Space Syntax
- Finding a "Bridge" between Cosmology and Practicality in Cities -

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Abstract

A city is a spatial system that is generated in the process of searching for an ideal form. From the structure of a city, we can find paradigms of the past in which worldviews of the society are instilled. Baroque, to be studied in this paper, is interpreted as a change from 'limitation' to 'infinity'. There are many studies that investigated Baroque but they see the change from a single viewpoint of either cosmology or practicality. The purpose of this study is, therefore, to combine these two viewpoints for a comprehensive understanding of what paradigm has formed Baroque cities. Practicality is revealed by means of Space Syntax and our new concept, Urban Entropy Coefficient (: *UEC*), which is then related to cosmology. We conclude that the intention of Baroque was to configure a Multi-Center layout for the dynamic function of the city.

Keywords: Baroque; Rome; Paris; space syntax; urban morphology

1. Introduction

For the generation of an urban fabric, the paradigm of the society plays an important role. Since the paradigm shifts along with the changing social demands, the concept of city planning also varies depending on geography, time and culture.

Lynch examined the history of cities and proposed "normative theories" which categorize them into three types: the cosmic city, the city as a practical machine, and the organic city (Lynch 1981:73). Concerned with this categorization, Kostof states that the cosmic model generates a plan based on the interpretation of the universe and gods, and encompasses Renaissance and Baroque ideal plans (Kostof 1991:15). Rykwert, who studied Roman cities from an ethnological viewpoint, argues that symbolic patterns in cosmic cities can only be conceived in mythical and ritual terms and, thus, an effort to find the rational or pragmatic logic for them is futile (Rykwert 1988). According to his idea, it may seem impossible to find the utilitarian evidence of the paradigm that made Baroque cities.

In contrast to Rykwert, Hillier argues that even the cosmic city contains rationality, and we could read it by means of precise evaluation of its spatial form. He writes, "Cities are large physical objects animated and driven by human behaviour. By far the most interesting and difficult questions about them are about how the two connect: exactly how is the physical city linked to the human city? Since the human is on 'either side' of the physical city, in that human both cause it to exist and then act within the constraints it sets, the question divides into two, one antecedent to, the other consequent on, the physical city (Hillier 2005)." He concludes that the aim of Space Syntax is to construct a bridge between the human and the physical city, and, for this aim, he proposes a concept of "Social Physics."

As Hillier mentioned, Space Syntax provides a kind of paradigmatic urban models, which is closely related to the traffic efficiency in a city. It may then be possible to find the unique structure of Baroque cities by using the Space Syntax analysis. By mirroring the city structure to the Space Syntax paradigmatic model, this study hopes to illuminate the internal spatial logic of Baroque cosmology.

2. Space Syntax

Space Syntax is a set of theories and analytical tools introduced in Social Logic of Space (Hillier and Hanson 1984). The procedure of this analysis has already been explained in a number of papers. Therefore, we will only show the basic principles of the methodology.

2.1 Space Syntax Methodology

In order to analyze a configuration layout of a city, the first thing to do is to translate a real spatial structure into a convex map (Fig.1.A) or an axial map (Fig.1.B). A convex map consists of the "fattest and fewest" convex spaces. A convex is a polygon in which all the interior angles are no more than 180 degree. An axial map is a map constituted by the "longest and fewest" lines. Hillier defined that "An 'axial map' is the least set of longest lines of direct movement that pass through all the public space of a settlement and make

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all connection (Hillier 2001)." On the basis of a convex map that shows the public space (See Fig.1.A), the axial lines are drawn to get the axial map (See, Fig.1.A and B).

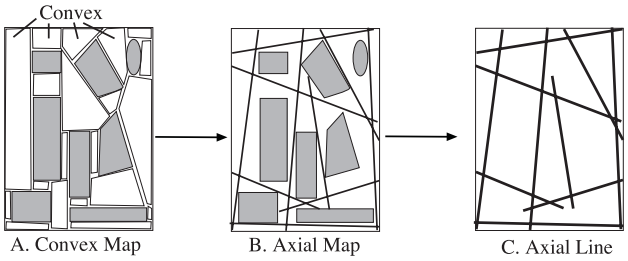

Fig.1.

For the topological analysis, then, the axial map is projected to a Graph where axial lines are replaced by vertices and line crossings by arms (Fig.2.E).

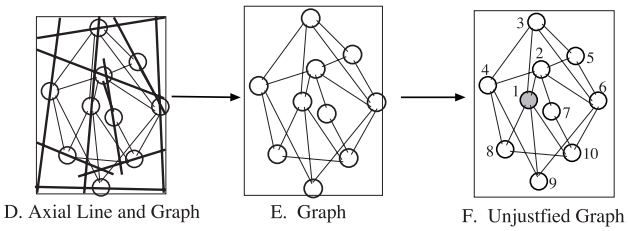

Fig.2.

Next, the Graph (Fig.2.E) needs to be justified. A justified graph (Fig.3.) is the "one in which some point, usually the carrier, is put at the base, and then all points of depth 1 from that point are aligned horizontally immediately above it, all points at depth 2 form that point from that point above those at depth 1, and so on until all levels of depth from that point are accounted for (Hillier and Hanson, 1984:106)." In the case of analyzing the vertex No.1 in Fig.2.F, it is necessary to draw the justified graph starting from it (Fig.3.). From the justified graph, Mean Depth can be acquired. In the graph, the number of vertices of depth 1 is 5, depth 2 is 4, and the total depth will be (1 - 5) + (2 - 4) = 5 + 8 = 13. By dividing this number by (k - 1) (k means total number of the vertices), we will obtain the Mean Depth. For the case of Fig.3., it will be 13 ÷ (10 - 1) = 1.4444. The Mean Depth will be 1.4444.

Using *MD* (:Mean Depth), *RA* (:Relative Asymmetry) will be calculated by Equation 1, to demonstrate "how deep the system is from a particular point with how deep or shallow it theoretically could be (Hillier and Hanson 1984)."

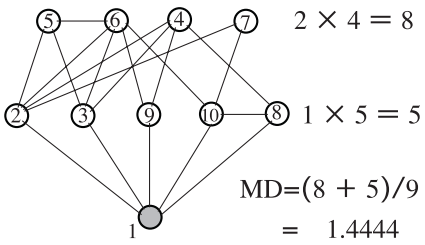

Fig.3.

Since the value of *RA* depends on the number of k, it is impossible to compare it with that of different sized systems with different number of k. To resolve this problem, *RRA* (: Real Relative Asymmetry: Eq.3) was invented by means of using D_k (Eq.2), which is the *RA* of diamond shaped system as defined by Hillier and Hanson (1984; 111-112). Finally, Integration Value is defined as a reciprocal number of *RRA* (Eq.4).

$$RA = \frac{2(MD-1)}{k-2} \qquad \text{Eq.1.}$$

$$D_k = \frac{2[k\{\log_2(\frac{k+2}{3}) - 1\} + 1]}{(k-1)(k-2)} \qquad \text{Eq.2.}$$

$$RRA = \frac{RA}{D_k} \qquad \text{Eq.3.}$$

$$Integration\ Value = \frac{1}{RRA} \qquad \text{Eq.4.}$$

By analyzing the Integration Value, it is possible to reveal the degree of a street; how topologically shallow or deep the whole system is from the point of the street. Put simply, a street with a higher integration value is located in a relatively "shallow" position in the whole spatial system, and thus tends to be accessed more easily from the other streets.

2.2 Global and Local

Regarding Integration Value, Space Syntax proposed different levels of values by setting Radius. Radius indicates the number of depths from the origin point of analysis. When Radius is set to 'n', all vertices are taken into the calculation. If it is set to Radius=3, vertices within depth 3 are taken into account (See Fig.4.).

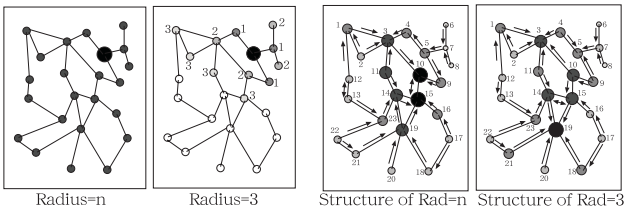

Fig.4.

The Integration Value for Radius=n is called Global and Radius=3 is Local. In the matter of Radius=n (: Global) and Radius=3 (: Local), Hillier writes,

"In fact it is slightly more subtle and depends on the typical length of journeys. Pedestrian densities on lines in local areas can usually be best predicted by calculating integration for the system of lines up to three lines away from each line (radius-3 integration), while cars on larger-scale routes (though not in local areas, where radius-3 is the best predictor) depend on higher radius integration because car journeys are on the whole longer and motorists therefore read the matrix of possible routes according to larger-scale logic than pedestrians (Hillier 1996:161)."

By means of these concepts, Hillier suggests, "...poor correlation between the local and the global

integration...suggesting an area which 'freezes' the natural movement (Hillier, 1996:135)." He defines the correlation between Global and Local as Synergy, a coefficient of determination, namely R^2. Stegen interpreted Synergy as one of the concepts that shows the capacity of an urban system and wrote, "The overall external image of the virtual community, mainly composed by both the majorities of the local and the global communities, is then confused. This must be confusing for all the social groups and urban functions (especially shops), which synchronize on the overall virtual majority (Stegen 1999:6)."

Focusing on the unique state of an urban system that can be expressed by "freeze" in Hillier's text and "confusing" in Stegen's text, we have developed a concept, Urban Entropy Coefficient (Kigawa and Furuyama 2004). Its definition will be shown in the next section.

2.3 Urban Entropy Coefficient

"Center": we defined it as a vertex that has higher integration value than any other vertices connected directly to it. Consequently, only a single center exists in Global; in contrast, plural centers exist in Local. Fig.4. shows the difference between Global and Local in the system. The concept of our entropy has been defined as a degree of how much estrangement can be seen between the distributions in Global and Local. The estrangement between Global and Local has conventionally been acquired by R^2 in Space Syntax methodology. However, R^2 has a limitation in showing the negative correlation–although such a correlation hardly appears. Therefore, we adopt another way of showing correlation coefficient by defining Urban Entropy Coefficient (: *UEC*) as in equation 7 (see Kigawa and Furuyama 2004, 2005). Since each Axial Line (: AL) has its own Global and Local values, we can describe a spatial system as AL_1 (x_1, y_1), AL_2 (x_2, y_2) ... AL_n (x_n, y_n) in which x_n shows the Global value and y_n the Local value of AL_n. The numerical value of *UEC* ranges from 0 to 2. If *UEC* value is high, the estrangement between the Global and the Local system is relatively wide, and it is likely that the urban structure would experience the state of "freeze" or "confusing" in Hillier and Stegen's terms respectively. The city experiencing this kind of state is regarded as having approached a point where transformation could happen for adaptation. We call this condition "dynamic."

Conventional Space Syntax methodology shows the traffic efficiency of a city, and *UEC* shows the condition whether or not the city is in dynamic state. In such a case when a new spatial system intrudes the existing one, the condition shifts from a static one to a dynamic one, and a new urban framework is required to reconcile these two. Thus, a city that has pluralistic spatial systems needs renovation.

$$AL_1 = (x_1, y_1), AL_2 = (x_2, y_2) \ \ldots \ AL_n = (x_n, y_n) \quad \text{Eq.5.}$$

$$x = (x_1, x_2, x_3 \ \ldots \ x_n) \qquad y = (y_1, y_2, y_3 \ \ldots \ y_n) \quad \text{Eq.6.}$$

$$r_{xy} = \frac{\sum_{i=1}^{n} (x_i - \overline{x})(y_i - \overline{y})}{\sqrt{[\sum_{i=1}^{n} (x_i - \overline{x})^2][\sum_{i=1}^{n} (y_i - \overline{y})^2]}} \quad \text{Eq.7.}$$

$$UEC = 1 - r_{xy} \quad \text{Eq.8.}$$

3. What is Baroque?

A number of scholars have written about the meaning of Baroque. However, it is usually stated from either a practical or cosmic viewpoint. For instance, Lynch writes from a practical viewpoint: "(Baroque) states that one may organize any complex and extended landscape in the following way: choose a set of commanding points throughout a terrain, and site important symbolic structures at those points. Connect these foci by major streets, wide enough to carry arterial traffic, and shaped as visual approaches to the symbolic points, or nodes (Lynch 1981:281)." From the cosmic viewpoint, Kostof writes, "The space conception of the European Baroque is consonant with the post-medieval repudiation of the static universe prescribed by theology–the world as a motionless exterior reflection of an inner order. With the Copernican shift from an earth-centered to a sun-centered universe, the world is now seen instead as an infinite space, an object moving around the sun (Kostof 1991:215)."

Historically, the European Baroque started in the 16th century along with the political changes. According to Kostof, "In a fundamental sense this climactic phase of the Grand Manner is bound up with broad intellectual, political and technological development, such as the Counter-Reformation, the rise of authoritarian, one-man rule, advances in astronomy, and the spectacular discoveries of hitherto uncharted corners of the worlds (Kostof 1991:215)." Since the shift in the paradigm towards 'Baroque' is related to the political system and worldviews of the day, it is important to approach the meaning of Baroque from both the practical and cosmic stand points.

The paradigmatic revolution that have produced Baroque was "a change from rest to motion, from limitation to infinity, and from plane surfaces to curvature and depth unless we isolate those trends and causes that have brought this about (Gutkind 1969:136)." Based on this ideal, several planning techniques of Baroque, such as straight streets, were introduced. The straight street, Kostof writes, "is run sufficiently contrary to the grain of the extant urban fabric...This is a seemingly willful slash to connect two points directly, either after the fact, or within an urban design created *ab ovo* for a new quarter of the city

or for an altogether new city (Kostof 1991:232)." As for the effect, Gutkind says, "(The sense of Baroque) absorbed man into the passionate movement of space and made him an active participant in the play of light, coalescing forms, and contrasting effects (Gutkind 1969)."

To sum up the major characteristics of historical views, Baroque tends to have high permeability and dynamic conditions.

4. Baroque in Rome

4.1 History of Rome

According to Benevolo, Rome still was a small and insignificant town in the mid-fifteenth century because of the long absence of the Popes (Benevolo 1980: 564). The ruins of the ancient dominated its landscape till the Popes returned to Rome in 1420; inevitably, his return brought a recovery of financial and political power to Rome. Boldly, straight street lines passed through the squalid and tangled mass of the medieval city and regular buildings were built. Three straight streets originating from the *Porte del Popolo*, the city's northern entrance of the day, were built at that time.

The reconstruction of Rome was not the restoration of the whole city. Gutkind wrote, "However, Real concern for the masses was just nonexistent in papal Rome as in imperial Rome. What was offered them was a Splendid Misery, a pompous show without economic basis, a show in which the common people remained passive onlookers, tolerated as admirers of the pageantry enacted by the high and mighty (Gutkind 1969:432-433)."

4.1.1 *Piazza del Popolo*

The construction of *Piazza del Popolo* had symbolic meaning in Baroque. Fig.5. shows the detailed map around *Piazza del Popolo* in 1748, in which one can find that *Trivium*, meaning a meeting of three radial streets, is stretching out from the *Piazza del Popolo*. As to the *Trivium*, Kostof writes that it was firstly applied to Rome and spread to other Baroque cities, like Versailles, St. Petersburg, and old Chicago (Kostof 1991:235). He points out that the *Trivium* is affiliated with the Renaissance experience with radial schemes of urbanism, but is less totalitarian and much more flexible. Considering the fact that the old conventional quarters still remain in the vicinity of the magnificent *Trivium*, it is reasonable to think that the Trivium was planned not for the practical but for the ornamental purpose.

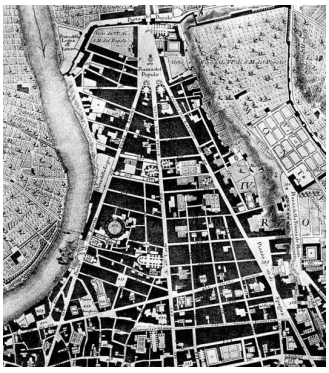

Fig.5. Piazza del Popolo

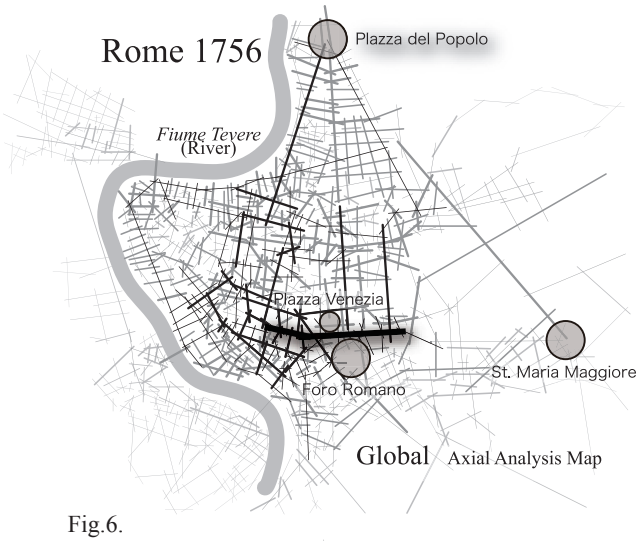

Fig.6.

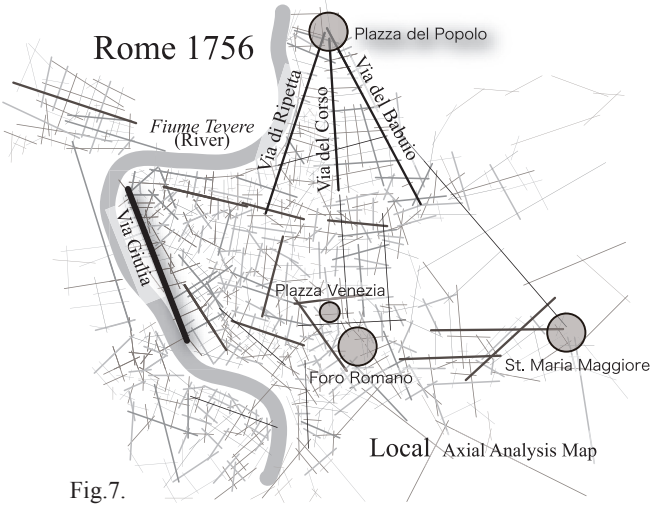

Fig.7.

4.1.2 Ruins of Roman Empire

Besides the straight lines of the *Trivium* that extended across the city, the old zone remained untouched. This could be due to financial reasons, but the conservation of ruins of Roman Empire could be another probable reason. Fig.9. shows the location of Roman Empire's important buildings. As to the treatment of the ruins, Benevolo writes, "Bernini realized that the vastness of the classical ruins and of Bramante's monumental works had to coexist with the small-scale houses and districts of the common people. As a result, the idea of building a new Rome along the same grandiose lines as the ancient one was finally abandoned, and the contrast between the courtly and the mundane, which could obviously not be totally eliminated, became a characteristic feature of the city (Benevolo 1980 :584)."

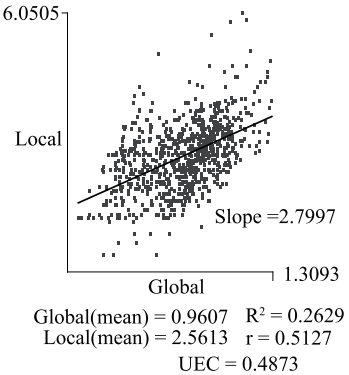

Fig.8.

He continues, "In this way the face of modern Rome became fixed: a city that did not try to relive its past, but acted as guardian of its ancient remains, having learned to live alongside these reminders of a bygone age in a perfectly natural way (*Ibid*.:584)."

4.2 The result of an analysis on Rome

Fig.6. and 7. demonstrate the result of axial analysis on Rome. This analysis was carried out on the map, "Place of Rome 1756 by Giovanni (Gutkind 1969:436)." On the map, we drew the least set of longest lines that pass through all the public space and street, and made all connection. The calculation was executed using the Space Syntax software called Axman.

We see from Fig.7. that the streets installed during Baroque, i.e. *Via Giulia and the Trivium* (*Via di Ripetta, Via del Corso and Via del Babuino*), are highlighted in the result of Local. Then, these highlighted streets can be understood as "center" because their values are higher than all the lines directly connected to it. In contrast to Local, we find that Global center in Rome is located on the street adjacent to *Piazza Venezia* (Fig.6.). If this map is compared with Fig.9., it can be recognized that the Global distribution is correlated with the ancient Roman configuration. The most significant point is that *Foro Romano*, the Roman Empire's scheme, is connected to the most integrated area in Global, but to the less integrated area in Local.

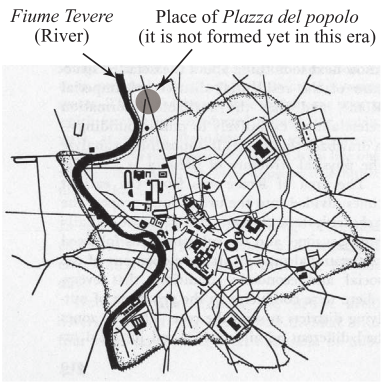

Fig.9.

Briefly stated, the spatial layout of the city of Rome can be divided into three: area of the Roman Empire, Baroque Rome and place for ordinary citizen. This polarization can be seen as the relation between results of Global and Local as well. From the scattergram in Fig.8., we could see the difference in Global and Local integration values: Local tends to be directly controlled by the Baroque planning. In terms of Local structure, this city has a multi centered plan. Therefore, the wide estrangement in the distribution of Global and Local makes the correlation low.

5. Baroque in Paris

5.1 History of Paris

Paris has a long history; however, it had taken a long time to become one of the biggest cities in Europe, the same as today's Paris. It is said that the history of Paris started from 200 BC when "Parissii", Celtic Iron Age people, had settled in the island, *Ile de la Cite*. In 53 AD, the island became a part of Roman Empire during Caesar's expedition. Empire Roma named the island "*Lutece*", and built a fortress to utilize the defensive advantages of the island (Gutkind1970:241). During the Carolingian periods, the political importance of Paris decreased due to the absence of the King. From the 10th century on, after the construction of a port, Paris increased its importance as a center of trade. While maintaining the importance of *Ille de Cite*, Paris expanded its region by gradually extending its concentric circle. From 1190AD to 1210AD, Philippe Auguste built a castle wall and the city acquired a typical medieval form. In the 12th century, the construction of *Cathedrale Nortre-Dame* started, and at the beginning of the 13th century, Sorbonne University was established. By this time, Paris had already become the academic center, not only of France but also of entire Europe.

Paris as a Baroque city started after the absolute monarchism was formed. The Baroque influence came from Rome, which can be read from the fact that Luis XIV asked Bernini (1598 AD-1680 AD) to design the extension of *Le palais du Louvre* (Honour 1966).

5.2 Paris in Medieval age

A glance at Fig.10. will reveal that Paris was a typical European medieval city until 1572; it was surrounded by city walls and contained a labyrinthine quarter in the central. Saalman points out that the town walls consisted of three characteristics: wall, tower, and gate, and they worked for the demands of the day, namely, protection from theft and natural disasters, and income for the city via the collection of the gate tax (Saalman 1968:22).

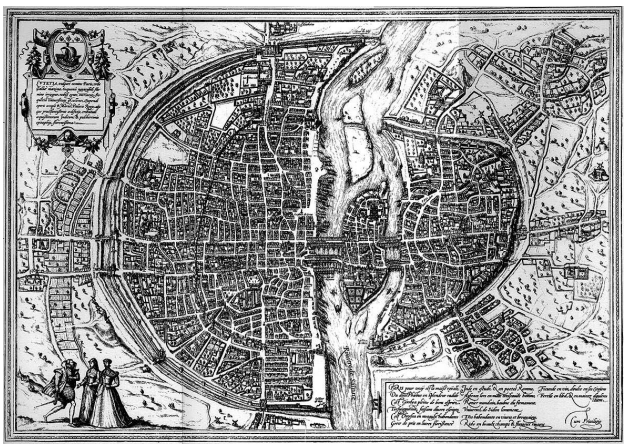

Fig.10. Plan de Braun (1572 AD)

Besides the practical function of city walls, Gutkind states, "men of the Middle Ages believed that peace and security can be provided only in a city surrounded by protecting walls with gates and towers, therefore the walls were more than utilitarian structure (Gutkind 1969:178)."

5.3 Paris in Baroque

Compared with the medieval form, the shape of Paris in 1779 (Fig.12.) illustrates certain differences. Paris has extended the size by moving the position of

the city wall further out; and, it can be seen in the map that the city wall of 1572 had been already removed. On the place where the wall used to be, boulevards with planted trees were formed. Besides boulevards, we can also see the typical characteristics of Baroque: circuses, wide avenues and geometrical gardens.

5.3.1 Boulevards, Avenues

Two street types in the map, boulevards and avenues, are considered interchangeable in modern parlance; however, according to Kostof, their origins and early history in the Baroque period are in fact quite different. The boulevard started as a boundary between the city and the country. Its structure rests on the defensive wall, which by the Baroque period was usually an earthen rampart rather than a stone curtain (Kostof 1991:249). In contrast, the origin of the avenue is largely rural: it functioned as approach axes to important features in the landscape of an aristocrat's estate, a farm, or a village. A famous example of its urban usage can be found in 1670s' Paris where Le Notre put the *Avenue des Tuileries* as an extension of the central axis of the Tuileries garden. This was the direct predecessor of the *Avenue des Champs-Elysees* in the modern city.

Considering the origins of these two street types, it can be said that most of the wide streets in 1779 Paris were Boulevards, except for several streets stretched towards the outside from the central.

5.3.2 Patte's design for Luis XV

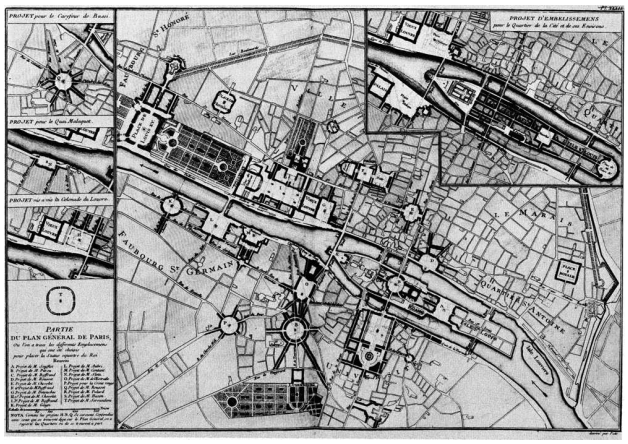

Fig.11.

From Fig.11., we can have some idea of how Baroque was understood and transferred to Paris from Rome. It is a competition plan submitted by M.Patte in 1748 for the redevelopment of the quarter of *Cite* and its surroundings. Although this plan was not executed, we can see several important points that show Patte's understanding of Baroque. In the plan, a number of circuses with monuments were proposed; however, the radial streets from the circuses stopped when they met with another street. Therefore, the scheme was concerning about Local, not a Global network. Kostof points out that Patte's plan was aiming for a multi-centered Baroque plan of Paris (Kostof 1991:212).

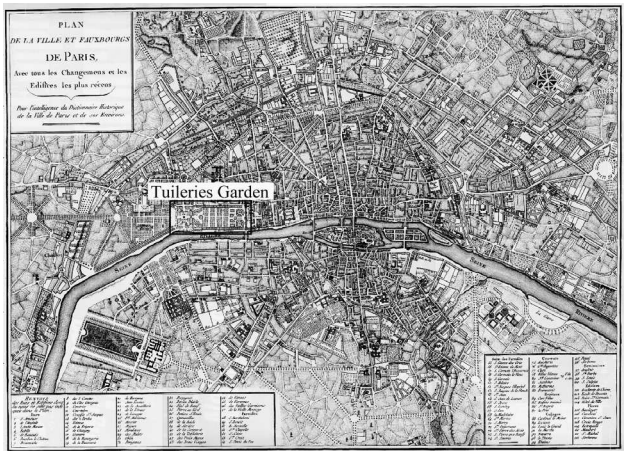

Fig.12. Dictionary of the History of the City of Paris and its Surroundings (1779)

5.3.3 Tuileries Garden

During the period of Louis XIV, while the dense and labyrinthine quarter in central Paris still remained, a big scale development was made on the west side of the Tuileries palace including the Tuileries garden (Saalman 1971:42). This Baroque garden was designed by Andre le Notre (1613-1700), Louis XIV's garden architect. As seen in Fig.11. and Fig.12., from the unique geometric plan of the garden, a great axial road with large trees, which is today's *Champs Elysees*, ran westward to a circular plaza with radiating streets, where *Arc de triomphe de l'Etoire* was standing just as today.

Laugier Marc-Antoine (1713-1769), an architectural theorist of the day, spoke highly of the irregularity of the Tuileries garden, from the aesthetic viewpoint. Thinking that excessive uniformity is the greatest of all faults, "(Laugier) enjoined the planner to look at the work of Le Notre, where the formal and informal, the regular and the irregular, symmetry and variety are neighbors. So too the planning architect should vary details to such an extent that, walking through a town, each quarter will seem new and different, resulting in a kind of irregularity and chaos which suits great towns so well (Kostof 1991:261)." It seems highly probable

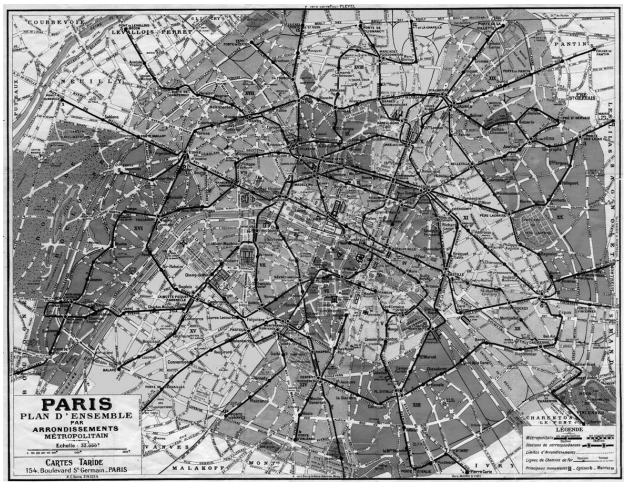

Fig.13. Plan de Map-circa (1960)

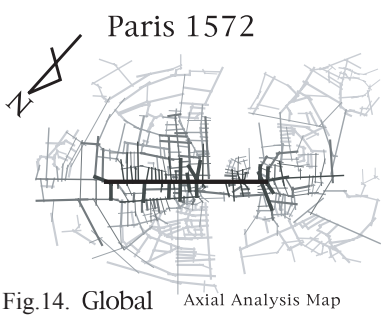

Fig.14. Global Axial Analysis Map

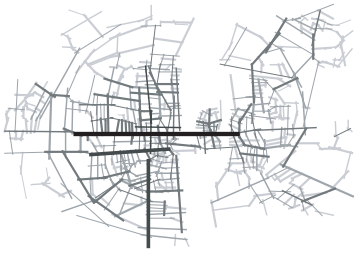

Fig.15. Local Axial Analysis Map

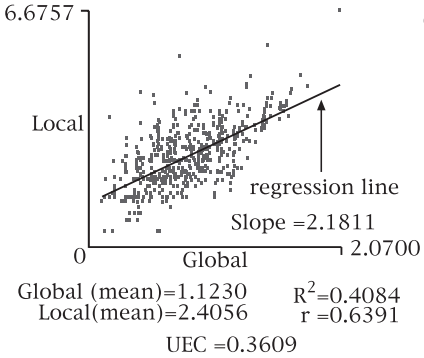

Fig.16. Scattergram

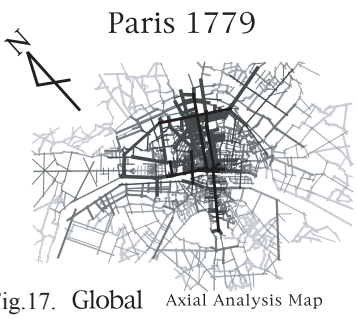

Fig.17. Global Axial Analysis Map

Fig.18. Local Axial Analysis Map

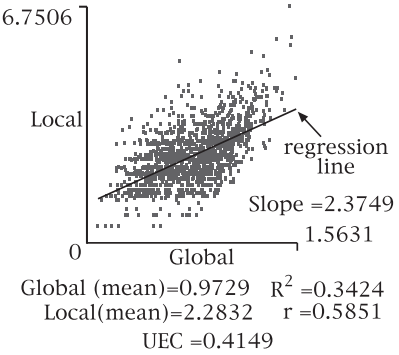

Fig.19. Scattergram

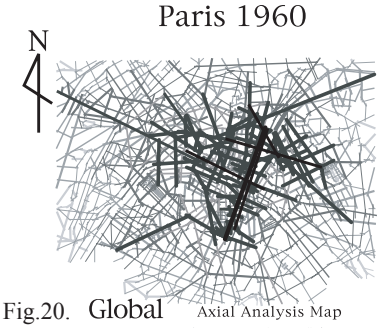

Fig.20. Global Axial Analysis Map

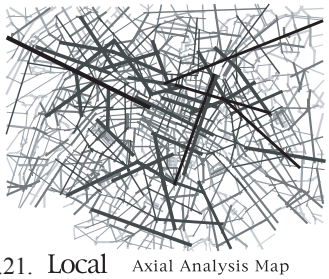

Fig.21. Local Axial Analysis Map

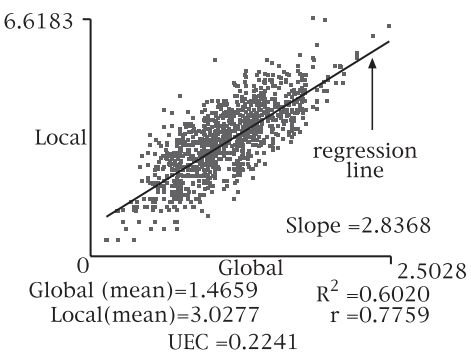

Fig.22. Scattergram

from this record that Laugier had enjoyed the design of the Tuileries garden, which not only put irregularities in its own design but also functioned as a geometric accent within the timeworn medieval city.

5.4 Baron Haussmann's renovation

After Haussmann's renovation on Paris, the boulevards that rested on the city walls' traces were removed and a number of avenues were added. As the boulevards were removed, avenues then became the majority of Paris streets. As to the avenues in Baroque, Saalman writes, "the formal concept of linking major architectural units by grand avenues, of superimposing a simple of monumental proportions over a complex of smaller units, has Baroque precedents, particularly Wren's plan, in which radial avenues broken by 'star' plazas link St.Paul's Cathedral with the Royal Exchange and the Tower while similar streets converge on the Exchange from the London Bridge and the main tower gates. As applied in Paris of the Second Empire the old concept had new implications (Saalman 1971:16)."

The renovation of Haussmann was quite different from the Baroque plans in Rome and Paris, however, in the sense that the medieval labyrinthine quarter was demolished. Because of this demolition, the avenue could work as part of a whole network of the city and, consequently, a homogeneous layout of Paris could be achieved.

5.5 Readings from the Analyses on Paris

Let us now consider the implications of the value, mean-Global. If the value is high, the city has high permeability and thus can be evaluated as generating an economical traffic movement. Overviewing the mean-Global values in Fig.16., 19., 22., it is found that as we move from the medieval to the Baroque, it has decreased from 1.1230 to 0.9729. This means that the Baroque cities have low permeability and uneconomical structures from the point of traffic movement. In contrast, the renovation by Haussmann brought an increase from 0.9729 to 1.4659. Thus, the layout of modern Paris can be considered as more economical in traffic movement.

It was outlined above that the characteristic of Baroque in Paris is the appearance of boulevards. This street system changed the configuration of the city layout from a liner pattern to a radial pattern. However, the installation of boulevards was carried out without adjusting the labyrinthine quarter; therefore, the boulevards could not work as a network permeating into the old quarter. Consequently, mean-Global of 1779 is the lowest. The structure of Paris in 1779 can be understood as a multi-center layout, which was

imported from the Baroque in Rome. Haussmann's renovation, then, can be thought of as having smoothed the multi-center to generate the homogeneous urban fabric of Paris. On the other hand, since Baroque did not change the whole but only a partial structure of the medieval city, Haussmann's plan can be also regarded as having smoothed the discrepancy between the medieval and the Baroque with a view of moving towards a modern city.

This act of "smoothing" can be translated into the index of *UEC*. When Baroque installed a new planning concept to the medieval city, the *UEC* increased from 0.3609 to 0.4149; subsequently, the estrangement got wider. The renovation by Haussmann greatly decreased the index from 0.4149 to 0.2241; as a result the city became smooth and homogeneous.

6. Conclusion

Up till this point, two cases of Baroque cities, Rome and Paris, were analyzed in terms of Space Syntax. In Rome, the intention of Baroque was to prepare several circuses locally under the restriction that the Roman Empire's remains occupied the central area of the city. From one of the circuses, *Piazza del Popolo*, the *Trivium* was drawn to cut the conventional quarter. Although Lynch understood Baroque as a planning concept that connects the circuses by major streets as discussed in section 3, the Trivium did not follow this concept; it is revealed from the Space Syntax analysis that it worked as a visual device rather than a network. In Paris, the concept of Baroque was to transplant radial circuses into Paris; however, Paris did not have any remaining plots but the dense and labyrinthine quarter in the central area. Since this quarter was not readjusted until the Haussmann's renovation, the function of avenues was restricted in the city in contrast to the Roman *Trivium* that cut the medieval city center.

The historian view on Baroque, as we mentioned in section 3, was an urban planning concept that allowed high permeability and dynamic conditions. However, in terms of Space Syntax, it could be found that Baroque cities actually did not have high permeability; the Global and Local values for Rome (Fig.8.) and Paris in 1779 (Fig.19.) were relatively low. Meanwhile, the high values in *UEC* (Rome = 0.4873, Paris 1779 = 0.4149) matched with the historian view that Baroque was about the dynamic condition.

In conclusion, it can be said that Paris learned from Rome that 'straight streets' and "visuality" of the city structure were the essence of Baroque. In the beginning, the straight streets were mainly boulevards, and circuses were constructed along with monuments for visuality. As the Baroque concept in Paris was maturing, they learned how to put "avenues" and assemble them to make a city network. The Baroque city was a cosmic city because the trend of putting circuses and boulevards was simply a fashion of the day, not related to the urban traffic efficiency. However, in the case of Paris, once avenues have been assembled as a network, the cosmology has been transformed to practicality.

Although Baroque in Paris has evolved towards practicality through the passage of time, the Baroque in Rome has continued to be cosmic. While Haussmann removed a confusing quarter from the central area, such a quarter in Rome remained. Therefore, it is reasonable to propose that the intrinsic difference between Rome and Paris is whether they had a symbolic center or not. While Rome has the ruin of the Roman Empire as its symbolic center, Paris does not. Without possessing the absolute symbolic, Paris seems to have desired a geometrical order in the urban structure in order to emphasize the artificial centrality, which could have naturally fabricated practicality.

Illustration Credit

(figures without credit belong to author)
Fig.5.:(Gutkind 1969: 435), Fig.9.:(Gutkind 1969:420) altered by author, Fig.10.: <http//www.paris.org>, Fig.11.:(Gutkind 1970:255), Fig.12.: <http//www.paris.org> altered by author, Fig.13.: <http//www.paris.org>

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