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SPATIAL CONFIGURATION PATTERN AN APPROACH TO SPACE ASSESSMENT

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ABSTRACT
In every city and within every district and neighborhood, there lie spaces in which the comm. unity utilize and employ according to their own aspire. However, each space has its own conception tale which has impacted its characteristics and features. Despite the variety of spaces, there has to be a common pattern that unifies them in one way or another. This is the quest of this paper, where it explores how different researchers assess spaces in order to highlight the common features utilized in such process. These spatial configurations would consequently form a space assessment tool that could be used to produce a pattern for each and every space where such patterns can be compared in search for resemblance. Finally this assessment tool is applied on an example (Al Raval Plaza) to clarify how it is applied and a conclusion of the selected space pattern is reached in order to exhibit a sample of the tool's outcome.

KEYWORDS: **Space Morphology, Urban Spaces, Visual Perception**

الملخص
من المناطق الريفية إلى الأماكن العمرانية المكثفة تعتبر مساحات الفضاء في النسيج العمراني المتعدد الذي يتم تكوينه بشكل متواصل وبدون توقف. تعمل هذه المساحات على خدمة الحضارة التي توجد فيها حتى ولو كانت قيمتها وأهميتها ذات أهمية فإن وجودها يعتمد بصورة مجردة على التكوين التصميمي. ومن خلال النمو العمواني فإن الحواف تكون لتحديد المناطق وتخلق مساحات تستضيف فيها أنشطة متعددة. يعتقد أن أعمال البحث المتعلقة بمساحات الفضاء والحواف التي تحددها قد اتخذت اتجاهات منفصلة ومن النادر وجود بحث يتعلق بالروابط الداخلية بين خصائص الفضاء وإعدادات الحواف. يهدف هذا البحث إلى استكشاف النشاط الداخلي بين الفضاء والخصائص التي تكونه مع الحواف التي تحدده والإعدادات المرتبطة. سوف يركز البحث على الفضاء العمراني المتوسط حيث تبدأ المباني في التداخل في شكل حافة ويتضمن ذلك المباني التجارية والمحطات والمساحات شبه العمومية والواجهات المائية وكذلك المنتزهات والحدائق. يتبع منهج البحث الطريقة الاستنتاجية التي تبدأ بمراجعة التراث حيث توجد مجموعة متعددة من الخصائص المرئية والظاهرية لمساحات الفضاء والتي سوف يتم البحث فيها وكذلك الإعدادات المرئية والظاهرية للحواف. كما أنه سوف يتم القيام بعملية تحليلية على عدد من الأمثلة الدولية حيث يتم فحص المساحات وإعدادات الحواف والخصائص المتعلقة بها في كل مثال من الأمثلة المطروحة. يتوقع من البحث أن يقوم بتصوير الارتباط الداخلي للفضاء والحافة من خلال فحص إعدادات الحافة بناءاً على مساحات الفضاء وارتباطها مع الخصائص المكانية المماثلة.

1.1 THE MEANING OF SPACE

To examine the aspects which are required to assess an outdoor space- referred to as “outdoor rooms” by Norman Booth- it is required to understand the definition of space in design. Space can be defined as the gap or cavityformed between solid elements. Novice designers are inclined to focus on what’s tangible in a space, which is the objects forming it, while space from a different perspective is simply not what most people tend to see when they experience the exterior.It is the emptiness surrounding the objects that the users experience (Booth 2011).

Therefore, in order to assess space configurations, the physical and visual attributes will be examined.

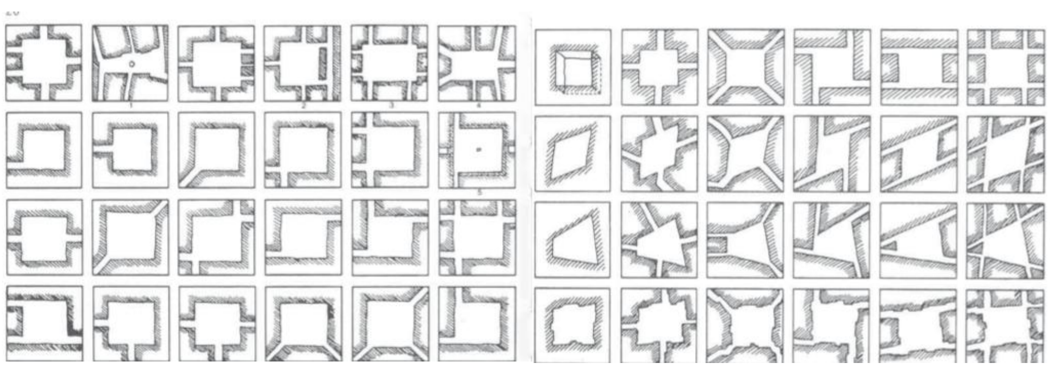
2.. SPATIAL MORPHOLOGY- PHYSICAL ATTRIBUTES

The spatial morphology can be defined as the interconnected patterns of space that arise as space is organized and differentiated by physical and social boundaries (Peponis, 2001). It is the study of pattern and formas Hanson claims (Hanson, 2001). There are commonly studied configurations in terms of spatial morphology which are irregularity, scale, proportions, positivity and convexity. Each configuration is discussed thoroughly in the next section in order to fully comprehend the morphological aspect of the space.

2..1 REGULARITY

The regularity of a space is determined through the alteration of the basic shape of an urban space. There are three main geometrical shapes in which spaces generally fall under which are squares, circles and triangles, as concluded from Rob Krier’s typology for urban spaces and spatial forms (Krier, 2005). Consequently, compound forms are created as a result of angling, adding, merging, overlapping and distorting segments to the three basic shapes, thus determining the openness and irregularity of the space as shown in the figure (1)

The displayed matrix in figure 1 shows regular and irregular configurations of the basic shapes after they undergo different modulation factors. Through understanding the modulation stages from top to bottom consequtively conveys: first it begins with the basic shapes, then angular alteration through enlargement or reduction without changing the dimensions, after that changing the dimensions of the two sides proportionally while the angle remains constant and finally altering both angles and dimensions. Whereas, the modulation stages from the left to right side of the diagram first begins with angular alteration of basic shapes, then segmentation, addition, overlapping, and finallyreaching amorphous spatial forms which can not be traced into their basic shape. Hence, when the space is assessed it is compared to these modulation stages and according to where it falls within these stages, its regularity is evaluated on a scale of regular to intermediate to irregular.



(Figure 1, Morphological Series of Urban Spaces)

2.2 SCALE

Another important physical aspect to consider when assessing spatial configuration is scale. The space’s scale is assessed from two perspectives; first the human scale, andsecond through its size in relation to human activity (C.Dee). For the later, the space can be categorized as being either small, intermediate or colossal based on how the user within it perceives its scale. Whereas for the former, the space can be categorized as being either small, intermediate or colossal based on its impact region of importance, whether it serves a neighborhood or a district or a city.

2. 3 PROPORTIONS

This physical attribute is concerned with the physical boundaries that form a space which translate the space into a three dimensional volume with measurable segments. The ratio between these segmentscoveys the space's proportions, where by changing the arrangement of the boundaries forming a space, a new relationship is created between these clusters. The resulting degree of spatial proportion depends on two relationships as stated by Booth; One is the ratio between a building's height and width which influences the degree of enclosure(Booth 2011).Another aspect is the ratio between the length and width which affectsthe form of enclosure.

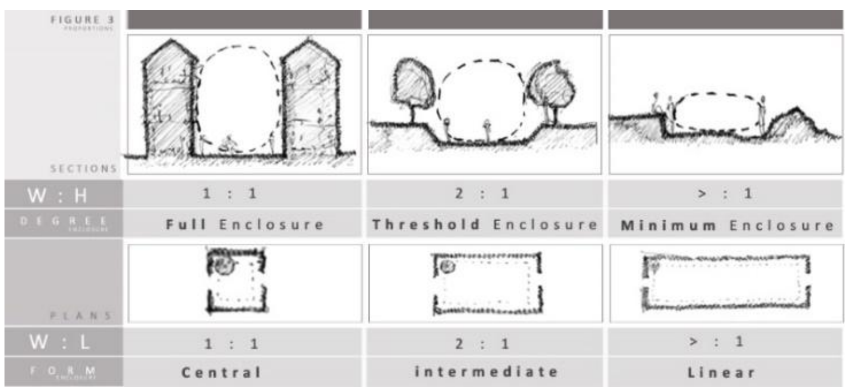
Theseforms of enclosure can be categorized as following based on Booth's contribution:

1. **Central open space:**A well-known type of space which is formed by clustering masses around a space.
2. **Focused open space:**The enclosure of the 'central open space' is broken, directing the openness of the space towards a certain angle.
3. **Linear spaces:** A long and narrow space with an opening at one or both ends. (Booth, 1989)

While the degree of enclosure can be classified as stated by Gary Robinette into the following:

1. Full Enclosure,
2. Threshold Enclosure,
3. Loss of Enclosure.

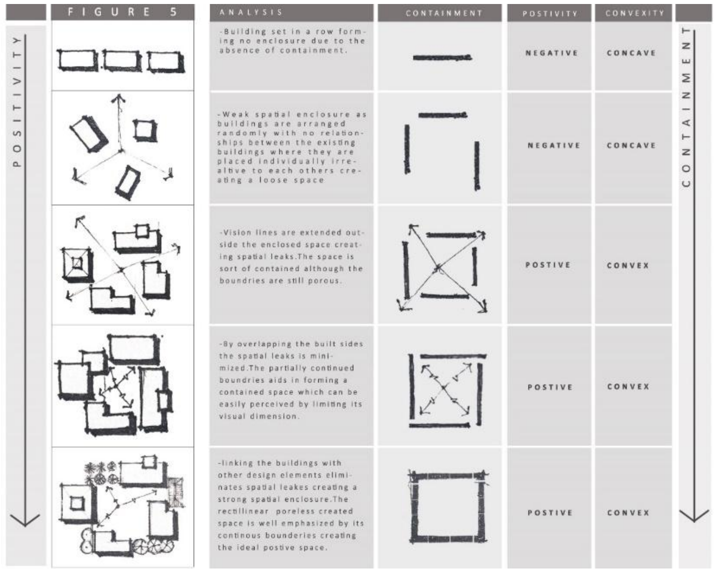
These previous types of spatial proportions can be found either independently, or merged with one another. Hence, the resulting compound space's proportions should be assessed as a whole.



(Figure 2.1, The degree and forms of enclosure of urban spaces, Source:)

*2.0.*4 POSITIVITY

An Urban Space is recognized through the continuity of its boundaries, and these boundaries indicate the degree of containment or openness of a space. Continuity accentuates the enclosure of a space; the more it has a distinct boundary, the more it is said to be positive and is otherwise known as a convex space. Meanwhile, when a spatial boundary is permeable, spatial leakages canoccur. This excessive penetrability can result in the formation of a negative space with indefinable boundaries, and can thus be referred to as a non- convex space (Alexander, Ishikawa et al. 1977) The following figure shows different degrees of positivity analyzed through the space's containment and its convexity.

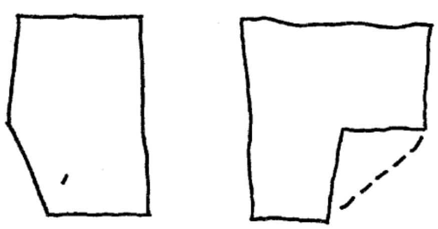


(Figure 2.2, Positivity and containment of urban spaces, Source:)

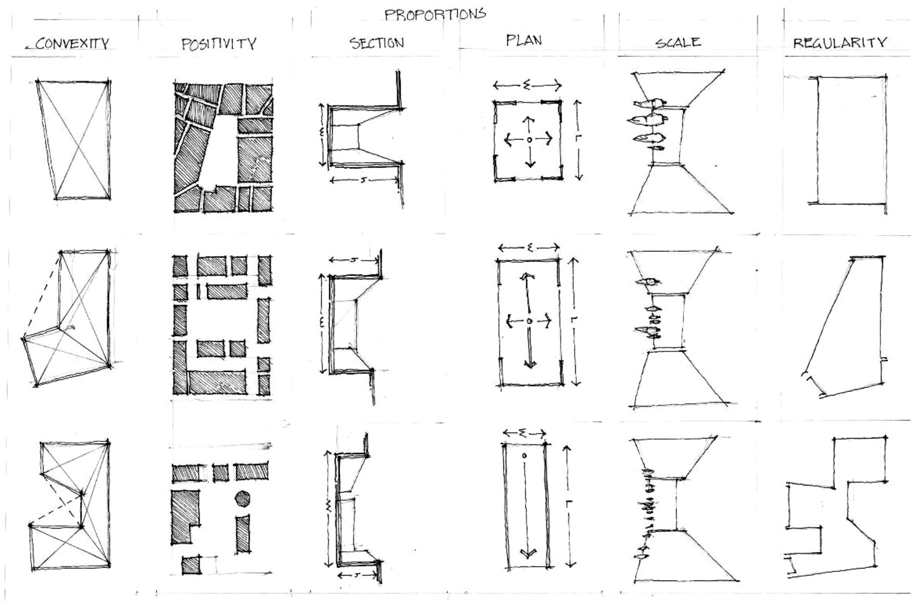
2.1.5 CONVEXITY OF SPACE

Another approach to recognizing spaces and subspaces is through their degree of enclosure and their convexity. The difference between a positive and a negative outdoor space can also be considered in terms of its convexity. A space is said to be ‘convex’ when any two points forming it can be joined by a line that entirely lies inside the space i.e. a line that does not cross the outlines of the shape. Convexity is the hidden property that is perceived when distinguishing a region as an essential and discrete spatial unit.

The irregular rectangular space (shown on the left in figure 2.3) is convex and, therefore, positive. Whereas the L-shaped space is not convex because a virtual line that joins two points of the shape cuts across the corner and therefore goes outside the space. According to Alexander Et. Al. (1977, p. 518), 'positive' spaces are enclosed - at least to the extent that their areas seem bounded (i.e. the 'virtual' area is convex). The L-shaped space, therefore, contains two large virtual spaces (thereby, adding to its interest). 'Negative' spaces are often poorly defined that it may not be possible to identify their boundaries.



(Figure 2.3, Convexity of spaces, Source:)



(Figure 2.4, The Physical Attributes for Spatial Perception, Adapted by Researcher)

3. VISUAL PERCEPTION OF SPACES

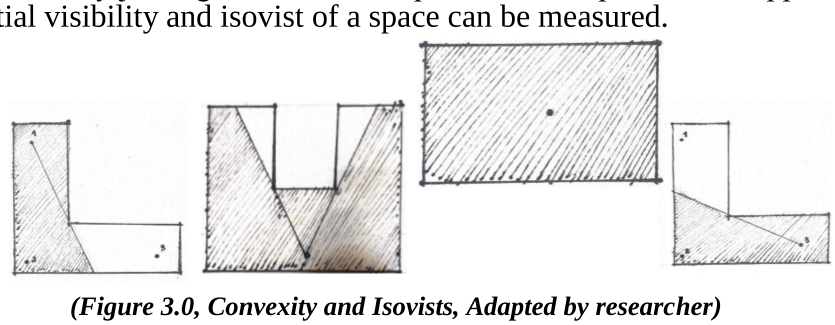
Spatial perception is often based on the assessment of the physical characteristics and containment boundaries defining the space, while neglecting the user's interpretation of the space. However, perception of space is about making sense of the environment.

People's senses are responsible for gathering information about a space, and making a meaning out of it. When it comes to interpreting a space, the sense of vision plays a major role in collecting visual information. The human brain then processes and understands this information, therefore each person behaves differently according to their interpretation. This section aims to present and provide an understanding of the perceptual dimensions of visual design.

3.1 ISOVISTS

Visual spatial perception can be assessed through examining the visible areas in an urban space which can be seen from several locations within the space, these visible area are called Isovists.(Benedikt 1979)

Perception of space can be measured in terms of the perceived distance, depth, size and movement. Hence, when studying an urban space, there are a number of isovists which can befound within. These isovists are all the points visible from a 'vantage' point. The vantage points of an isovist vary according to the spatial position of the observer, as each vantage point in the space has a different visual exposure from the other due to the boundaries obstructing one's vision. Any change in the observer's position generates a new set of isovists. However, convexity has an inversely proportional relation with isovists;i.e.In order for several isovisits to appear, a space can't be convex. By joining the observer's position in a space to the opposing obstructing boundary, the spatial visibility and isovist of a space can be measured.



(Figure 3.0, Convexity and Isovists, Adapted by researcher)

Figure 3(a) shows a space bounded by a convex boundary with zero isovists, as any point of perception within this space will have the same visible area as a result of the absence of any obstructions. Thus, the space is no longer convex. However, in Figure 3(b) a set of isovists can be recognized conveying the convexity-isovist relationship. Vision points 1 and 3 have identical spatial vision area as configured in points b1 and b3, therefore they have equivalent isovists. Whereas vantage point 2 can perceive the entire space, although this space is a non-convex one. In contrary, Figure 3 (c) which doesn't have a point at which one can perceive the entire region, by joining the vantage point to its opposing obstructive edges, the maximum number of isovist of all the previous figures is created.

3.2 LEGIBILITY

One of the main factors affecting the visual perception of a space is 'legibility', which refers to the possibility of making sense within a three-dimensional space. A legible space is a place that can be organized in a coherent and recognizable pattern as Kevin Lynch (1960) described. Hence, the degree of legibility also depends on the distinctiveness and spaciousness of a space as stated by (Kaplan 1975).

According to Kaplan's theory, the visual information acquired is derived from the content and organization of space. Organization of space is therefore an important variable when it comes to visual perception, and it highly influences the creation of a scene (Kaplan 1975). However, people feel uncomfortable when the view is obstructed, as it conveys a sense of insecurity as it's hard to predict what will happen next.

Another perspective of legibility is the ease at which a space can be perceived. This can be conveyed through dividing the space into subareas or shapes, and then focusing on the conditions for moving within this space and its coherence.As shown in the figure 3.0, a space can be highly legible but partially obstructed so it's characterized as highly mysterious. Likewise, a space can lack coherence and still be highly complex. The presenceof more than one factor of the following matrix increases the spatial configuration of a space.

Level of Interpretation	Making Sense	Involvement
The Visual Array	Coherence	Complexity
Three-Dimensional Space	Legibility	Mystery

(Figure 3.1, Level of interpretation of Urban spaces, Source:)

3.3 SIMILARITY

The visual perception of space can be conceived by comparing the volumetric aspects of spaces. The design of space doesn't only involve the whole space, but also the relation between the subspaces forming it. The arrangement of subspaces can be manipulated to generate a certain user experience. This sequential experience of moving from one space to the other should be taken into consideration while designing a space. Furthermore, a space can be unified by series of repetitive subspaces with the same shape or size. (Dee 2004) However, a limited degree of contrast is favorable as (Dee, 2004) suggested that contrast and similarity in spaces should be balanced to avoid both monotony and chaos.

3.4 SPATIAL SEQUENCE

Walking is a very common activity, however, its significance in spatial perception lies in its ability of being the 'mode of experiencing a place' through fully understanding and engaging with the space. Walking from one end of a space to the other at a uniform pace helps the viewer to perceive the space through a progressive series of images, which eventually buildsup the whole image of the space. Hence, Gordon Cullen (1961) conceived the concept of "serial vision".

Cullen argued that the experience is one of series of revelations, with delight and interest from being motivated by contrasts, and the 'drama of juxtapositions'. Furthermore, environments are experienced as dynamic, emerging, and unfolding temporal sequences to describe the visual image of townscape.

4.0 INTRODUCTION AND SELECTION CRITERIA

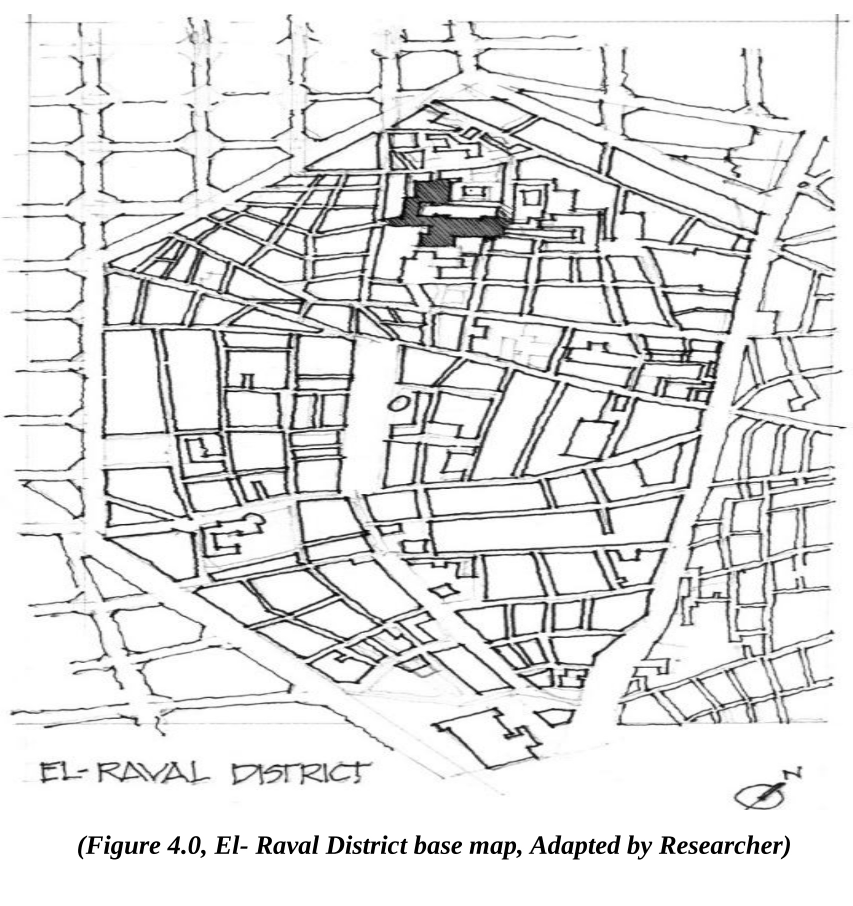
After researching space characteristics studied by different scholars in the previous sections, and consequently arranging them into an assessment template; the next step is to use the template to assess a chosen example. Hence, in this section, one example is selected to display the process of extensive analysis. The reason for selecting this example for demonstration is due to its complexity and rich characteristics which would convey to a large extent the comprehensive analysis.

4.1 El Raval Plaza, Barcelona, Spain

4.1.1 HISTORICAL BACKGROUND

Plaza del angels is located in the old complex urban fabric of the "Raval" district in Barcelona, Spain which was constructed during the Medieval era. However, during the industrial revolution it became one of the poorest and most dangerous districts in Barcelona. Consecutively, the government started demolishing some of its blocks which created spaces within its compact fabric.

The space assessment will be carried out in two stages; first, its **physical aspects** will be examined, then the space's **visual qualities** will be studied based on the variables concluded from chapter two. This assessment will result in a pattern representing both the physical and visual characteristics of the space.



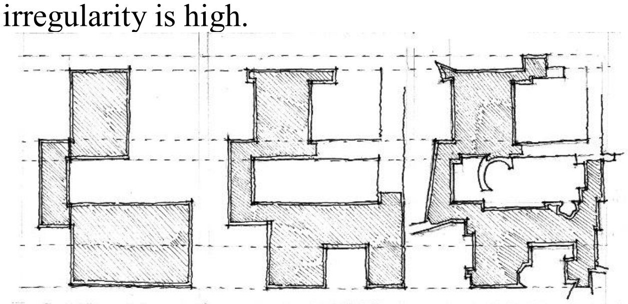
(Figure 4.0, El- Raval District base map, Adapted by Researcher)

The space in this example is formulated by three interconnected subspaces, where the MACBA building lies between them. Hence the analysis will be carried out comprehensively on the space as a whole, as well as on each subspace separately in certain cases.

4.2 PHYSICAL ASPECT ASSESSMENT

1. IRREGULARITY

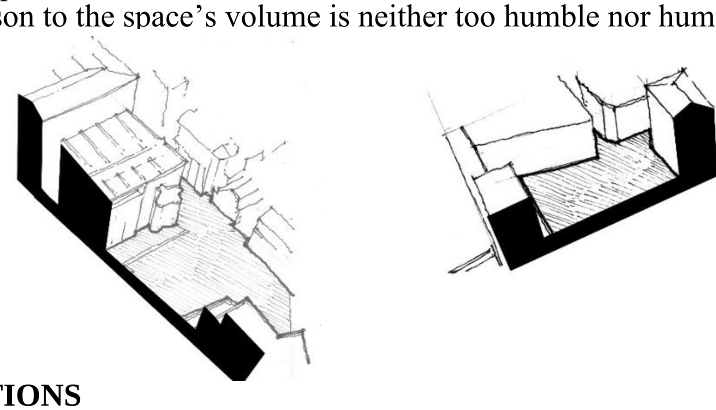
Rob Kreir claimed that any shape starts with a basic shape which then undergoes two stages (Addition and subtraction, tilting and alternating). Therefore, in order to study the aspect of irregularity, the space is abstracted into a simple shape which has different modulation factors that formulates its existing form as discussed in section two. In this example, the space is composed of three simple regular rectangles which are attached to one another (as shown in figure 4.1), where their regularity decreases due to both the addition and subtraction of parts from the original shape, as well as the alternation of the angles of its borders. Hence, it can be deduced that the space's level of irregularity is high.



(Figure 4.1, El- Raval Plaza Irregularity Assessment, Adapted by Researcher)

2. SCALE

The scale of space is reviewed in two levels; first the space is studied in relation to its surroundings where as stated by Stanley et. al the space is either formal, intermediate or intimate. Whereas in this example, the space is considered intermediate as it serves El Raval neighborhood. Secondly and at a rather profound level, the space's scale is assessed in accordance to the human scale where the space is either small, intermediate or colossal. The space in this example is considered intermediate as the human volumetric space, in **plaza del angels**, in comparison to the space's volume is neither too humble nor humongous.

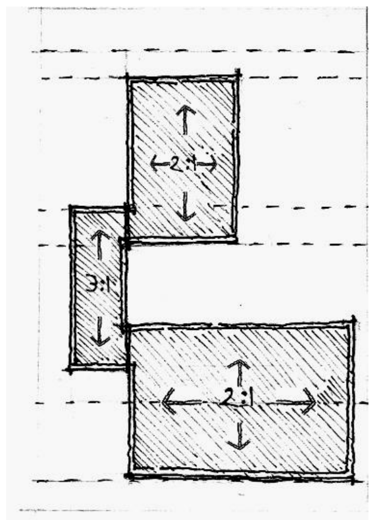


3. PROPORTIONS

On another note, the proportions of space are assessed through examining both the height to width ratio in terms of its section as well as the length to width ratio in terms of the space's plan. In this case, each subspace is studied separately where space 01 and 03 acquire a length to width ratio of 2:1 and a height to width ratio of 1:2 which makes it of intermediate proportions. Whereas space 02's length to width ratio is 3:1, and a height to width ratio of 2:1 therefore making it a linear narrow space. In order to assess the proportions of the space as a whole, a weight for each subspace is calculated based on its volume relative to the whole volume. Hence, the overall proportion is calculated relative to this weighting as shown in figure 4.2.

4. POSITIVITY

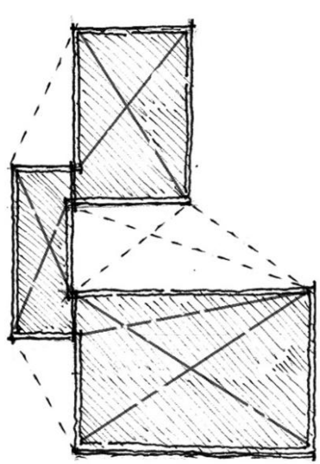
To assess the space's positivity, the enclosure is examined through the reviewing the degree of containment created by the boundaries of the space as discussed in chapter two. In this example, the space is considered highly positive since it is well contained as its surrounding buildings create a continuous wall with minimal space leakage. Moreover, the buildings overlap at the space corners with each other further emphasizing its positivity.



(Figure 4.2, El- Raval Plaza Proportions Assessment, Adapted by Researcher)

5. Convexity

With the purpose of evaluating the space's convexity, the vertices on the space's corners are connected to one another where the more lines connected outside the space, the less convex the space becomes. In this example, each subspace has a certain degree of convexity on its own as their vertices are connected within the space. However, in terms of the space as a whole, the lines between its vertices are mostly connected outside as shown in Figure 4.3, hence the space's overall convexity is considered very weak.

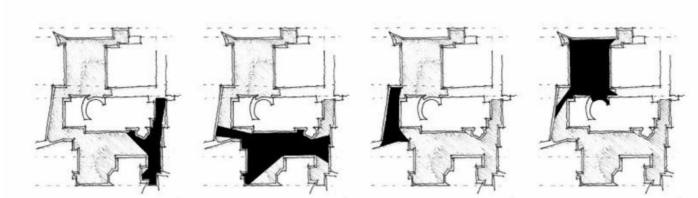


(Figure 4.3, El- Raval Plaza's Convexity Assessment, Adapted by Researcher

4.3 VISUAL QUALITY ASSESSMENT:

1- ISOVISTS

As a result of the space's weak convexity, the space cannot be visually perceived all at once as it is divided into subspaces (01,02 and 03) and each subspace's boundaries prevent the users within it from viewing the space as a whole. This hence generates a different set of isovists where the space is perceived differently according to the spatial position of the observer (vantage point) within these subspaces and with every change in this spatial position a new set of isovoits is created as shown in Fig 4.4. Accordingly, this example can be considered as one of the extreme cases of the isovosits as there is no single vantage point in it that can perceive the entire space.



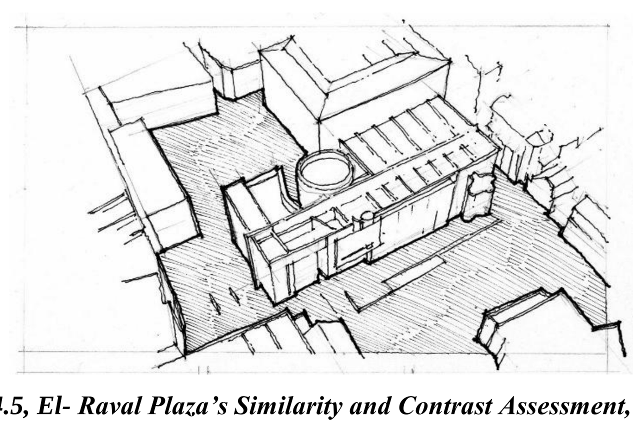
(Figure 4.4, El- Raval Plaza's Convexity Assessment, Adapted by Researcher

2- LEGIBILITY

From the previous assessment of the space's physical aspects, it can be deduced that the space is complex which results in the creation of various visual areas. The complexity of the space does not allow its users to read the space all at once as at each corner a new scenery is revealed hence creating mystery. However, in this example the space has a high level of complexity which results in too much mystery, this hence makes some areas hard to discover. Moreover, the presence of a threshold between space 01 and 03 induces more mystery as it introduces duality in the visual scene.

3- SIMILARITY AND CONTRAST

As mentioned earlier, the space is constituted of three subspaces (01,02, 03) which induces the users to visually compare the volumetric aspect of these subspaces. In this case there is high contrast between these subspaces as the volumetric proportions and scale of subspace 01, 02 & 03 varies greatly as shown in fig 4.5



(Figure 4.5, El- Raval Plaza's Similarity and Contrast Assessment, Adapted by Researcher)

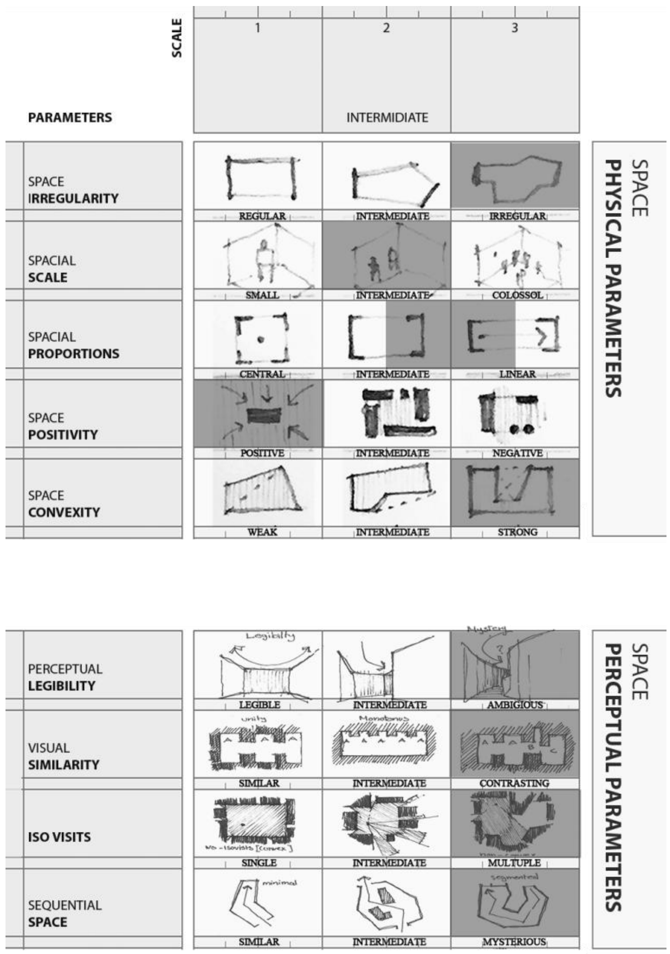
4- SEQUENTIAL SPACE

The visual experience of the space in this example is sequential throughout the three subspaces where the users perceive the space in terms of a set of revelations as the space unfolds in front of them while they move through it. Moreover, the concept of vacuum and pressure discussed by

Cullen is highly present in the space as the transitions between one subspace and the other induces a juxtaposition experience of the space.

5. CONCLUSION:

As a result from analyzing the space's configuration, both physical and visual as discussed above, a pattern is produced as an outcome. This pattern concludes Al Raval Plaza's assessment in form of a stamp that portrays its space's configurations as shown below in Figure 4.6.



Accordingly, this assessment could be carried out on different spaces in order to generate a pattern for each space. Such patterns are distinct yet have a common base that would tremendously help researchers in unifying and categorizing the spaces according to their physical and visual configurations.

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