

CONTROLLABILITY OF TRADITIONAL NEIGHBORHOOD AND ITS SIMPLIFIED LAYOUT

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Abstract

Street hierarchy, as a way of presenting intended information, conforms to social rules that underlay architectural and urban designs to create public, semi-public, and semi-private. These social rules have the responsibility to convey necessary information about place to outsiders as well as to insiders. This research looks at urban spaces as physical structures that represent foci of attention of users and that are collectively a part of the social pattern framework. The argument of this study is that connectivity and forms of streets house certain social rules that intended to serve users, so that any changes in the street layout lead to changes in its social rules. As a case study, the complexity of a walled Arab neighborhood was examined through Sur Lawatyia, located in Muscat Governorate, Oman. By replacing the curvilinear and broken streets of this neighborhood with straight ones; a simplified street layout was derived. Then, a comparison of both street layouts was carried out through mapping, tabulation, charts, correlation test, and with reliance on the method of measurement of street control values introduced by Hillier and Hanson in 1984. The result was that the simple form is far short to be the representation of the space syntax of the traditional street layout.

Keywords

Control value; given value; social rules; social environment; simplified street layout

Introduction

The study of street syntactic and the social logic embedded in urban space relatively is a new area of social science. It helps to examine existing street network or a proposed one and highlight their syntax, hoping to explain some phenomena (Hillier, 2005) or predict one. Street syntactic is a semiotic component (Morris, 1938-71) that is a formal property of physical and social environments as they are construed by society (Broadbent, Bunt, Jencks, 1980). This formal property is a set of rules that governs the assemblage of outdoor units into a coherent spatial arrangement. Based on Hillier and Hanson's concepts of the social logic of space (1984), these rules are developed as rules of privacy, security, segregation, non-interference, integration, control, and publicness. These culturally-socially based rules govern the use of spaces to maintain different degrees of inhabitant-inhabitant's and inhabitant-stranger's relationships.

In traditional cities, street layout is a mix of curvilinear, broken, and dead-end streets, as well as various width and sudden turn situation. The complication of the street syntactic emphasizes the segregation and other related social rules

(Ferwati, 1993). After all, the complication of the traditional neighborhood has evolved through time reflecting the social interaction of its participants and their various needs. As Harrison and Dourish (1996) explicitly stated, "space is the opportunity, place is the understood reality". But what if the same street layout is presented in a simple layout, would it produces different space syntax? The answer for this question forwards the aim of this paper.

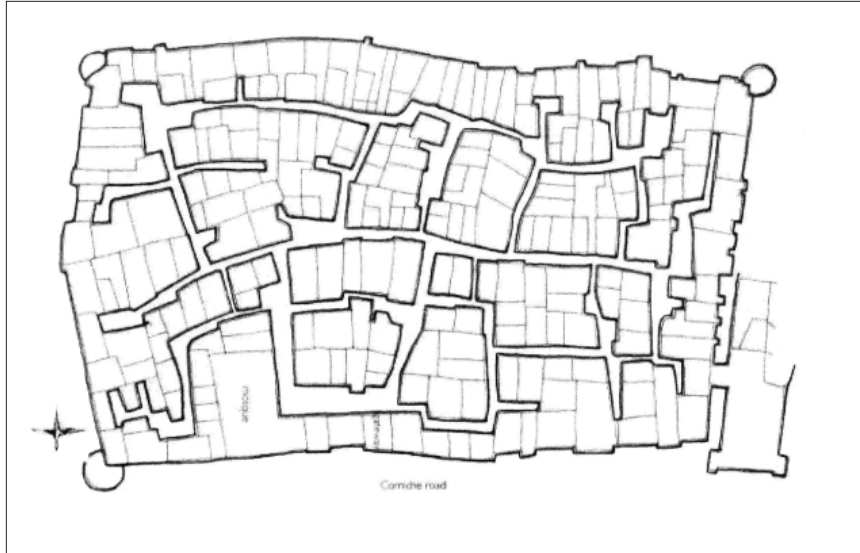
Before going ahead in this research, it is important to define related terms: space syntax, stranger, outsiders, connectivity, and spatial controllability, as used in this study. Syntax in linguistic terms refers to rules governing the formation of sentences to convey messages among people (American Heritage Dictionary); these urban social rules convey messages for both inhabitants and strangers (Hillier and Hanson, 1984). A narrow street with one entrance and no outlet to others, means that "this place is not for public use; it is for inhabitants and insiders to use". "Space syntax then begins by studying the phenomenon of space as it is found in the real world, and from this works towards an understanding of the spatiality of human activity" (Hillier, 2005, p.4). The term "outsider" refers to the residence of different part of the neighborhood, and to visitors whether relatives or friends; while the term "stranger" means the outsider who has no business in the neighborhood or relation with the inhabitants, as a result, they are not expected to wander through the resident area.

Based on Hillier and Hanson's work in 1984, the connectivity of urban spaces takes its community significance according to its degree of integration and controllability. Integration of a space is the overall integration of a space with every other

space of the estate. Controlled spaces are those spaces with a high degree of inaccessibility. It is determined by the number of connections with neighboring spaces (Hillier and Hanson, 1984, p. 109). When a space is controlled (has minimum accessibility from neighboring spaces), inhabitants are secluded from strangers, and thus they can enjoy a high degree of privacy. Privacy was defined by Irwin Altman as a "selective control of access to the self or to one's group" (cited in Gifford, 2002, p. 211). Also, a controlled space is secure as a result of segregation and protection from strangers' interference. The term controlled space may not figure as social control similar to a policeman who monitors and sometime checks the ID of those who come in and out (Jacobs, 1993). It engenders the feeling of being in one's own private place where one has the right to give a questioning look or to avoid unfamiliar faces (Krupat, 1985).

In order to measure the controllability of traditional urban spaces, Sur Lawatiya (walled Lawatiya), as an example of Arab traditional walled neighborhoods, is considered. With the size of 100 by 160 meters, Sur Lawatiya belongs to Muscat Governorate in Sultanate of Oman (Map 1) (Damluji, 1998). It has been evolved to ensure a high degree of security, privacy and isolation from surroundings estates while at the same time occupants feel togetherness and belonging. This walled neighborhood is protected by a main northern gate facing the sea.

It is worth mentioning that this neighborhood characterized by narrow streets (range from 1 - 3 meters), short, irregular width, and its circulations are used mainly by pedestrians. These urban characteristics have social interaction significance on the inhabitants. Jacobs (1995)



Map 1: Sur Lawatiya (walled Lawatiya), an ethnic walled neighborhood beside Matrah area of the Muscat Governorate in Sultanate of Oman, is protected by walls with a main northern gate facing the sea. (Source: Damluji, 1998, p. 175).

pointed out that inhabitants' interaction within their space increases when they are familiar with each other. Of course, this results from frequent meetings and eye contact among inhabitants and the related absence of unfamiliar faces. Gehl (2008) elaborates on how the physical design of a neighborhood helps to create eye contact and socialization among people. The relationship among users of Sur Lawatiya may result from the personal distance in public space that is large enough so it does not permit people to ignore the presence of others or turning their side or back, especially where the personal distance is less than the front. Similar argument is supported by the works of Tuan, 1990 and Hall, 1990.

Research Methodology

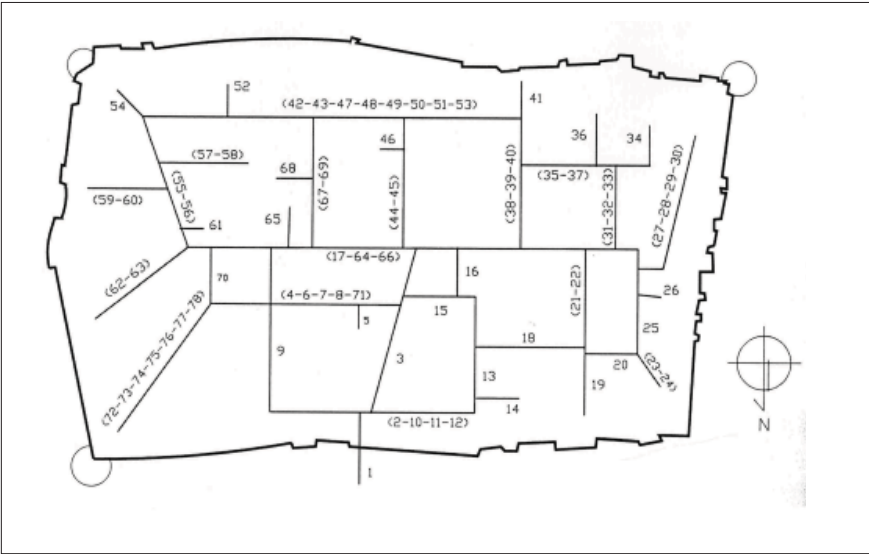
The logic behind this measure relies on the proposition introduced by Hillier and Hanson

(1984) that the higher the number of connected spaces with space X, the less control space X will have. The determination here is based on a route's accessibility to immediate neighbor(s). For example, space X gives a full share to the space that is connected with it; this share is called the given value. If the space X is connected with "n" number of spaces, space X gives each neighboring space a share equal to $1/n$. The degree of controllability of a space (C. value) is the summation of all given values (G. value) that are received by the space from its neighboring spaces.

For the estate of Sur Lawatiya, the space-layout is so complicated that the simple calculation becomes a laborious one. The first step requires the replacement of the streets' layout with their axes. A curved space is represented by broken lines. Then, every line (or space) is assigned an ID



Map 2: Sur Lawatyia with the axial and ID numbers assigned for its street network (Source: Author).



Map 3: The simplified map of Sur Lawatyia and streets' ID numbers (Source: Author).

number. The result is shown in Map 2.

Since the objective of this study is to determine the social representation of the curved and broken streets, the second step is the redraw of Sur Lawatya's street map in a simple layout. The simplification is presented in Map 3 where, for example, streets 2, 10, 11, and 12 combined in one straight street and all numbers of the street remained in parentheses for the benefit of comparison. Also, all dead end-streets became straight since they are single broken spaces. In order to demonstrate the distribution of different social zones of both maps, the third step is to calculate the C. value for each space. The results show that for the traditional spaces the C. values ranges from 0.17 to 4.53; while for the simplified spaces C. value ranges from 0.09 to 4.5. In the following step, it is important to determine the thresholds for different social zones. For public and semi-public zone, there are no defined criteria to select control value thresholds; Hillier and Hanson (1984) used 25, 50, and 75 percent of the control values. The mean value can also be used as a threshold but it divides the spaces of a resident area into two zones only, that is above or below the mean value. Since the street network has (according to many researchers such as Newman, 1972) up to three zones: public, semi-public, and semi-private, the mean values are not considered here.

To select the threshold for the high, moderate, and low-controlled spaces, we seek the case of the minimum connection for each type. This is because the less connection a street has, the higher given value to neighboring spaces. Taking this condition into consideration, Figure 1 illustrates the minimum connection of three levels of controlled spaces. That is a dead-end street

for the high-controlled space; one dead-end street and a public pace for moderate controlled space, and three connections for a low-controlled space.

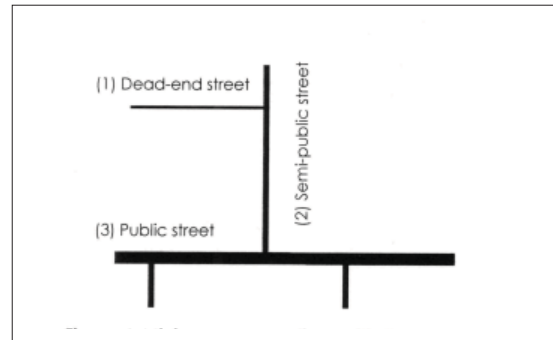


Figure 1: Minimum connections with three types of streets: (1) High, (2) Moderate, and (3) Low-controlled spaces. (Source: Author).

The dead-end street is an extreme case of high-controlled space because it has only one single exit street. This exit street gives a maximum G. value of (0.5) to the dead end-street; minimum connection with the exit street represents the maximum given value to the dead-end street. Therefore, the C. value of 0.5 is selected as the maximum threshold for high-controlled space. The moderate-controlled space, or exit street, is connected with one high-controlled space and one low-controlled space. The high-controlled space gives the maximum given value of 1 to the moderate-controlled space.

The low-controlled space has the minimum connection; therefore it gives the exit street a $1/3$ share = 0.333. The C. value for the exit space in this example is the sum of both received given values

($1 + 0.33 = 1.33$), representing the maximum C. value or threshold for moderate-controlled space. In brief, between the highest and the lowest C. values, the classification of three levels of controllability of spaces is defined as follow:

- 1.32 and lower = High-controlled space
- 1.33 - 1.49 = Moderate-controlled space
- 1.50 and higher = Low-controlled space

Accordingly, the calculated C. values were divided into three categories that were illustrated in Maps 4 and 5.

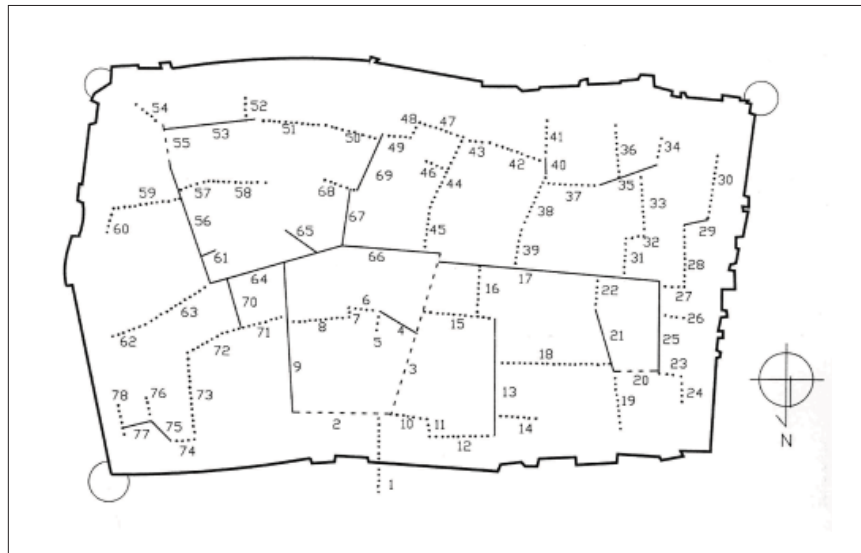
Discussion

This analysis provides different possible inhabitant-outsider encounter situations, and not inhabitant-inhabitant encounters. As defined above, inhabitants of one street are outsiders for inhabitants

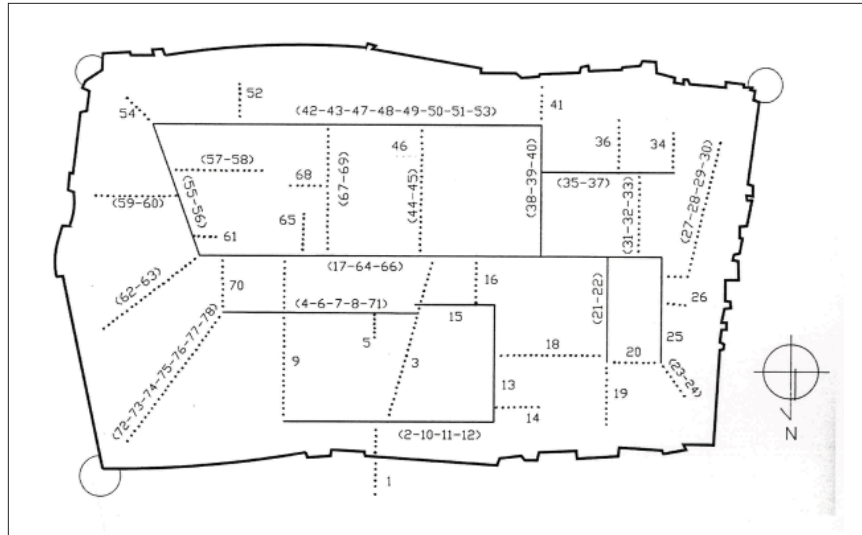
of other streets within the same neighborhood. For the comparison of both the traditional map and its simplified layout, it is important to examine two aspects: 1- the spatial distribution of streets with different control values; and 2- changes in the strengths of the degrees of controllability.

Spatial Distribution of Streets with Different Control Values

An investigating look at Maps 4 and 5 confirms that the number of streets in the traditional street pattern is reduced in the simplified layout almost to half, from 78 % to 40 %. However, the major percentages go to low control values of 26 % and 28 %, and high control values of 69 % and 72 % respectively. Both maintain no significant differences. In regard to the moderately controlled streets, the number is very small (4 out of 78) in the



Map 4: Control Values of the traditional map
Solid lines = low-controlled spaces;
dash lines = moderate-controlled spaces; dot lines = high-controlled spaces (Source: Author).



Map 5: Control Values of the simplified map
Solid lines = low-controlled spaces;
dash lines = moderate-controlled spaces;
dote lines = high-controlled spaces (Source: Authors).

traditional map while none is found in the simplified map. Despite the close to tied percentages between both groups of control values, this finding does not illustrate the syntactic changes of the spaces' distribution. Systematic analysis of Maps 4 and 5 shows different connectivities of social spaces: low, moderate, and high-controlled spaces where the examination of each type raises several questions: Are they located, in the core or in the periphery? Are they radial or parallel, cluster or evenly spread pattern? Are they long or short? And, how they cross the area?

Map 4 shows that low controlled spaces form 26 % of the total streets while map 5 shows 28 %. In the former case, there are major roads (17, 66, and 64) located in the middle of the neighborhood. As a broken road, these roads lay east west forming the longest street of all. Some other low controlled roads lay northward and the southward, as the

case of roads 9, 25, 67 and 56. In the simplified map, we have roads 17, 66, and 64 in the center and others with similar low C. value lay above it (as roads 35, 26 and 42, 43, 47, 49, 50, 51, 53) and below it (as roads 15, 4, 6, 7, 8, and road 2, 10, 11) with link roads such as roads 3, 13, (21-22), (25-26), 70, (39-38), (44-45), (67-69), and (55-56). They are clustered in forms of loops or grid-like core.

The moderate-controlled roads for map 4 are very few and represent only 5%, which are of relatively medium and short length; while the high-controlled spaces that are relatively short and medium, represented two third of all spaces in both maps. In the traditional Map 4, high-controlled spaces are found as dead-end and connector streets; while in the simplified Map 5 there are only dead-end streets with exception of four connectors: 3, 9, 20, and (31-32-30).

In both maps (4 and 5), there is a lack of intermediate or semi-public zones. Semi-public space is also called the filtering zone because it works on reducing or filtering the types of users who enter the place. As a result, it is evident the dramatic shifts from semi-private to public, such as streets 26, 57, 65, and 68. In typical cities or unconfined neighborhood, the absence of semi-public zone is responsible for the increase in crime rate (Newman, 1972) and the social isolation (Jacobs, 1995). In the case of walled neighborhood of Sur Lawatyia, the isolation of the strangers is determined by the single gate, enforcing low control level on street 1. Therefore, I believe, the direct connection between Low and High controlled spaces is acceptable here since all residents in this compact neighborhood know each other at least by family names, as one of the residence told me. In a relative sense, the presence of strangers becomes unusual in this zone while the present of outsiders, defined earlier as friends or relative, is expected.

Changes in Strength of Control Values

Investigating changes in the strength of streets' control values is important for the comparison between the traditional street layout manifested by both broken and curvilinear streets and their transformation to straight lines. This investigation points out two questions: Is there changes in the strength of C. values? If yes, is there a correlation between C. values of the traditional streets and that of their counterpart of the simplified layout? To answer both questions, an examination of C. values in Tables 1 and 2 is possible through two statistical tests, the standard division and the correlation coefficient test.

By a close look at the related data, it is clear that

C. values unevenly range between the lowest number (0.09) and the highest one (5.29) that found in the simplified map. The scatter chart shown in Figure 2 demonstrates changes of all traditional streets' C. values and its counterpart of simplified ones. The mismatch of C. values of both cases is clear. In another word, the level of controllability changed more or less besides a shifting up of the mean value from 1.06 (in the traditional map) to 1.36 (in the simplified layout). Additionally, the Standard Deviation for the traditional C. values is 0.802, while for the simplified C values is 1.402, proving that the Standard Deviation of the traditional C. values is relatively closer to its mean value than that of the simplified one.

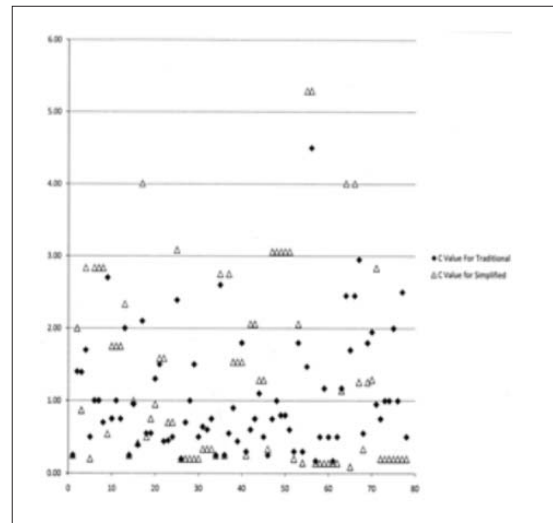


Figure 2: Comparison of the dispersion of 78 C. values of traditional and its simplified streets. The mismatch between both cases is clear. (Source: Author).

To find out whether this mismatched of C. values of both cases can be correlated, a performance of a correlation coefficient test is performed. It reveals an intermediate value of 0.53466, a demonstration of a lack of a strong correlation. Since not all C. values have the same degree of correlation, Figure 3, a plot of C. values of traditional map against C. values of the simplified layout, helps to determine the strongly correlated values from the weak ones.

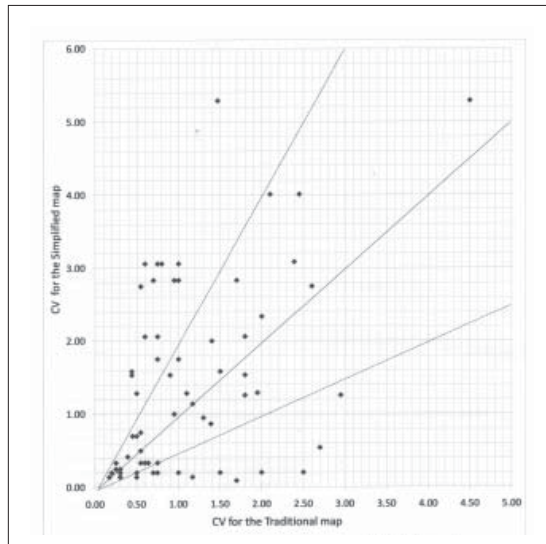


Figure 3: Correlation plot for paired comparison of 78 C. Values of the traditional and simplified maps (Source: Author).

David Lowenthal (1972) used strong resemble lines with an equal division of the scatter chart by a center line and two other dash lines. Likewise, Figure 3 was constructed. The closer of a control value to the center line, the higher its correlation and the farther the weaker is its correlation. The

other two dash lines form a strong resemble cone where that value lying inside has strong resemblance, while the one located outside has a weak resemblance. Therefore, streets lying outside the cone of a strong resemblance tend toward either Y or X. The former pertains to the simplified data that has 15 streets, while the latter pertains to the traditional data that has 18 streets. Streets lying outside the cone form 42% of total streets, an indication of moderate resemblance of C values between both cases.

Conclusion

Outdoor spaces are perceived and cognitively understood by the social rules (publicness, privacy, security, etc.) governing space accessibility and shape (straight, broken, or curved). This produces a coherent spatial and semiotic arrangement. The method followed in the analysis of these coherent spatial arrangements helped the construction of maps to show locations of public, semi-public and semi-private spaces in Sur Lawatiya and its simplified layout. However, these maps only give a general interpretation of the social logic. For traditional neighborhoods, syntactic analysis of the relationships of outer-spaces at the local level helps understand the social rules that govern the logic of space connectivity. It means looking at given space relationships with neighboring spaces. It was demonstrated through a comparison study of Sur Lawatiya, a traditional Arab neighborhood, with its simplified layout. The study focuses on streets' spatial distribution besides strength and correlation of their control values. This result suggest that both traditional and its simplified layout cannot claim similarity, as both have different space connectivities.

References

Broadbent, G., Bunt, R. & Jencks, C. (eds.) (1980). Signs, symbols, and architecture. Toronto: John Wiley & Sons.

Damluji, S. S. (1998). The architecture of Oman. UK: Garnet Publishing Ltd.

Ferwati, M. S. (1993). A geographical semiotic analysis of four Damascene residential neighborhoods: Spatial design and behavioral relations. London, Ontario: Faculty of Graduate Studies, University of Western Ontario.

Gehl, J. (2008). Life between buildings: Using public space (6th Edition). Translated by Joe Koch. New York: Danish Architectural Press.

Gifford, R. (2002). Environmental psychology: Principles and practice (3rd Edition). Canada: Optimal Books.

Harrison, S., & Dourish, P. (1996). Re-place-ing space: The roles of space and place in collaborative systems. Proceedings of CSCW 96, 67-76. New York, NY: ACM.

Krupat, E. (1985). People in cities: The urban environment and its effects. Mass.: Cambridge University Press.

Jacobs, J. (1993). The death and life of great American cities (Modern Library Edition). New York: Random House.

Hillier, B. & Hanson, J. (1984). The social logic of space. London: Cambridge University Press.

Hillier, B. (2005). The art of place and the science of space. World Architecture, 185 (Special Issue on Space Syntax), 96-102.

Hall, E. T. (1990). The hidden dimension (Anchor House edition). USA: Doubleday and Company.

Newman, O. (1976). Defensible space: Crime prevention through urban design. New York: Collier Books.

Tuan, Y. F. (1990). Topophilia: A study of environmental perception, attitudes, and values (Morning Edition). New York: Columbia University Press.

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