Abstract

Space reflects the culture of its respective society. By analyzing configurational patterns of space, the discipline of spatial analysis attempts to reveal the underlying socio-cultural implication within space. In this paper, however, spatial analysis is criticized as being superficial, as the cultural studies discipline sets out several topics that currently cannot be properly addressed by spatial analysis. One major topic is the Individualism-Collectivism cultural dimension. This study provides insight on how the IND-COL dimension can be addressed through spatial analysis. The IND-COL dimension is reinterpreted as the degree of differentiation between inhabitants and strangers, where the differentiating factor is 'familiarity' obtained through the differing wayfinding behavior within a spatial configuration. Assuming that an individualist space displays a configurational pattern that hardly differentiates spatial familiarity between inhabitants and strangers, while a collectivist space displays a larger difference between the two groups, spatial familiarity of inhabitants and strangers are quantified as the integration synergy index and ERAM synergy index, respectively. It is then the degree of difference between the two synergy indexes that identifies the IND-COL dimension of a spatial configuration. To verify this conceptual framework, comparative analysis on single-family houses and multi-family apartments, housing types with differing cultural backgrounds, was conducted.

Keywords: individualism-collectivism; cultural dimension; spatial analysis; Space Syntax; ERAM

1. Introduction

Space is often said to be a social product. Therefore, space reflects the culture of its respective society. Well known studies that support this argument are the works of Amos Rapoport (Rapoport, 1969) and Irwin Altman (Altman & Chemers, 1984), who studied various indigenous cultures and the indigenous domestic homes that reflect those respective cultures. Their works were mainly focused on cultural practices such as lifestyles, norms and activity systems. However, in the contemporary information age where cultural practices are converging, their studies are mere ethnographic studies, lacking implications on designing contemporary domestic homes.

The absence of a conceptual framework between contemporary space and culture also has to do with how space has been approached. Since architectural practice is not the direct planning and design of space, but of the physical beings that surround space, spatial discourses were in fact on the form, structure and materiality of the physical beings. In the contemporary world, where most buildings are mass produced concrete structures, space as form, structure and materiality is more likely a constant, rather than a variable.

Understanding culture as a practice such as rituals, and space as physical characteristics such as form and/or materiality, there can be no correlation between the two, since both tend to be uniform in the contemporary world. That is, most people live westernized lifestyles while living in concrete structures. Can there be a relational framework between contemporary space and culture? This study shall address this question.

Culture is not just a set of practices. More importantly, culture is a set of abstract concepts such as worldviews and values, the differences of which remain constant to this day. In recent studies, quantitative scales that can comparatively 'measure' abstract culture at a national scale have been developed by cultural anthropologist Geert Hofstede. Known as the 'IBM study,' he compared cultural differences between nationalities while other factors were kept controlled. The study covered 66 nationalities and over 100,000 survey subjects. Through this study, he identified several cultural dimensions, among which is the individualism-collectivism (hereafter IND-COL) dimension. (Hofstede et al., 2010) The IND-COL dimension has been adopted as the key framework in numerous cross-cultural studies. Unlike the cross-
cultural framework used by Rapoport and Altman, this framework maintains relevance to contemporary societies. For this reason, the author argues that cultural understandings of space should be based on the IND-COL dimension.

On the other hand, there have been theoretical attempts to understand space not as physical matters, but as a medium that carries a 'social logic.' (Hillier & Hanson, 1984) Their original vision was to address the dynamics between three user groups; inhabitants, visitors and strangers, within a spatial context. Interestingly, it is the dynamics between in-group and out-group that defines whether a culture is individualist or collectivist. (Triandis, 1995) Conceptually, inhabitants and strangers respectively correspond to in-group and out-group, as space creates a virtual boundary between 'those that belong' and 'those that do not.' Such conceptual correspondence hints at the possibility of uncovering the 'cultural fundamentals' embedded in space.

2. Introduction and Critical Review of Spatial Analysis as a Methodology for Cultural Studies

2.1 Overview of Spatial Analysis

Space is a social product because it not only addresses the needs of its society, but also because it becomes a part of the society once produced, affecting the daily lives of the people. Such intimate relation between space and society cannot be investigated through style and/or aesthetics, currently the primary discourses on space. In this regard, spatial analysis focuses on the relational characteristics of sub-spaces, spatial nodes that are part of a larger spatial structure. Take Fig.1. for example, where two similarly looking buildings of a 3x3 layout can still have a completely different network of spaces. While the example in the upper row has a spatial network of a tree-structure, the example in the lower row has a decentralized structure.

In essence, spatial analysis is the quantitative description of the centrality of each spatial node. The notion of centrality comes from social network analysis in which centrality is defined in various ways such as: degree centrality, closeness centrality, betweenness centrality and eigenvector (prestige) centrality. Among these centralities, Space Syntax follows the closeness centrality model which is based on the sum of shortest distances between that node and the other nodes in deriving the integration index, while ERAM, a less recognized spatial analysis model, follows the eigenvector centrality model which is based on the probability of arrival assuming complete random wandering. As centrality reflects the topological position of the spatial node within the spatial network, spatial analysis is referred to as a configurational analysis. Such configurational analysis can be done throughout the entire spatial structure (thus, global integration and global ERAM), or within a certain depth limit (thus, local integration and local ERAM).

For each spatial node, four configurational indexes, namely global integration (denoted as I), local integration (denoted as I₁), global ERAM (denoted as ERAM), and local ERAM (denoted as ERAM,) can be defined. Then, for each spatial structure, or the network or spatial nodes, the statistical correlation between global and local indexes can be calculated. The statistical correlation between global and local integration is defined as the integration synergy index, which in Dalton's work is shown to be an effective index in quantifying the degree of sense of community. This is because the higher the synergy index, the more one can rely on the local spatial structure to predict the global configuration. (Dalton, 2010) On the other hand, ERAM synergy can be defined as the statistical correlation between global and local ERAM. Such index is yet to be utilized in spatial analysis, and will be explored in this study.

2.2 Contemporary Ethnography or Quasi Traffic Simulation?

The idea of spatial analysis was originally proposed to explore 'the social logic of space.' (Hillier & Hanson, 1984) Choi supports this attempt in saying that "studies on the close relationship between culture and house form are largely ethnographic ... the full richness of the relationship between culture and house form remains obscured" and emphasizes the significance of spatial configurations. (Choi, 1987) In another study, Choi diachronically analyzed Korean apartment plans to trace the topological changes of the kitchen, a space culturally designated for women. In his study, the increased social status of women was found to be evident in the increasing trend of the integration index for the kitchen. (Choi, 2003) However, whether this finding fully illustrates the relationship between culture and space remains questionable.

In the cultural studies discipline, such anecdotes do little in understanding a culture, as they are specific cultural practices, unsuitable for comparative studies. To ensure commensurability between different cultures, interest is placed on the common issues that
every culture must face. Such issues include relation to authority, relationship between individual and society, concept of masculinity and femininity, dealing with conflicts, etc. (Inkeles & Levinson (1954) and Hofstede et al. (2010)) It is how each culture deals with these common issues that define cultural identity, and need to be identified from the socially produced space.

Fig. 2. illustrates the framework used in previous studies in applying spatial analysis to space. Spaces are designated for specific user groups. In Choi’s exercise, the kitchen was seen as a space designated for women; a notion probably valid in the Confucian context, but less so in other parts of the world. Because the assumed designation itself is not universal, the resulting finding has less socio-cultural implications in understanding space.

Moreover, the framework of designating certain spaces to certain user groups can hardly be applied to an urban setting, since urban spaces tend to be public, unable to be exclusively designated to certain user groups. In this regard, spatial analysis, when applied to urban spaces, no longer serves as a means for understanding interpersonal relations that the spatial configuration promotes. Spatial analysis is rather used in urban settings as a traffic simulation model, anticipating the locations where more people can be expected. Following this utilitarian approach, variations of spatial analysis models were proposed to improve the forecast accuracy. (Turner, 2001, Kim, 2006 and Cho, 2006) Considering that urban space has, by definition, more socio-cultural implications than architectural space, it can be said that the original purpose of spatial analysis is yet to be fulfilled. In this study, the author will demonstrate the utilization of spatial analysis in identifying the IND-COL dimension in space, with emphasis on urban space.

2.3 Operational Definition of Spatial Analysis Models

It will be discussed in the following section that the analysis of IND-COL dimension requires the comparative analysis between inhabitants and strangers. To achieve such analyses, the two spatial analysis models, Space Syntax and ERAM, will be operationally defined as the corresponding spatial analysis models for the two user groups. This is due to the difference in the type of centrality that the models are based on. As mentioned earlier, Space Syntax is based on closeness centrality, the classic definition of which implies that the spread of information is modeled by the use of shortest paths. Spatially, this implies that all movements occur along the shortest path. Meanwhile, ERAM assumes the complete randomness of movement. While both are quite extreme assumptions, the assumptions of Space Syntax and ERAM correspond to the behaviors of inhabitants and strangers, respectively. This correspondence can be verified through the works of Penn et al. (1998) and Cho (2006). Penn et al. revealed that Space Syntax better models the movement of cars, which tend to follow route efficiency and thus resemble the behavioral pattern of inhabitants, as to the movement of pedestrians, which are relatively free to wander around as a stranger would. Cho’s work found that the ERAM model better models pedestrian movement than does Space Syntax, which reinforces the operational definition.

3. IND-COL Dimension in the Spatial Analysis Context

3.1 Hofstede’s Cultural Dimensions Theory

Between 1967 and 1973, Geert Hofstede executed a large survey study regarding national values differences across the worldwide subsidiaries of IBM, a multinational corporation. He compared the surveys of 117,000 employees from various nationalities. Through analysis of this survey, he identified systematic differences in national cultures on four primary dimensions: power distance, individualism-collectivism, uncertainty avoidance and masculinity-feminity. His cultural dimensions theory was one of the first theories to quantitatively describe cultural differences. More importantly, it should be noted that Hofstede’s theory shed light on the awareness of cultural differences in contemporary societies. Rather than the cultural convergence phenomena one can
expect with the availability of information technologies ('the global village culture'), it is shown that cultural differences still remain significant. Among the various Hofstedean dimensions, Nisbett traces the roots of IND-COL dimension back to the ancient times of Aristotle and Confucius. (Nisbett, 2003) It is because of these strong roots that cultural differences regarding the IND-COL are considered the most significant among the various Hofstedean dimensions.

3.2 IND-COL Dimension in Interpersonal Relations

The IND-COL dimension explores the "degree to which people in a society are integrated into groups." Individualist societies have loose ties that often only relate an individual to his/her immediate family. They emphasize the "I" versus the "we." Its counterpart, collectivism, describes a society in which tightly-integrated relationships tie extended families and others into in-groups. These in-groups are laced with undoubted loyalty and support each other when a conflict arises with another in-group. (Hofstede et al., 2010) This leads to differences in one's self-concept. While an individualist would define themself by his/her uniqueness, a collectivist would do so by his/her social role, going as far as sacrificing his/her individuality. Triandis discusses four defining attributes of the IND-COL dimension; how individuals perceive themselves, how individuals relate to others, what goals an individual follows, and the inspirations to their behaviors. (Triandis, 1994) In this study, discussions on the IND-COL dimension will be limited to interpersonal relations (how individuals relate to others) since that is the common theme with spatial analysis; 'the social logic of space.'

A group of individualists is an open network of people merely 'sharing' an interest. Even when one is involved in a group, his/her individuality is maintained and respected. As an open network, this in-group displays loose inner ties while being open to those outside. On the contrary, a group of collectivists is a closed group requiring a certain level of individual sacrifice for the collective benefit. This in-group has strong inner ties, and more importantly, an exclusive boundary against those outside. Such are the cultural behaviors of individualist and collectivist societies, which is expected to be reflected in the socially produced spaces. A primitive example would be the difference in mainstream housing types according to the cultural backgrounds. In Hofstede's survey, South Korea and the United States of America were found to be the most collectivist and individualist societies in the world, respectively. Interestingly, the two societies have contrasting mainstream housing types, where South Korea is referred to as the "Republic of Apartments," (Gelezeau, 2007) while it is "The American Dream" to live in a suburban single-family house. However, at this stage, it is only superficial to relate the differences in space with the IND-COL dimension. To do so, we must review the IND-COL dimension in a spatial context.

3.3 IND-COL Dimension in the Spatial Context

The above diagram highlights the main difference in individualist and collectivist cultures with the intensity of boundaries between in-groups and out-groups. That is, individualist cultures have 'weak boundaries' whereas collectivist cultures have 'strong boundaries.' Such boundaries can be materialized literally as physical barriers or the lack thereof. However, as such cultural behaviors are practiced subconsciously, they are also expected to be configurationally embedded in space, identifiable through topological analyses such as Space Syntax and ERAM.

How does space distinguish between in-group (inhabitants) and out-group (strangers)? In other words, what distinctive spatial power/capital do inhabitants possess over strangers? To answer this question, the author would like to highlight the importance of one's ability to benefit from the services provided by his/her surroundings.

In his book 'Place and Placelessness,' Relph discusses the spatial environment through concepts such as existential insideness, existential outsideness, behavioral insideness, etc. In Relph's framework, existential insideness is "the situation involving a feeling of attachment and at-homeness," the psychological state that an inhabitant would ultimately pursue. On the other hand, existential outsideness is "the feeling of being separated and out of place," the psychological state of a stranger. Most important is behavioral insideness, which is "the deliberate attending to the appearance of the place to familiarize oneself with the setting." (Relph, 1976) Traditionally, the built environment is understood as the provision of services; e.g., a school located near a residential area provides educational services while a nearby store provides amenity. From the user's perspective, however, the level of benefit can differ. Long-tenured inhabitants are likely to know the whereabouts of the available services, taking full advantage of the surroundings, while strangers or newcomers are less likely to do so. That is, the user's spatial cognition plays a key role in the distinction between inhabitants and strangers. Furthermore, as Walter Benjamin (2002) portrays in the idea of a 'flaneur,' movement from one place to another is not only the means to benefit from
services, it is by itself a key service of urban space. The joy of strolling and exploring the city is only allowed to those with knowledge of the whereabouts; the inhabitants.

In sum, the IND-COL dimension is spatially reflected through the difference in spatial cognition that inhabitants and strangers possess. That is, for spaces where strangers possess a substantially less amount of spatial cognition, strangers can be easily distinguished from inhabitants as being lost, whereas for spaces where the difference in spatial cognition between inhabitants and strangers is minimal, the distinction would be less pronounced, resulting in a generally welcoming atmosphere. From the view of spatial analysis, the possession of spatial cognition is configurationally structuralized and can be analyzed through integration synergy (as demonstrated in Dalton (2010), but specifically for inhabitants in this study) and ERAM synergy (specifically for strangers in this study).

3.4 Spatial Analysis Theories in the Context of the IND-COL Dimension

As the proposed framework for analyzing the IND-COL dimension has been set, the proposed methodology was initially tested on actual examples of urban spaces. For the test subjects, three of Jiang & Liu's (2010) axial maps of typical blocks from major cities, frequently referenced in spatial analysis studies for their typicality, were used. The three cities are: Barcelona, Paris and London. According to Hofstede's original work the respective national culture of these cities on the IND-COL dimension are: Spain 51 (Neither Individualist nor Collectivist), France 71 (Moderately Individualist) and UK 89 (Highly Individualist). (Hofstede et al., 2010) Given the cultural differences of the three societies found on the IND-COL dimension, it is expected that the difference in spatial cognition between inhabitants and strangers (with spatial cognition of inhabitants being greater) would be in the ascending order of London, Paris and Barcelona. Take London, for example, the integration synergy index, which is the statistical correlation between global and local integration is .996, meaning inhabitants are ‘granted’ a very high level of spatial cognition. Similarly, ERAM synergy is .984, meaning strangers, through their wayfinding efforts, can also obtain a high level of spatial cognition as well. As a result, the synergy difference remains minimal, a pattern expected from an individualist culture. It can be seen in Table 1. that the expected configurational patterns are present in the ‘Synergy Difference’ row.

4. IND-COL Dimension in Mainstream Housing Types
4.1 Empirical Study of the Synergy Difference Model

In this section, the synergy difference model set forth in the previous section will be applied to select residential districts in Korea and the USA. As aforementioned, Korea has the most collectivist national culture (IND-COL dimension 18) contrasting...
with the world's most individualist national culture (IND-COL dimension 91) of the USA. Ideally, such cultural differences should be found in all spatial settings. For commensurability, however, the comparative study will be limited to housing districts for they are fundamental to the peoples' daily routines, thus reflecting and reproducing their respective cultures.

Samples were selected based on their significance in regards to their respective housing studies. In selecting Korean samples, the book 'History of Collective Housing Planning in Korea (Kang, et al., 1999)' was referred to, while American samples were selected from the book 'Great Planned Cities (Gause (ed.), 2002).' From the two books, samples of similar size (number of households in the 5,000 – 20,000 range) were chosen. For analyses, spatial structures of the sample districts were represented with axial lines. Fig.6 illustrates that the axial lines mainly represent a road/street/path running along a land block, hence ending at a crossing. Additionally, entrances to buildings were also represented as axial lines since they are also part of the circulation system in a housing district. (Right illustration of Fig.6.) Following this convention, axial maps of the selected samples were drawn. From the axial maps, integration synergy and ERAM synergy were analyzed using the S-cube Axial Analyzer software.5

Table 2. IND-COL Dimension and Spatial Analysis Values (Building Entrances Included)

| Sample Residential Districts in Korea (Collectivist) | Sample Residential Districts in the USA (Individualist) |
|-----------------------------------------------------|--------------------------------------------------------|
| Banpo Apartment Complex | Irvine Ranch, CA |
| Integration Synergy | .473 | Integration Synergy | .381 |
| ERAM Synergy | .398 | ERAM Synergy | .357 |
| Synergy Difference | .075 | Synergy Difference | .025 |
| Jamsil Apartment Complex | Rancho Santa Margarita, CA |
| Integration Synergy | .547 | Integration Synergy | .240 |
| ERAM Synergy | .440 | ERAM Synergy | .322 |
| Synergy Difference | .107 | Synergy Difference | -.081 |
| Mokdong Apartment Complex | Celebration, FL |
| Integration Synergy | .521 | Integration Synergy | .370 |
| ERAM Synergy | .337 | ERAM Synergy | .339 |
| Synergy Difference | .185 | Synergy Difference | .031 |
| Sanggye Apartment Complex | Ladera Ranch, CA |
| Integration Synergy | .488 | Integration Synergy | .268 |
| ERAM Synergy | .231 | ERAM Synergy | .294 |
| Synergy Difference | .257 | Synergy Difference | -.026 |
| **Average** | | **Average** | |
| IND-COL 18 | Integration Synergy | .507 | Integration Synergy | .315 |
| | ERAM Synergy | .352 | ERAM Synergy | .328 |
| | Synergy Difference | .156 | Synergy Difference | -.013 |
The analysis results are as reported in Table 2. For the four Korean samples, the average integration synergy (spatial cognition of inhabitants) and average ERAM synergy (spatial cognition of strangers are .507 and .352, respectively. For the American samples those averages drop to .315 and .328, respectively. As a result, the synergy difference between user groups for the Korean samples (.156) is significantly larger than that of the American samples (.013), reflecting the cultural polarity on the IND-COL dimension. Of interest is that for several American samples, the ERAM synergy value is actually greater than the integration synergy value. This implies that the inhabitants, due to their behavioral characteristics (following route efficiency as opposed to random wandering), feel even more out of place compared to strangers who obtain a better spatial cognition through wandering.

4.2 How Housing Type Factors into the IND-COL Dimension of Space

It was seen in Table 2. that the IND-COL dimension is reflected in the spatial layout of residential districts. However, it is still unclear whether this cultural congruency comes from the street layout or the housing type, or both. To answer this question, a second set of analyses were conducted, this time based on axial maps excluding axial lines representing building entrances. The rationale to this analysis mode is that by doing so it is possible to observe the effects of placing buildings onto a site. The results of this analysis are reported in the lower half of Table 3. For the Korean samples, the synergy difference is less than that of the original analysis, while the opposite is true for the American samples. Comparing the ‘difference in synergy difference,’ the addition of building entrances, and therefore buildings, solidifies the cultural difference.

5. Conclusion

In the contemporary world, the assumption that culture and spatial design are related has been in question. However, it was Hofstede's cultural dimensions theory that shed light on the continued presence of cultural differences. Focusing on the IND-COL dimension, this study proposed a methodology to uncover the underlying IND-COL cultural dimension from space. The methodology was tested and verified, leading to the conclusion that spaces from collective cultures are those that distinguish between inhabitants and strangers through difference in spatial cognition, while spaces from individualist cultures are those where the distinction is minimal. More importantly, such patterns were found in significant residential districts of two culturally different societies, with the housing types playing an important role.

This study was an interdisciplinary study to introduce a major framework from the cross-cultural studies field into the spatial analysis field. This was made possible by the interoperable concepts of inhabitant (in-group) and stranger (out-group), and the complementary utilization of Space Syntax and ERAM. Thus far, Space Syntax and ERAM were under debate as to which is preferable. In this study, however, it was found that both models have their roles in the cultural understanding of space.

Notes

1 For further details of each centrality, refer to Wasserman & Faust (1994)
2 For further details on calculating integration, refer to Hillier & Hanson (1984)
3 For further details on ERAM, refer to Choi et al. (2003)
4 Locations with higher centrality indexes are, by definition, more public, thus attracting more traffic.
5 Software download URL : http://laus.snu.ac.kr/_pages/s3.php
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