



# A Methodology approach for the comparison of cases in space syntax and morphology studies

Mehmet Emin Şalgamcıoğlu\* 

## Abstract

The aim of this paper is examining a research design methodology approach. This methodology approach is mainly focusing on investigating the comparison of consistent cases within a research structure. The comparison is carried out through the 2D drawing layouts such as plans in the selected study. Although the main concern is examining the methodology covering the comparison of low-rise apartments' domestic space plan layouts, the exemplar study is also introduced briefly within the paper for a better understanding of the introduced comparison structure and the part of the methodology scrutinized. Comparison of plan layouts related cases in space syntax and morphology studies is the starting point. Afterwards, the discussion on the selection of similar plan types (2D drawings) in meaning and sizes made the methodology introduced possible. Focusing on an architectural design related research study is a crucial part of this paper supporting the core discussion. For this reason, focusing on a former research based on architectural design related domestic space investigation with its context related to low-rise apartment plans' in Istanbul was needed. Other than domestic space investigations, this approach may also be applied to similar investigations covering building design morphology and spatial syntax related researches focusing on the comparison of cases depending on a systematic selection. The selection of the analyzed cases in this design methodology approach is crucial with their similar extent of plan sizes and semantic coherence in relation with their use of spaces. Environment-Behavior Studies related research context is also crucial for this methodology approach. Behavioral circuits, behavior setting, and culture-ecology perspective within the building scale should be primarily discussed in order to use this paper's methodological approach.

*Keywords:* domestic space, research methodology, spatial morphology, space syntax

## 1. Introduction

Starting from the 10-15 house configuration in the spiraling street in Aşıklı Mound/Aksaray in the Late Neolithic Age (Çorlu, 1999), extant today via the house we encountered in the grid plan in Priene and Hierapolis and houses of Bergama with atrium, and hillside houses of Ephesus, the development of housing within the context of sheltering need as a basic need of humanity will always continue physically and semantically.

\*(Corresponding author) Assoc. Prof. Dr., Istanbul Technical University, Turkey, [shalgamcioglu@itu.edu.tr](mailto:shalgamcioglu@itu.edu.tr),

Article history: Received 25 March 2021, Accepted 14 April 2021, Published 29 April 2021

Copyright: © The Author(s). Distributed under the terms of the [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/)



As for the 20th century was approached, the process this study accentuated within the context of multi-housing development and Istanbul is the housing development process rooting from the formation of large, luxurious apartments on the main streets of Pera, Taksim and Pangaaltı around 1900 (Colonas, 1999) and continuing its development and transformation.

Multi-housing concept coexists with city and city (in Turkish: Kent, originating from the words Kand/kant, kasaba (town), kale (fortress/home) (Nişanyan, 2009)) involves people engaging in trade, industry, management, service activities. Cultural, social, economic and religious factors are also conspicuous as important complements of a habitation to become a city (Cezar, 1977). Being much-debated within the framework of dialectic relations of globalism and localism nowadays, the city and housing within the city also brings about the similar debates for Istanbul. "Global cities faithfully reflect the economic restructuring, employment structure, and the changes at the population and class formation levels associated with them, as the people and commercial units which assume the vital controlling functions on the global flows are present in these cities" (Keyder, 1999). It is accurate to consider the housing development within this context.

In order to be able to scrutinize the relations regarding the development and changes of the housing space, initially, its relations with its users shall be taken into consideration. Examination of the place identity-social identity relationship and belonging gain importance within this context. In addition to this, environmental perception and cognition, behavioral pattern and personal space should be scrutinized within the scope of environment-behavior theories. Theories based on environmental satisfaction, environmental coherence should also be considered. The association of technological changes within the context of space with socio-cultural changes is substantially important for examination of the effects of communal change, cultural change and social change on identity.

In this context of investigation possibilities of domestic space studies, the aim of this paper is examining a research design methodology approach. This approach may also be applied to similar investigations covering building design morphology and spatial syntax related researches focusing on the comparison of cases depending on a systematic selection. The selection of the analyzed cases in this design methodology approach is crucial with their similar extent of plan sizes and semantic coherence in relation with their use of spaces. Environment-Behavior Studies related research context is also crucial for this methodology approach. Behavioral circuits, behavior setting, and culture-ecology perspective within the building scale should be primarily discussed in order to use this paper's methodology approach.

Design methods, the approach of foreseeing the future in accordance with the scope of DRArch journal is also important. In this context, the details of introduced space syntax related research methodology is covering the core of this paper. Potentials for making comparison related research in the field of space syntax tools is discussed through "Syntax 2D" software developed by University of Michigan (UM). Similarly, University College London's (UCL) Space Syntax Laboratory has also developed "Depthmap" software and still updating with a open source code in order to make analyzes of space syntax related parameters. These software tools are working on a "grid initialization" basis onto a 2D drawing such as plan or section drawing imported from vector based drawing software, which is Autodesk's "Autocad" software in this case.

The parameters covering the space syntax methodology is developed within these softwares. This paper will mainly mention "Syntax 2D" related approach and the unique contribution to the field is explaining how comparisons of different plans or 2D drawings are possible within this methodological approach.

---

## 2. Building the framework

In the low-rise apartments' multi-housing development, the possible changes in space configuration, specialization of some of the intra-residential spaces, their gaining importance and transformation into more high integration value/more integrated, shallow spaces or contrarily, their deepening in terms of space syntax, transforming into spaces where connections weaken put forth the requirement for examination of semantic relations together with the space syntax relation. Cengiz Eruzun (1980) also pointed the gradual specialization of some spaces considering the housing plans in his doctorate study titled a method regarding the detection of space specialization level in houses mentioning the changing state of the intra-residential spaces. As much as the analyses performed utilizing space syntax method, the other factors bringing the transformations in apartment plans should also will be scrutinized in addition to this study in order to determine the specialization of space concept and its shifting level.

The methodological approach that is discussed in this paper is based on "Social Structure of the Space and Space Syntax Based Theories". As much as the descriptions regarding understanding the social structure of the space, the space syntax theory and the structure regarding the grounds of this theory will be revealed in this part of the paper before introducing the core discussing regarding the comparison methodology model of this paper. Once we are aware of the relation of changes regarding space. Further explanations about methodology in the context of Space Syntax Theory will be made on the basis of this ground. "Spatial Recognition" is embraced as the perception style about space syntax. Space Syntax scrutinizes the state of perceiving the space in fragments by people who experience a space and of bringing those fragments together in brain, narrates the fragments into representation and reveals them as cognizable, measurable expressions.

If we consider the space syntax based theories, the space syntax emerges as a theory and method used for identification of structural environment. It was first asserted by Hillier and Hanson (1984) in their book "The Social Logic of Space" as the existence of relations among the external influences producing the patterns and social forces. From the point of view of architecture theory, space syntax contributes to better understanding of the interaction among design features and targeted objective, and social constraints and formal possibilities. According to Hillier, the key concept in The Logic of the Space is the concept of spatial configuration (Hillier, 2007); this concept narrates the state of a relationship covering the other relationships in a complex. Whereas Hillier mentions how this state can pioneer a new theory for architecture in his book "Space is the Machine", he reveals a research on how this analytical theory will gather the improvement of understanding and design (Hillier, 2007).

According to Hillier and Hanson (1984), our biggest obstacle for making better designs originates from our not completely understanding of the delicate nature of the relationship between the social life and spatial organization. The interdisciplinary literature between space and society shall also be more attentively analyzed in order to achieve this. The main target of the research on social logic of the space is to put forth a theory and method that will contribute to the pursuit of society-space relationship starting from architecture in order to overcome the difficulties regarding understanding, research, designing within this context. One of the questions which shall be investigated within the scope of this theory is what the relations of social content of spatial texture or reciprocally spatial texture of social content are. As a method intended for analyzing the spatial texture, the emphasis, accentuation of the relations of local morphological relations and global texture highlights another dimension.

---

The book “The Social Logic of Space” (Hillier and Hanson, 1984) which is placed at the base of space syntax theory examines the definitive theory of spatial texture, and afterwards, its analysis methods. Importance of research on social logic of housing is also emphasized in pursuance to examination of this theory.

The research “A Pattern Language” written by Christopher Alexander (Alexander et al., 1977) in Berkeley in 1977 can be shown as the basis of the method and theory that Hillier and Hanson (1984) put forth, however, Alexander’s approach is rather at a summery level. Alexander’s (1966) article “A City is not a Tree”, on the other hand, approaches more non-hierarchical abstract concepts of spatial relations at its background. As for Stiny and Gips’s (1978) shape grammars, it is in closer proximity with the “space syntax” concept with its configuration on the grounds of basic principles forms, however, it is an appeal developed by extensively refining over more abstract emergence and production circumstances of spatial textures. In the Social Logic of Space (Hillier and Hanson, 1984), on the other hand, the “syntactic generator” concept and explanation of forms of syntagmatic emergence of space are approached in a simpler way than “shape grammar” (Hillier and Hanson, 1984).

The contributors to addition of geometric elements into morphology come up from Thünen (Thünen and Hall, 1966), who was taken as reference from 1826 among the geographers who made appeals with rather formal and traditionalist approach, to Christaller (1933) and Lösch (1954). The most important point to emphasize here is the assertion of distance and location concepts concordantly.

Both cultural identity and semantics are concepts built on the circumstances of function and significance within this context. In continuation of this situation, their appearance of accepting the proper functioning of buildings is also an important aspect of culture.

In addition to this, it would be a deceptive definition to say that the buildings seem in their artifactual, totally physical state. Creation of vacant spatial volumes and transformation of their layout from the state of a physical object to a texture dimension is important. The purpose of buildings is to put the space in an order, in brief, to enable its consideration along with an order concept, to approximate the spaces (Hillier and Hanson, 1984).

The organization of inter-spatial relations, their hierarchy is associated with the order and hierarchy among the relations of people. Society is intervened in the form and basic nature of buildings. In this state, buildings are important visual symbols of the society (Hillier and Hanson, 1984). Systems of spatial relations are also important along with the objects of the buildings.

When we move to another starting point for space syntax, we can come across with concave designed villages by structuring moving from the center on in South America, Africa or in Ukraine in B.C. 4th century (Piggott, 1965). With reference to this example, architecture and spatial form can be assumed to be organized under the influence of some external factors such as climate, technology, topography, however, space resists being explained by such simple external factors. Levi-Strauss (1967) could observe the opportunity provided by working with an approach which handles the social and reasoned processes in space as unbiased and strained projections of external factors, but in this case, it is also difficult to associate the social structure and spatial configuration structure. Whereas space can provide us with plenty of data in social sense in some cases, sometimes it provides as with very little data. Within this context, the need for a spatial theory that can explain the process of moving from disorder to order and meaninglessness to meaningfulness better emerges (Hillier and Hanson, 1984; Hanson 1999).

---

Privacy, territoriality and defensible space theories, all regarding the defense of a given area, or a pattern of behavior that defines and defends a territory of the space as a distinct expression of social reality have affected architecture at many stages such as understanding, designing and altering the space. With the Altman's (1975) style of approaching, privacy emerges as an organizing mechanism that designated the interpersonal interaction. Proshansky, Ittelson and Rivlin (Proshansky et al., 1970; Proshansky et al., 1976) stated that privacy increases the freedom in choices associated to behavior to high level.

Individuals acting upon designated instincts for claiming and defending an explicitly marked space are emphasized in Oscar Newman's (1972) defensible space theory. The approach that can be addressed regarding cognition based theories is also not solely sufficient in order to make a start for the social logic of space (Hillier and Hanson, 1984), but Kaplan's (1987) studies stand on a milestone to be emphasized in terms of being able to understand the relation of cognition based theories and physical environment. Kaplan acquired findings towards the possibility of a low awareness leveled kind of cognitive state that we think fast to affect our assessments about the space by obviating our judgments. This situation reveals the place of perception-cognition-physical environment relation in structuring, defining and development of environment.

Buildings express social meaning with their appearance and planning. Space syntax theory tries to demonstrate this social relation by handling the association of space with its physical relations (Hillier and Hanson, 1984). As for Hillier and Leaman (1973), they discuss in "The Man-Environment Paradigm and Its Paradoxes" that the artifactual physical world is already a social behavior along with its grip on the spatial organization.

While the physical state, physical denomination of the spatial setup is handled by the space syntax, the social meaning is the total of the dynamics constituting the semantic dimension of the space. It is important to accept that the physical and semantic dimensions not separately, but collectively constitute the space. The rules, constraints of the space, at the same time, help us define the relations required to make sense of the space and they lead us to associate this meaning among one than one space cells. Syntax, which can be used to explain the interspatial relations along with the singular spaces which can randomly develop in different forms, processes, the objects in the space, other physical creations, shall be approached together with the meaning of creation of space. Within this context, syntax and semantics are of characteristics of being each other's continuation, far from being each other's antithesis.

The best way to express the social meaning of the space is by discussing on their physical relations. This situation shows us the integration of "space syntax" and "semantics". Pursuant to this discussion, it is not erroneous to express the "space syntax" concept as "an imperfect mathematics of the artificial" (Hillier and Hanson, 1984). Every type of artificial creation which uses syntax can be named as "a dialect pertaining to form or shape". This dialect pertaining to form can be any creation group organized by syntax and this situation generates the "social knowables". Space defines a dialect pertaining to form and every "community" establishes its ethnic terrain, space by organizing according to certain principles. In this case, social relations also express a dialect pertaining to shape at the same time.

Reducing the structure concerning shape into integrated principles means reducing it into principles of knowability. In order to explain the spatial states, which have potential of changeability by time, and which change by the different needs and effects of people, it is required to understand the "integrated principles" generating these states. According to Hillier (1984), these integrated principles are the syntax, itself.

---

What can be known about the physical spatial state of a dialect at any time is its syntax. Syntax also allows the revelation of the systematic similarities and differences of the orders generated by these spatial states. Space syntax analyses also enable comparison of different styles on the same quantitative base (Kim, 1999; Penn, 2003). According to Hanson (Hanson, 1994), configurative analyses of the architectural plans can be perceived and accepted as the archeology of the space, and within this context, space syntax can be used to investigate the form-function relation for housing. Isovist (Figure 1) and visibility graph (Figure 2) analyses constitute an important base in these analyses. Benedikt (1979) suggests that isovists are the most basic element which is used for spatial analysis of small scale environments and their spaces and which can be determined. The studies of Montello (1993), with his study on explanation of spatial features of environmental spaces by extending across a certain observation point, and Turner et al. (2001), with his visibility graph analyses which enables computer-aided integrated analysis of multiple positions in association with each other of multiple points which are prorated on a certain environment, are important (Franz and Wiener, 2008). Hillier, Hanson and Peponis (Hillier et al, 1987) also made important contributions to the space syntax method and theory with their studies regarding isovist.

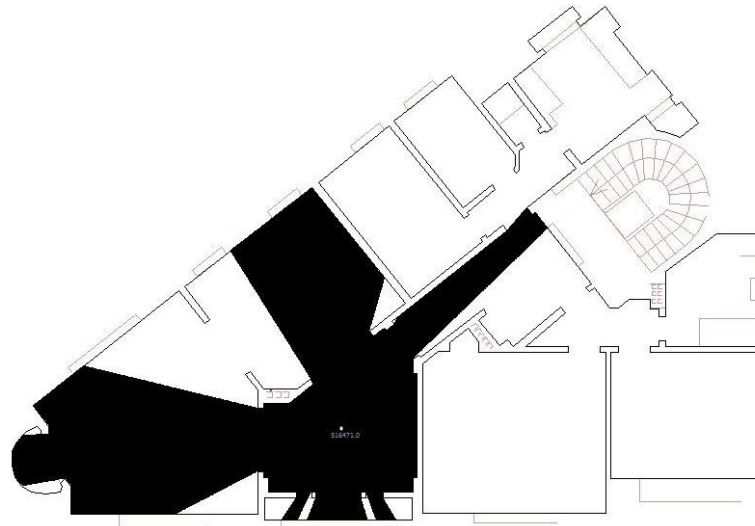


Figure 1 Isovist area based on a single view point is shown on an example plan (Pertev Apartment, Taksim, 1933).

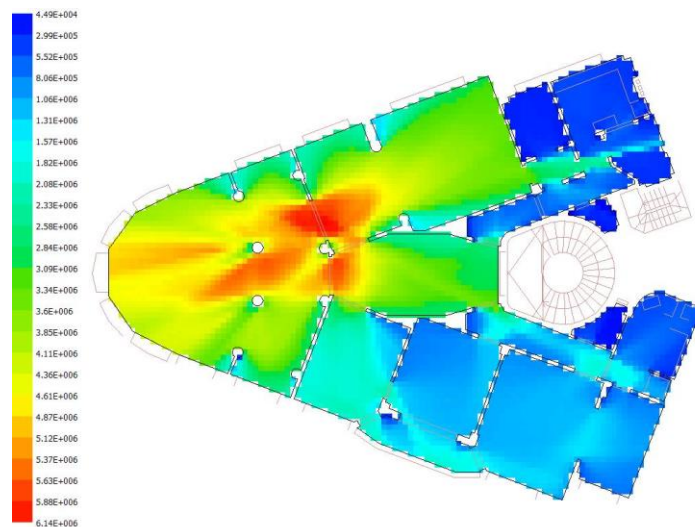


Figure 2 An example image of the visibility graph analysis is shown that is applied on a plan (Ceylan Apartment, Taksim, 1933).

Another point that shall be considered for space syntax analyses is the fact that our visual field is not totally 360 degrees if the relation between movement and cognitive representation is important in our research. Distinct differences occur among forward movement, edge-to-edge movement and the movements made by turning the head (Penn, 2003). The state generated by these differences shall definitely be evaluated as a parameter in the researches and space analyses.

Regarding the space syntax, the discussion on possibility of cognitive space concept not being a metric space concept at all, but being rather qualitative concept and whose state is not changeable by certain geometric variables, a rather basic concept such as topological space or even more prior concept of it, may be a simpler space concept stands out (Penn, 2003).

In the space syntax researches, sometimes it may be claimed that the individuals who use the space and the motivations these individuals have, their use of the space do not reside in the space concept; according to Penn (Penn, 2003), motivations of individuals and clues in the essence of their cognitive states may already exist in the space syntax theory itself and its analyses, thus, theory and analyses may contribute to better understanding of individual level mechanisms by excluding these. In the space syntax theory as a social theory, this state of exclusion is a method for better understanding of mechanisms. In the meantime, with its aspects representing the spatial texture and rendering it countable, space syntax analyses have shown us that the observed movements of pedestrians are strongly associated with spatial configurations (Hillier, Burdett, Peponis and Penn, 1987; Hillier, Hanson, Peponis, Hudson and Burdett, 1983; Hillier, Penn, Hanson, Grajewski and Xu, 1993; Peponis, Hadjinikolaou, Livieratos and Fatouros, 1989; Read, 1999; Penn, 2003). In addition to this situation, the conclusion that spatial integration is associated with observed movements was drawn in Kim's (Kim, 1999) PhD research on configuration, cognition and behavior relation; an escalating relationship is observed in more integrated spaces (Penn, 2003).

As examples of researches handled based on method and theory of space syntax, many researches can be shown from researches scrutinizing the relationships of line analyses and crimes at the downtown neighborhoods (Ünlü et al., 2001a) to evaluation of social interaction spaces in university buildings (Ünlü et al., 2001b); from generation of space syntax based emergency exit models of hospitals (Ünlü et al., 2005) to scrutinizing of comparative design strategies of metro systems (Ünlü et al., 2007); from syntactic comparison of interfaces between the inner and outer spaces of architecture schools (Ünlü et al., 2009) to space syntactic, semantic comparison of conventional shopping places of different geographies and cultures (Edgü et al., 2012).

A system constituted by spaces can be approached as a system of syntactic relations and can be syntactically analyzed. Analyzing with most basic principles, relations such as symmetry – asymmetry, distributedness – non-distributedness has this meaning. Among these concepts, depth also stands out as an important concept in the plan systems which are asymmetric and which move by passing from one cell to another. Assessment of spaces as deep or conversely shallow spaces as a result of the analyses involves important data regarding interaction, integration of spaces. It is observed that the integration of deep spaces is generally weaker, and that of shallow spaces is generally stronger.

The two space types constituting the base of space syntax are briefly denominated as concave, inward expanding spaces, space whose inward margins continue its relations by constituting the exterior surface of the space they define and convex, outward expanding spaces, space whose outward margins continue its relations by constituting the exterior surface of the space they define. Convex space type is equivalent of a formal expression approached during space syntax calculations and in this space reduction, when any two points drawn within the space boundaries are connected,

the line connecting these points never gets out of the space boundaries, whereas in the concave space it does. Convex spaces constitute the basis of space definitions of determined analysis space counts and especially line analyses in the space syntax analyses such as integration, depth analysis.

As conclusion, if we try to make syntactic explanation of spaces, every space possesses the features of a syntactic space regardless of being convex or concave, having a distributable structure or not, either symmetric or asymmetric; and these features can conveniently be used to define it. Representing a structure pertaining to form, space syntax is also the focal point of the theories based on social structure of space. It contributes to understanding of space along with its many physical and semantic parameters by the concepts it reveals; it constitutes a strong systematic and basic analysis relationships by enabling the analysis of change of space in time, and of space types which are different in terms of location and time on the same quantitative basis through its analyses.

When we look into the core of the space syntax based theories, space syntax is a theory and method used in order to be able to define the structural environment. In the theory first asserted by Hillier and Hanson (1984), it is put forth that there are relationships among the external factors generating the forms and the social powers. From the point of view of architecture theory, space syntax contributes to better understanding of the interaction among design features and targeted objective, and social constraints and formal possibilities.

### **3. Method of Analysis**

Space syntax method which will provide significant data in terms of method of analysis is an important theory used in order to define the structural environment. Various softwares and method of analysis have been developed in the light of this theory. Whereas the external factors generating the forms are mentioned in the theory asserted by Hillier and Hanson (1984), the changes regarding zoning, construction systems, alterations in the intra-residential technologies by time approached within this study are important. Also revealing the existence of relations between space and social powers, the space syntax theory makes it possible to discuss social changes via numeric analyses. Space syntax enables us to analyze different morphologies on the same quantitative ground (Penn, 2003). What will make it possible to make analysis among the different plan types in the research within the study is this feature of the space syntax method.

Used in space syntax field as syntactic measurement method, the "Syntax 2D" software developed by "University of Michigan" is making the calculations starting from a logical ground built over the equal vision fields we name as "isovist" (Benedikt, 1979; Batty, 2001; Conroy, 2001; Edgü et al., 2012). As for the convex space concept approached in scrutinizing of interspatial relations within the space syntax theory, it reduces the different size plans, spaces whose relations will be examined into cellular spaces. In the "Space Syntax" analyses, researches within the framework of a base logic moving via scrutinizing the relations among these cells, convex spaces are performed. The way of Syntax 2D's handling the analyses moves from equal visual fields. Equal visual field (Isovist) is the definition of the entire space a man can perceive with eyesight, can have visual command of when he is in a space making 360 degree turn around at any point he stands firm. Each point that a man stands firm has a distinct isovist definition, value and these values can be used as an instrument in order for us to understand and measure the relations of different cellular spaces in the plan platform whose analysis is desired to be performed. Within the definition of isovist, the walls, furniture and other systems obstructing our sight in the space are handled as walls and they affect the determination of the equal visual field (Benedikt, 1979; Batty, 2001; Conroy, 2001; Ünlü et al., 2009; Edgü et al., 2012).

---



Moving from the basis of isovist, Syntax 2D requires us to define the boundaries of the plan we want to analyze and the walls within. By defining the boundaries and walls, the main impact field is determined and the relations in this field are researched. Working with a grid system, the program calculates physical space relations within the boundaries to be analyzed associated with the isovist and grid fragmentation after designating a grid regarding this impact field.

The important situation within this study is the requirement for specifying an analysis method in “Syntax 2D” in order to research the relations among the different samples to be approached in 1930-1980 period. The “smallest grid cell” was defined to enable comparison of different plan samples in the program which works by making grid fragmentation and the plans digitally drawn in AutoCAD format (.dwg) were transferred to “Syntax 2D” program proportionally with real plan sizes; consequently, the “smallest grid cell” that the program calculated for the field fallen into the main impact field at every distinct sample analyzed was standardized. The grid cell count which also constitutes the ground for isovist based calculations of the program at every sample in the main impact field was taken as 23 grid cells per square meter. This situation also enabled the values read from 23 different grid cells for per square meter plan section analyzed to be used via handling them individually, and became an important part of the method in terms of precision of the calculation. As the main analysis field in the each entire plan is cleared from all the elements obstructing the inner plan vision at the same time, it can also be referred to the used net field; according to this logic, whereas the active grid cell count of a plan with 150 square meter net field was approximately 3450, that of a 120 square meter plan was 2760, 100 square meter plan was around 2300. This situation also enabled comparison of inter-plan integration and depth comparison values. This situation is an important assumption in terms of the logic of comparability of numeric values. Visible, perceived field (on the plan platform) analyses were performed within this context. The tendencies of the alteration between two different phases emerged along with the generation of mean values of the phases as a result of the analyses. The relations of these tendencies in the supporting case of this paper with dynamics such as changing construction systems, design inclinations, zoning rules, technological changes and changes in socio-economic structures were also discussed, but the methodology is highlighted in this paper. The referenced original research was finalizing its research structure with the statistical relations of the different phases approached, and examination of the addressed comparisons by using “Statistical Package for the Social Sciences” (SPSS) program as well.

#### **4. Brief Introduction About Background Research Supporting the Methodology of This Paper**

In this part of the paper, the example supporting research that is used to highlight the significant methodology regarding to this paper’s core discussion is introduced. The original research in that context was a PhD dissertation titled as “Examining the development of urban apartment housing through semantic and syntactic considerations in istanbul: 1930-1980 period” (Şalgamcıoğlu, 2013).

The aim of the selected supporting research was to examine space specialization and transformation in apartment based housing units of Istanbul with space syntax parameters.

Housing units can emerge and also reflect the structure of space organizations as well as social organizations of various scales. This structure is mainly related with when and where they are built, as well as in which social and physical structure they exist.

This thesis was aiming to examine and define the relation of the changes in Istanbul apartments’ spatial syntax parameters with the specialization of apartment spaces. The change, development and specialization of the living spaces in Istanbul’s apartments by time, related with the

---

technological changes in building materials, building mechanical systems and the social structure of the society was the key to examine and analyze the syntactic parameters. The zoning, construction and building regulations and laws determined by the authorities in the city of İstanbul and the government of Turkey through 1930-1980 period was also key to the change of urban apartment housing plans; social organizations, space sizes, locations and distributions in those plans. Although syntactic parameters were important to analyze the changes related with various turning points in building technology affecting interior and exterior design of buildings, semantic parameters and the behavioral acts of the people living in these houses had to be considered in order to indicate the relations with specialization and space syntax. Changes in the perception of apartments' living spaces by their users with the affect of the technological changes such as the contribution of mechanical heating systems and the TV to the buildings' spaces, the glazing systems in the building core had the potential on being turning points in the change of spaces.

The results of the syntactic analysis made in different types of spaces of various time periods of technology, laws and regulations examined the change in terms of syntactic parameters of space, but the most important part of the analysis was the affect of building, construction law and regulations, which have changed several times since 1930s in İstanbul, reflecting the transforming morphology of apartment-housing units' spaces. This research aimed to provide an understanding of this phenomenon. Analyses were made through apartment units' plans by syntactic methods of spatial analysis and these analyses were evaluated with the semantic values of spaces. The research concentrated on the architecture of apartment buildings built between 1930s and 1980s tried to explore the spatial properties and transformations of the apartments with several examples from different periods in the specified timeline. The results of the case study in apartments' living spaces were converted to numerical database in order to be analyzed by "University of Michigan" licensed "Syntax2D" software. In this sense, convex space integration analysis with the isovist integration, space partition analysis, visual field and line analysis were important.

The dynamics that affect İstanbul's urban apartment housing development in different periods of time were mostly related with the changes and transformations in laws - regulations of building construction; technological developments that affect the usage of housing spaces; cultural and socio-economical changes in the society.

In this research, the investigation of the cultural and socio-economical changes affecting the identity of housing plans and identity of people were also determined as a variable through its relations with the development of various indoor technologies. The syntactic and semantic reflections of the production and occupation of housing were directly affected by the variables of technology and the law. All of these affects and variables were investigated in 1930-1980 period with the determination of two phases. These two phases were 1930-1954 and 1954-1980 where the dissertation's analysis examples were selected and the research was examined.

The goal of this study was to understand the logic of the space organization in urban type, low rise apartment housing units through their plans of different phases in 1930-1980 period. The morphological character and the meaning of these plans, shifts and changes of spaces in these plans were discussed. Space syntax analyses were made in order to discuss issues on 37 different plan types. These plan types were selected in close average area measures which was between 140-150 square meters in average area for different phases. The socio-economic structures of the neighborhoods of the selected building plans for analysis were also homogenous, including the neighborhoods in close characteristics. The examples were also selected from architectural periodical publications that have similar selection criteria.

---

The differing turning points, thresholds for the housing spaces through time was key to the research and the quantitative research of space syntax was determining the changing points in the organization of housing plans. The transformation of the space sizes, locations, and meaning were all discussed with their measurable and immeasurable dynamics, variables.

The turning points were very important for the study that reflects the specialization and transformation of the spaces in houses. The most obvious parameter that reflected the transformation of housing plans and spaces was the one related with the change of laws and regulations affecting the plan characteristics. In this context, 1954 law about the apartment flat ownership was a breaking point determining the differentiation between the two phases. Some other important parameters related with the differentiation of the two phases were the technological development such as the integration of television to the living spaces of the houses starting from the 1950's, but becoming more common in 1970's in the second phase of the analysis; the changing character of the guest living room, which has a separated location and meaning as a guest living room in the first phase, has started to lost that meaning and house started using that space as a living room not only for guest, but also for the members of that apartment flat starting from the second phase in 1930-1980 period. The development of the heating systems, the increasing availability of passing from one space to another in the apartment, the opening of the doors were all also important for the determination of these two different phases in 1930-1980 period. The affects of these changes were investigated with the determined specific method of space syntax for this study.

The analyses were made in three different plan zones and in two different specific spaces for each example in 1930-1980 period. The plan zones were living zone, service zone and the bedroom zone and the two specific spaces of the plan were bathroom and the kitchen. The living zone was including the living rooms, dining rooms and entrance halls. The service zone was including kitchen spaces, servants' spaces such as servant bedroom and toilet, storage spaces and service corridors. The bedroom zone was including the bathrooms and bedrooms. University of Michigan licensed Syntax 2D software was used to make the analysis with the specific method of this research including the specific same number of grid determination for every square meter area in all 37 apartment plan examples of analysis. The determination of the same number of grids per square meter coming from the software made the quantitative comparison possible between all plans.

Two phases had 37 examples in this study, which were considered with the syntactic concepts, and quantitative average measures of mean isovist area, mean isovist perimeter, mean circularity, mean compactness, mean connectivity, average mean depth, and mean integration.

The analysis showed some tendencies such as the rising integration levels of living room in the second phase, which also has the tendency of becoming only one living space in the second phase that means the multi-room structure of living zone in the first phase has the tendency of becoming only one space, one living room, in the second phase. In the second phase, the bathroom has the tendency of becoming a deeper space in terms of location, showing the same character with the bedroom zone. Service zone is also getting deep, but the kitchen is getting shallow when we look at the tendency at the second phase. Although the kitchen is included in the service zone during the analyses, it is getting shallow different from the rest of the service zone.

Briefly, this research was scrutinizing the relation of transformation in urban apartment's spaces in İstanbul through two different phases in 1930-1980 period with the change in building construction laws-regulations, and technological inputs of exterior and interior design of apartments by using the syntactic design parameters and analysis.

---

As a final remark regarding this supporting study after the summary given above, the core discussion of this methodology paper was linked to this background study with the part where “The determination of the same number of grids per square meter coming from the software made the quantitative comparison possible between all plans” is explained.

## **5. Discussion of the Relations with the Concepts Approached Regarding the Method in Analyses, Assumptions and the Research Method**

An important decision to be addressed pursuant to the method when performing analyses on the basis of domestic space plan is identification of three distinct intra-plan areas within different configuration of each plan and scrutinizing the syntactic values of these areas within themselves. According to the plan types, the convex spaces inside these areas, intra-plan space cells were identified distinctively and addressed via analyses. These three areas were differentiated as “Bedrooms Area”, “Living Area” and “Service Area”. In the bedrooms area, the bedrooms, their bathrooms and the interconnecting area spaces remaining in between their relations, their balconies; in the living area, the lounge, dining room, living room, apartment entry spaces, hall and the balconies and interconnecting area spaces remaining in between their relations, extension; in the service area, the halls, hallways outside of the first two areas, kitchen, maid’s rooms, cellar, and office areas in relation with the kitchen, their balconies and restroom and shower areas in the relation, and intermediary spaces providing all of these relations are included in the area. This trinary analysis structure is important in terms of the method and analysis model.

Of the plans of the samples in the analysis structure constituting the model, bathroom and kitchen sections also enabled scrutinizing, discussing the syntactic differentiations within the integrity of the samples via approaching them individually.

Two basic phases considered as a part of the focused research, which was conducted earlier and herein, only used for reflecting the significant methodological approach in this paper. If we go back to this previous research, we will see that the syntactic differentiations emerging with the effect of the zoning rules, social structure, construction system and changes in the intra-residential technologies such as television, heating system in 1930-1980 period was researched. Starting from the zoning movements, regulations and changes that Turkey, the world took part, the first group involves 1930-1954 period, and starting from the end of this period, the latter group is constituted by 1954-1980 period, which was developed by the law and regulations on flat ownership in 1954 and differentiated by development of multiple-housing, emergence of small scale property developers, and afterwards, arrangements of the municipalities regarding allotment of parcels. Researching the space specializations, differentiations, alterations, relation differences of their plan structures, traces of the syntactic change and differences in the planning of housing space will be brought into question.

In order to reflect a certain selection level, almost all of the addressed multiple-housing samples were selected from the multiple-housing samples published in the *Arkitekt Magazines* published from the end of 1920s to the beginning of 1980s. Whereas the preferred neighborhoods of Istanbul for selection of the samples involved neighborhoods such as Nişantaşı, Cihangir, Ayaspaşa, Taksim, Maçka, Harbiye until 1950; Moda, Bomonti, Şişli, Bebek, Elmadağ, Etiler, Çiftelmezler, Suadiye were included to these neighborhoods after 1950.

The samples addressed in analyses were comprised of various multiple-housing samples, apartments built within the framework of attached order and detached order zoning rules within the texture of the city. Samples diverge as two main façade for attached order, three main façade for corner apartments and four main façade for detached order. In the samples addressed via a

---

façade at the front and a façade at the back side, which we encounter along with the attached order within the texture proceeding in an order where the parcels of the city block continues along the street, generation of bright fields between two attached apartments and designing of spaces which are enabled to receive light via this field, briefly planning of spaces related to skylight in terms of space positioning is also frequently observed.

Space syntax data which would provide data for the model to be discussed in the wake of analyses was calculated distinctively for each sample plan. Comparisons among samples can be performed via utilization of the values generated by the arithmetic means obtained by individually evaluating all the grids in the effective analysis field emerging at every plan on the basis of the approximately 23 grid count per square meter, adding their values on the basis of the plan, and dividing the own sum of the plan by its own total active grid count.

Of the data generated as a result of the analyses, the utilized data was:

1. Isovist area
2. Isovist perimeter
3. Circularity and Compactness
4. Connectivity
5. Depth
6. Integration

These six data is also the primary concepts addressed in the space syntax theory. This data was calculated separately for every plan, depth and integration values were also obtained for living and service areas, and bathroom and kitchen in every plan. Subsequently, the values at the active grids were set in these six data groups for each grid at every plan separately, added in six different chart and a data mean value was obtained for six concepts by dividing the total data value of each plan's own by their own grid count which was also different for each plan. In figure 3, an example table focusing on the first period of the study is given for understanding how the data is arranged for further analysis in the process of this methodological approach introduced through this paper. Contingently, calculations were made via arithmetic averaging of grid values of areas or a single space. The names used for each data group for which a mean value was obtained are addressed as per below:

1. Mean isovist area
2. Mean isovist perimeter
3. Mean circularity and mean compactness
4. Mean connectivity
5. Mean depth
6. Mean integration

Of the concepts relevant to addressed space syntax theory, isovist perimeter values were also used in addition to the isovist area values. The difference of this concept from isovist area is instead of surface area of 360 degree visual field at a single point, calculation of perimeter of the two dimensional polygon identified by the respective isovist. The situation this perimeter data can explain us is the state where the dimensions of the perceived space are or are not loner and thinner. It can be said that latitude and longitude measures of a singular space gradually differentiates by considering the perimeter data of different points with same area. As a sample assumption, it can be said that gradual increase in perimeter data will show gradual change from square to rectangle in the perception of distinct spaces addressed in the comparison or in a general explanation, movement, differentiation towards geometries of convex spaces whose dimension data is different

---

from convex spaces whose dimension data is close. This situation can be used in terms of revelation of differences of dimensions physically on plan platform among the space cells in a plan.

Construction Year	Name Neighborhood	Net Used Area /plan	Mean Isovist Area (+E6) m <sup>2</sup>	Mean Isovist Perimeter (+E6) m	Mean Compactness (+E6)	Mean Circularity (+E6)	Mean Connectivity	Mean Depth (+E6)	Mean Integration (+E9)
1931	Park Apartmanı Nişantaşı	164	285652	4124	58,85	63,01	662	2,33	1135
1932	Nan Apartmanı Nişantaşı	95	241977	3476	67,81	53,25	562	2,10	659
1932	Hüsnü B. Apartmanı Nişantaşı	132	272976	4019	66,64	63,48	636	2,22	946
1932	Mühendis Derviş Bey Apartmanı Cihangir	121	245047	3509	67,70	55,18	569	2,34	760
1932	Bosfor Apartmanı Ayaspaşa	135	280441	3549	78,75	49,41	656	2,31	922
1932	İstiklal Apartmanı Taksim	149	348980	4375	77,11	59,54	814	2,17	1434
1932	Melek Apartmanı Nişantaşı	120	219102	3665	59,03	67,37	512	2,23	735
1933	Pertevalı Apartmanı Taksim	151	283867	3587	76,85	51,44	656	2,52	854
1933	Ceylan Apartmanı Taksim	216	423339	6029	67,49	92,44	990	2,19	2518
1933	Agop Fendi Apartmanı Taksim	66	189903	3364	55,52	64,52	439	1,99	408
1934	İskeçe Apartmanı Maçka	95	211039	3285	65,21	55,30	496	2,15	548
1934	Şerefi Apartmanı Nişantaşı	169	316005	4741	65,23	76,99	858	2,20	1998
1939	Anı Apartmanı Taksim	108	228952	3577	64,99	61,09	533	2,35	557
1940	Doğulu Apartmanı Taksim	163	273152	3768	75,06	55,72	634	2,52	893
1946	Anı Apartmanı Maçka	175	400738	3990	91,15	47,65	933	2,34	1802
1946	Anı Apartmanı Maçka	97	225265	3019	71,79	42,88	520	2,39	525
1946	Anı Apartmanı Maçka	120	298265	4017	70,76	58,77	692	2,01	1207
1949	Başaran Apartmanı Harbiye	186	270806	3833	68,33	59,32	629	2,65	951
1950	Birgiler Apartmanı Moda	100	203344	3175	62,82	55,89	474	2,27	507
1951	İlibay Apartmanı Bomonti	84	190004	3153	60,27	55,77	448	2,20	439
1951	Sadıklar Apartmanı Şişli	160	265720	3274	81,77	46,78	624	2,64	817
1951	Sadıklar Apartmanı Şişli	179	261289	2402	77,99	48,89	608	2,57	939
1951	Sadıklar Apartmanı Şişli	187	345527	4066	80,57	53,81	801	2,34	1582
1951	Anı Apartmanı Nişantaşı	198	332044	4466	72,47	67,20	767	2,42	1497
Period Average		140,46	275647,29	3769,33	70,59	58,57	646,38	2,31	1026,83

Construction Year	Name Neighborhood	Bathroom Mean Depth (+E6)	Bathroom Mean Integration (+E9)	Kitchen Mean Depth (+E6)	Kitchen Mean Integration (+E9)	Bedroom Area Mean Depth (+E6)	Bedroom Area Mean Integration (+E9)	Living Area Mean Depth (+E6)	Living Area Mean Integration (+E9)	Service Mean Depth (+E6)	Service Mean Integration (+E9)
1931	Park Apartmanı Nişantaşı	2,27	779	3,05	297	2,35	996	2,20	1583	2,47	825
1932	Nan Apartmanı Nişantaşı	2,41	138	2,17	294	2,40	273	1,93	922	2,22	249
1932	Hüsnü B. Apartmanı Nişantaşı	2,43	445	2,65	257	2,25	715	2,10	1329	2,50	360
1932	Mühendis Derviş Bey Apartmanı Cihangir	2,65	193	2,26	369	2,50	353	2,08	1043	2,36	334
1932	Bosfor Apartmanı Ayaspaşa	2,55	209	2,54	248	2,40	665	2,18	1305	2,62	216
1932	İstiklal Apartmanı Taksim	2,69	239	2,53	234	2,35	723	2,02	2060	2,39	508
1932	Melek Apartmanı Nişantaşı	2,48	173	2,65	172	2,32	478	2,01	1194	2,60	208
1933	Pertevalı Apartmanı Taksim	2,85	228	2,82	289	2,68	493	2,31	1338	2,77	285
1933	Ceylan Apartmanı Taksim	2,70	584	2,80	443	2,37	1228	1,96	3920	2,58	681
1933	Agop Fendi Apartmanı Taksim	2,42	91	2,38	74	2,09	287	1,87	536	2,40	68
1934	İskeçe Apartmanı Maçka	2,49	112	2,45	140	2,21	438	2,05	751	2,44	143
1934	Şerefi Apartmanı Nişantaşı	2,57	469	2,33	840	2,22	1620	2,07	3019	2,48	605
1939	Anı Apartmanı Taksim	2,42	271	2,48	259	2,45	414	2,23	767	2,45	268
1940	Doğulu Apartmanı Taksim	2,50	355	2,55	412	2,58	749	2,41	1217	2,58	555
1946	Anı Apartmanı Maçka	2,69	403	2,67	583	2,65	578	2,06	2971	2,55	708
1946	Anı Apartmanı Maçka	2,59	197	3,19	99	2,44	363	2,07	808	3,37	85
1946	Anı Apartmanı Maçka	2,56	174	2,30	500	2,19	641	1,78	1814	2,42	424
1949	Başaran Apartmanı Harbiye	3,69	144	2,81	264	2,83	546	2,44	1657	2,68	506
1950	Birgiler Apartmanı Moda	2,29	224	2,65	133	2,35	310	2,13	649	2,72	150
1951	İlibay Apartmanı Bomonti	2,39	144	2,45	154	2,27	333	2,08	625	2,33	263
1951	Sadıklar Apartmanı Şişli	3,04	271	3,10	278	2,71	541	2,37	1474	3,07	271
1951	Sadıklar Apartmanı Şişli	2,71	434	3,56	253	2,47	999	2,40	1185	3,07	279
1951	Sadıklar Apartmanı Şişli	2,97	278	2,64	403	2,61	651	2,16	2178	2,69	384
1951	Anı Apartmanı Nişantaşı	2,86	517	3,08	334	2,56	818	2,22	2382	2,57	885
Period Average		2,63	294,67	2,68	305,38	2,43	633,83	2,13	1530,71	2,60	386,40

Figure 3 An example table reflecting the selected research case’s period 1 average syntactic results and the information based on the arrangement of selected plans for this specific period of the study.

Another, yet the most important concept which will show us the differentiation of physical dimensions of the plan is circularity value. Circularity analysis is utterly important in order for us to discuss the geometric structure of the spatial relations as a whole. This data can provide us also with the compactness value of spaces and the potential time to be spent in these spaces or state of passing by without spending time, it enables our interpretation. The important situation within the context of research of this study is that it provides a measure regarding the relation between longitude and area value in plans. Batty (2001) mentions six geometric measurement where isovist concept can be explained, revealed and identified in his studies regarding isovist referring to Benedikt (1979). These are “area”, “perimeter”, “length of the overlapping boundaries within isovist (occlusivity)”, “variance” of the radial lengths obtained around the point which provide wide vision, advantageous points, “skewness”, and finally, “circularity” value which is named as a measure of compactness. This circularity value is defined as the proportion of square of perimeter to area. Dalton (2001) states that the circularity value not only shows us how well the space becomes close to a circle, but also provides us with a measure of a viewpoint in a space. Due to this reason, circularity concept not only provides a measure regarding the shape of the space, but also how central a viewpoint in the space is depending on how high the value of that point is. Its calculation method begins with the calculation of the perfect circle for the space, so that it is

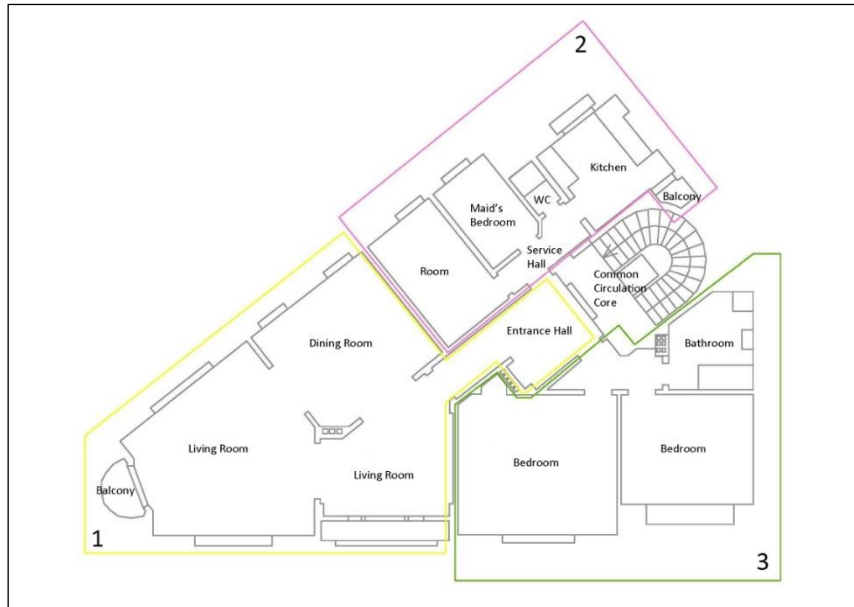
calculated by dividing the mean length value of the radius of this circle and length of the rays from the center of the relevant isovist to the boundaries of the isovist by the area values of the isovist. In this study, “circularity” value, which can provide us with how central an isovist is, is an important data. It is extensively required that it shows the morphological alteration of the plan dimensions depending on this situation in terms of discussing the inter-periodical differences. Another value calculated during analyses is the compactness value which is important in terms of its relation with the circularity value, thus it is addressed together with this value. Increase in this value is indicator of gradual increase in the differences of the mean dimension measures of the plans in their means all across the plan.

Other than these three concepts, connectivity, depth and integration values are also important measurement values of space syntax theory. It can be said that the integration value has the primary guiding feature in terms of syntactic values. As a result of the integration analyses, we can interpret which spaces gradually lie out within the overall relations in the impact field analyzed, i.e. which spaces are deeper, or on the contrary which spaces, fields attends more to the interconnecting area between spaces, isovist relations within these overall relations considering interconnecting area between spaces, relations and the entire plan analyzed, i.e. which spaces are shallower.

Regarding the mean depth, integration value (Hillier and Hanson, 1984; Hanson, 1999), it is principally a value associated with gradation of cells in a plan in their interconnecting areas, as it can be better understood from justified graphs constituted by considering the interconnecting areas among different cells of the plan, connections. The more the access to the cells in a plan is substantiated via passing through each other, the higher extent the mean depth of the plan is expected. On the contrary, as the gradation will remain at lowest level in a plan constituted of cells around a single hall or hallway, patio connecting the spaces to one another, the mean depth is expected to be utterly low.

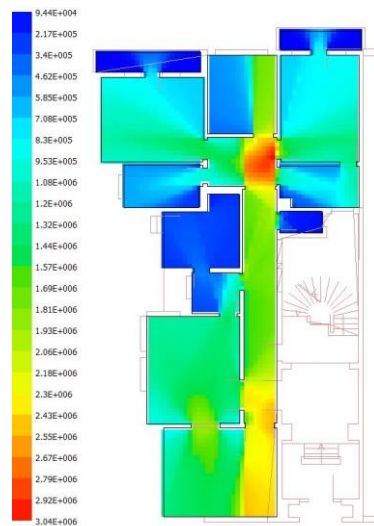
As for connectivity value, it provides us a value considering the relation of each unit grid inside the grid structure at the analyses performed via Syntax 2D with all of the active grids in the entire plan, it is a value generating outcomes directly proportional with integration value, it can be addressed in this direction.

Finally, should the need arise for an explanation regarding the state, change of colors and numeric values to be observed in visual expression of all analyses performed via Syntax within the framework of the concepts addressed, space names in the plan are explained as it can explicitly be seen for instance in [figure 4](#), which is one of the results of first analysis, that the plan scheme and analysis areas are stated.



**Figure 4** Example Plan Analysis, 1933 Pertev Apartment, Taksim (Phase 1), illustrating the division for the three primary areas (through different colors). 1- living area, 2-service area, and 3-bedroom area, wherein the syntactic analyses were performed

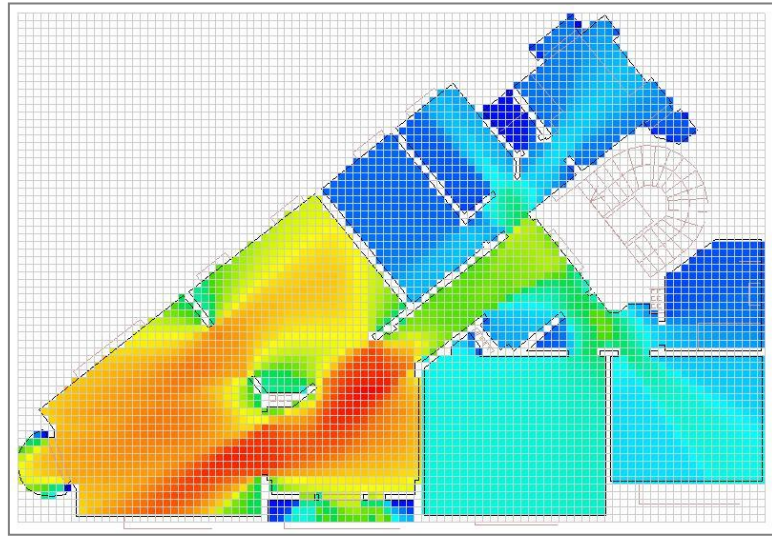
This situation is provided at all of the analyses by same method. In addition to this, the areas are stated as 1- Living Area, 2- Service Area and 3- Bedrooms Area (Figure 4). The dark blue color in the distribution of integration values (Figure 5) connotes the lowest integration value in the plan, and the highest integration value is connoted by red in the color palette finally reaching to red passing from gradually lightening blue to green and yellow.



**Figure 5** An example plan analysis showing the distribution of integration values

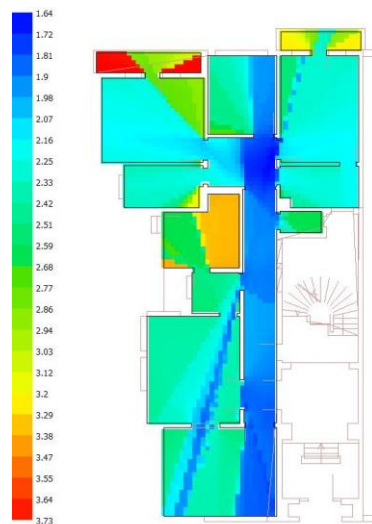
The color palette showing the numeric values is provided on the left side of each figure visually demonstrating the distribution in the plan (the analysis example is shown at Figure 5 in that sense). The color distribution logic of integration value also exists in the figure where the grid system calculated to be 23 grids per square meter in the analyses is demonstrated by projecting on the integration value (Figure 6).





**Figure 6** 1933 Example Plan Analysis, Pertev Apartment, Taksim, illustrating the allocation of the 23 grids per m2 for the syntactic analysis, which is superimposed with the visual representation from the integration analysis

In the figure 7 where distribution of depth values is provided, dark blue demonstrates the shallowest spaces and dark red demonstrates the deepest spaces by proportioning within values of the relevant plan in a color palette beginning from dark blue, reaching dark red (Depending in the nature of this study, shallowest spaces are shown in dark blue and deepest spaces are shown in dark red. The general sense of visualisation in the majority of studies done before in this context, darker blue areas are deeper where the dark red areas are accepted as shallower areas).



**Figure 7** An example plan analysis showing the distribution of depth values

The same system is also in command for demonstration of the isovist area, the highest area value is dark red. When isovist perimeter is demonstrated dark red reveals the highest perimeter value, whereas dark blue reveals lowest perimeter value in the repetitive system logic. In the circularity value, dark red reflects the highest circularity value by the same logic, the state of compactness value is in parallel expression with circularity value distribution highest compactness is reflected by dark red. The relation between circularity and compactness generates inversely proportionate values, the lower the circularity value of an isovist point, the higher the compactness

value. This situation is a result of the points high in circularity value demonstrating the vicinity to the central and circular structures in plans. The characteristic of a space with high compactness is in a structure gradually moving away from being central, and the physical distribution and even the morphology of the space moves away from circle gradually. Pursuant to this semantic evaluation, of the figures addressing results of the analyses, finally the connectivity value has a visual expression both parallel to the distribution of integration and isovist area, and bears a meaning parallel, directly proportional to these concepts semantically.

## **6. Conclusion**

In this paper, the research methodology approach and its significance, some framework and context relating to the previous example field study have been scrutinized. Space syntax tool Syntax 2D software provided data for the methodology model discussed in the light of previous research's analyses. The exemplar study showed the calculation distinctively for each sample plan. The important fact is the part where comparisons among samples were made for the utilization of the values generated by the arithmetic means. These means obtained by individually evaluating all the grids in the effective analysis field emerging at every plan on the basis of the approximately 23 grid count per square meter, adding their values on the basis of the plan, and dividing the own sum of the plan by its own total active grid count. Briefly, as many times repeated before in the paper, the core discussion of this methodology paper was linked to the background study with the part where "The determination of the same number of grids per square meter coming from the software made the quantitative comparison possible between all plans" is explained. This part was also the significant proposal of this paper as a research methodology that makes the comparisons possible in these kind of morphology studies regarding space syntax tool within itself.

As an extending conclusion and discussing by the help of the methodology proposed in this paper, revealing the existence of relations between space and social powers, the space syntax theory may be making it possible to discuss social changes via numeric analyses. Space syntax may enable us to analyze different morphologies on the same quantitative ground and the differences, similarities and changes of the samples between many cases and among one another may be scrutinized. Syntactic analyses setting off from the isovist may always be used for detection of this situation.

In the "Syntax 2D" software, the "smallest grid cell" that the software used for calculation was standardized according to the methodology proposed and this was for per square meter plan section analyzed, where the values read from 23 different grid cells used. This is the unique and significant part of the methodology introduced in this paper regarding the aim of previous PhD study.

This situation was an important assumption in terms of the logic of comparability of numeric values between plans with different sizes. Visible, perceived field (on the plan platform) analyses were performed within this context. Identification of three distinct intra-plan areas within different configuration of each plan, and scrutinizing the syntactic values of these areas within themselves was also a part of the method specific to the study. The differences and similarities among these three areas identified as "Bedrooms Area", "Living Area" and "Service Area" were scrutinized. Within the structure of the analyses, bathroom and kitchen areas from the plans of sample were also individually examined. In the two phases of the previous study, analyses related to space syntax concepts such as isovist area, isovist perimeter, circularity and compactness, connectivity, depth, integration were performed in addition to these.

---

As a final result referring to the potentials of correlations tested by the help of SPSS program between the syntactic values and changing compared cases' syntactic parameters, may give statistically approved tendencies or significant correlations as results. Herein, the context discussed as methodological approach is giving way to the discussion of such correlations and making them possible to scrutinize.

## References

- Alexander, C. (1966). A city is not a tree. *Design magazine*, 206, 46-55.
- Alexander, C., Ishikawa, S., Silverstein, M. (1977). *A pattern language*. New York: Oxford University Press.
- Altman, I. (1975). *The environment and social behavior: privacy, personal space, territory, crowding*. Monterey, CA.: Brooks/Cole Publishing.
- Batty, M. (2001). Exploring isovist fields: space and shape in architectural and urban morphology. *Environment and planning b: planning and design*, 28, 123-150.
- Benedikt, M. (1979). To take the hold of space: isovists and isovist fields. *Environment and planning b: planning and design*, 6, 47-65.
- Colonas, V. (1999). 19. Yüzyıl dönüm noktasında istanbul'daki Rum mimarlar ve yönlendirici öğeler. (çeviren: D. N. Özer) *Yapı*, 217, 84-88. İstanbul: YEM Yayınları.
- Conroy Dalton, R. (2001). Omnivista: An Application for Isovist Field and Path Analysis. *Proceedings of The 3rd International Space Syntax Symposium*. Atlanta: Georgia Institute of Technology.
- Cezar, M. (1977). *Anadolu öncesi türklerde şehir ve mimarlık (City and architecture in turkish society before anatolia)*. Türkiye İş Bankası Kültür Yayınları 176.
- Çorlu, V. (1999). Bir anatomi dersi: ev. *Cogito*, 18. İstanbul: Yapı Kredi Yayınları.
- Edgü, E., Ünlü, A., Şalgamcıoğlu, M. E., Mansouri, A. (2012) Traditional Shopping: A Syntactic Comparison of Commercial Spaces in Iran and Turkey. In M. Greene, J. Reyes and A. Castro (Eds.), *Proceedings: Eighth International Space Syntax Symposium*, Chile: Santiago de Chile, January 3-6
- Eruzun, C. (1980). *Konutlarda mekan özelleştirme düzeyinin saptanmasına ilişkin bir yöntem (Yayınlanmamış doktora tezi)*. İstanbul Devlet Güzel Sanatlar Akademisi, Mimarlık Fakültesi, İstanbul.
- Franz G., Wiener, J. M. (2008). From space syntax to space semantics: a behaviorally and perceptually oriented methodology for the efficient description of the geometry and topology of environments. *Environment and planning b: planning and design*, 35, 574-592.
- Hanson, J. (1994). Deconstructing architects' houses. *Environment and planning b: planning and design*, 21 (6), 675-704.
- Hanson, J. (1999). *Decoding homes and houses*. Cambridge: Cambridge University Press.
- Hillier, B. ve Leaman, A. (1973) The man-environment paradigm and its paradoxes. *Architectural design*. August Issue.
- Hillier, B., Hanson, J., Peponis, J., Hudson, J., Burdett, R. (1983). Space syntax: a different urban perspective. *The architects journal*. 178 (48), 47-63.
- Hillier, B. ve Hanson, J. (1984). *The social logic of space*. Cambridge: Cambridge University Press.
- Hillier, B., Burdett, R., Peponis, J., Penn, A. (1987). Creating life, or does architecture determine anything? *Architecture and behavior/Architecture et comportement*, 3, 233-250.
- Hillier, B., Hanson, J., Peponis, J. (1987). Syntactic analysis of settlements. *Architecture et Comportement/Architecture and Behavior*, 3 (3), 217-231.
- Hillier, B., Penn, A., Hanson, J., Grajewski, T., Xu, J. (1993). Natural movement; or configuration and attraction in urban space use. *Environment and Planning B: Planning and Design*, 20, 29-66.
- Hillier, B. (2007). *Space is the machine: a configurational theory of architecture*. [UCL Discovery Version]. Erişim adresi [http://eprints.ucl.ac.uk/3848/1/SpacelsTheMachine\\_Part1.pdf](http://eprints.ucl.ac.uk/3848/1/SpacelsTheMachine_Part1.pdf)
- Kaplan, S. (1987). Aesthetics, affect, and cognition: environmental preference from an evolutionary perspective. *Environment and behavior*, 19 (1), 3-32.
- Keyder, Ç. (1999). *İstanbul küresel ile yerel arasında*. İstanbul: Metis Yayınları.
-

- Kim, Y.O. (1999). *Spatial configuration, spatial cognition and spatial behaviour: the role of architectural intelligibility in shaping spatial experience* (Yayınlanmamış Doktora Tezi). University College London, Londra.
- Levi-Strauss, C. (1967). *Structural anthropology*, (Vol. 1). Garden City, New York: Anchor Books.
- Lösch, A. (1954). *The economics of location*. New Haven, Connecticut: Yale University Press.
- Montello, D. R. (1993). Scale and multiple psychologies of space. *Spatial information theory: a theoretical basis for GIS* içerisinde, (pp.312-321). Berlin: Springer.
- Newman, O. (1972) *Defensible space*, New York: Mac Millan.
- Nişanyan, S. (2009). *Sözlerin soyağacı: çağdaş türkçe'nin etimolojik sözlüğü*. Cağaloğlu, İstanbul: Everest Yayınları.
- Penn, A. (2003). Space syntax and spatial cognition, or why the axial line? *Environment and behavior*, 35 (1), 30 - 65.
- Peponis, J., Hadjinikolaou, E., Livieratos, C., Fatouros, D. A. (1989). The spatial core of urban culture. *Ekistics*, 334/335, 43-55.
- Piggott, S. (1965). *Ancient europe*, Edinburgh: Edinburgh University Press.
- Proshansky, H. M., Ittelson, W. H., Rivlin, L.G. (1970). *Environmental psychology: man and his physical setting*. New York: Holt, Rinehart and Winston.
- Proshansky, H. M., Ittelson, W. H., Rivlin, L. G. (1976). *Environmental psychology: people and their physical settings*. New York: Holt, Rinehart and Winston.
- Read, S. (1999). Space syntax and dutch city. *Environment and planning b: planning and design*, 26, 251-264.
- Stiny, G. ve Gips, J. (1978). *Algorithmic aesthetics*. Berkeley, CA.: University of California Press.
- Thünen, J. H. ve Hall, P. (1966). *Von thünen's isolated state: an english edition of: der isolierte staat*. Oxford: Pergamon Press.
- Turner, A., Doxa, M., O'Sullivan, D., Penn, A. (2001). From isovist to visibility graphs: a methodology for the analysis of architectural space. *Environment and planning b: planning and design*, 28, 103-121.
- Ünlü, A., Edgü, E., Özden, T., Özener, O. (2001a). Axial Lines and Crime Relationship in Central Neighbourhoods. In J.Peponis, J.Wineman, S.Bafna (Eds.), *Proceedings of 3rd International Symposium on Space Syntax*. Atlanta, USA: College of Architecture, Georgia Institute of Technology.
- Ünlü, A., Özener, O., Özden, T., Edgü, E. (2001b). An Evaluation of Social Interactive Spaces in A University Building. In J.Peponis, J.Wineman, S.Bafna (Eds.), *Proceedings of 3rd International Symposium on Space Syntax*, (pp.46.1-46.8). Atlanta, USA: College of Architecture, Georgia Institute of Technology.
- Ünlü, A., Ülken, G., Edgü, E. (2005). A Space Syntax Based Model in Evacuation of Hospitals. In Akkelies van Nes (Ed.), *Proceedings of 5th International Space Syntax Symposium*, (pp.161-173). Netherlands: Delft University of Technology.
- Ünlü, A., Edgü, E. (2007). Comparative Space Syntax Analysis of Design Strategies for Istanbul Underground System. In Ayse Sema Kubat (Ed.), *Proceedings of 6th International Space Syntax Symposium*, (Vol.2, p.74, 01-10). Istanbul: Istanbul Technical University, Faculty of Architecture.
- Ünlü, A., Edgü, E., Cimşit, F., Salgamcioglu, M. E., Garip, E., Mansouri, A. (2009). Interface of Indoor And Outdoor Spaces in Buildings: A Syntactic Comparison of Architectural Schools in Istanbul. In D. Koch, L. Marcus, J. Steen (Eds.), *Proceedings of 7th International Space Syntax Symposium*, (p.132). Stockholm, Sweden: KTH Royal Institute of Technology.

## Resume

Mehmet (BSc. MSc. PhD., ITU) is an Architect and Associate Professor of Architectural Design in Istanbul Technical University. He was a visiting scholar in University of Michigan in 2010 and worked on several professional design projects previously. He is currently Vice Head of Architecture Department in Istanbul Technical University and his current research areas are Architectural Design and Morphology, Space Syntax, Gentrification, Housing, and Domestic Space Organization. He also has international and national architectural design competition awards as well as published design critics, book chapters, conference papers, and journal articles. He is one of the founding members of "National Architecture Accreditation Association" (former Architecture Accreditation Board - MIAK), in 2019 and a proud member of International Association for People-Environment Studies, IAPS Network.