Physical Visual Properties of Domestic Space that affects on the Degree of Choice for Occupations Daily Activities
Isovist-Graph of contemporary houses in Mosul city

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Abstract. The specific patterns of everyday life in the domestic space vary according to the cultures of the people, which are reflected in the variation of houses designs in terms of size, number and pattern of their basic spaces, as well as spatial relations between them. The domestic space is the basic space unit of the dwelling, the daily life of this space is based mainly on the social beliefs and customs practiced by the family in human society. The problem of research in determining the local privacy of the domestic space Within the context of the contemporary local houses and what the domestic space creates possibilities, determinants, and obstacles that determine the types, patterns and periods of daily activities of the Iraqi family. The aim of the research was to arrive at the effect of the visual properties of the domestic space (the vision plan) on the degree of choice that space provides for the daily activities of the whole family and at any time intervals. The nature of this relationship was investigated in a practical study of a sample of contemporary local dwellings and using (Depth Map 10) software application to measure the size of the vision plans of their schemas, given that the visual structure of the household space enhances the structure of space permeability with each other. Keywords: domestic space, isovist graph, a degree of choice, houses, Mosul.

1. Introduction:

The family as a social unit is an embodiment of many relationships between men and women, adults and children, and well illustrates the complex nature of the family space itself and the meanings derived from it by family members. The homes in which we live are not simple structures that contain the daily routines of our lives but are an essential part of the cultural and social system in which we live. Therefore, the study of the family within the dwelling is important to evaluate and re-evaluate the design process of a housing unit, as well as to study the relationship with the broad range of social, cultural and human aspects of life itself [Asquith, 1, 2008]. The descriptive analysis of place as contains any human behavior included two phases: First, determines the physical concrete of place that identifies by its inside and outside boundaries. Second phase is based on the interpretation of the occupants of that place by focusing on their real experiences and the perceptions they use to produce the space pattern, or through physical substitutions provided by the place. [Capoglu, 22, 2008]

Domestic space is a physical entity of one of the most important space units that make up the dwelling. Which are shaped in detail by the perceptions of the family members and their lifestyle and daily routines, many research studies on the use of domestic space usually focus on the space pattern, the physical boundaries that frame the space used, or the cultural and behavioral considerations that determine how we use space and how it is included in the dwelling. [Asquith, 1, 2008]. Rezeanu indicates that domestic space can be studied as an arena for doing and undoing gender, as a context for
understanding the contemporary transformations of gender identity. She differs between two items: Doing gender enforces the maintenance of conventional masculine and feminine identities based on the traditional oppositions between mind and body, rational and emotional, and public and private; and, undoing gender enforce the emergence of alternative feminine and masculine identities. She also refers that the emergence of alternative domestic masculinity is supported by the fact that men are orienting towards the domestic space where they involve in domestic tasks (like cooking, raising children, gardening, etc.), decorating their home and using their body to connect with their emotions and sensuality.[Reneanu, 2015]. Irene indicates that the domain of present-day domestic spaces most likely extends into the domestic garden, as the popularity of the outdoor kitchen illustrates, or onto the roof, as the popularity of the roof terrace illustrates. And refers that the seasonal influences on these outdoor spaces are countered by all-weather furniture and domestic comforts like fireplaces, heating devices, and awnings. She believes that also in today’s interpretation of domestic spaces, the traditional interiority of domestic space is not defining anymore, but its domestic usage, in particular of these outdoor spaces. Where the garden or the roof terrace is used for food preparation, dining, relaxing, or receiving guests, it becomes one of the many domestic spaces in and around the house.[Cieraad, 2018]

2. Knowledge Base - Study and Analysis of Domestic Space:

The intellectual proposals for the study and definition of the domestic space included many approaches that differed in the characterization of the space and its use. From the point of view of Anthropology, domestic space is a human dimension and a cultural reflection. While behavioral studies of an internal environment focused on the use of space from the perspective of individuals and within specific provisions such as age and sex, to conceptualize and understand the meanings resulting from the use of space. The sociologist's approach dealt with the principle of using space in relation to family structure, their beliefs and rituals, and how they affect their formation inside and outside the housing unit. As for architectural studies, the residential domestic space has two dimensions: formal and structural. Anthropological studies of domestic space indicate that: The anthropological approach of architectural space focuses mostly on the dwelling as a symbol of the culture it produced. That is, the dwelling is the product of a social and cultural symbol. The building is a product associated with behavioral practices and social rituals. Therefore, its study must be within the limits of the social and cultural knowledge of the society that produced it. The anthropological approach was used in an important way in defining the effects of individuals on how dwellings were formed. [Rapaport, 1986]. From the point of view of anthropologists, the principle of culture is what characterizes human groups of values and beliefs that form ideas and which are transmitted between groups through the process of urbanization. Culture is learning behavior rather than conscious or intuitive behavior. And that general spatial behavior is reflected in the qualitative characteristics of the exercise of effectiveness among individuals in any given context. The study and evaluation of the organization of the family space in the dwelling stem from the definition of the events, the routine of daily life and rituals associated with the different ages and races of the groups within the families not only as a culture but as an approved physiological context. [Asquith, P.2, 2000]. Behavioral studies of domestic space indicate that: Behavioral studies have adopted responses, behavioral relationships, cognition, and sensitivity as well as the meanings in which individuals in the family share and interact with their residential spaces. Space behavior cannot be adopted as a fixed or stable culturally state, but constantly changing and defined in principle through the general context. The influence of both age and sex from the point of view of behaviorists is what is known as perception derived from the context rather than a cultural product. Therefore, when testing the daily routines of the whole family, the behavior must be defined in relation to space use in particular for each individual by age and gender. [Asquith, P.3, 2008]. And last, Social studies of domestic space indicates that: The use of space has been linked to interpretations or interpretations of principles Social-cultural ideals, which are reflected in daily routine modeling processes [Lawrence, 1989]. The family represents the pivotal system for the transmission of cultural and social ideals and beliefs, not in relation to the form and function of the dwelling, as well as with the multiple manifestations of the same culture: the language, the names, the religion, the behavior, the origin of the children, the social hierarchy, the nature of the families and
their history. The family is not seen as a single unit but as a unit composed of a number of individuals of different ages and different needs to use space in the dwelling. [Asquith, P. 3, 2008]

3. Architectural Perspective of Domestic Space:

Architecture works like a language only when its individual components unite to form a particular model [Hanson, 1998]. This model can be applied several times effectively in the design patterns of the house and the whole community as well [Alexander, 1977]. The different organizations of the same number of these components may have different shape characteristics within the building that may look similar in their external designs but have different internal configurations and interiors that directly affect the pattern of space use. The process of understanding and interpreting the hidden inner structure of dwellings is necessary to realize what is the necessary difference to the generality of the majority of dwellings. [Asquith, P. 4, 2008]. It is clear from the foregoing that the whole range of ideas for the study of domestic space has been addressed from a number of points of view, such as cultural model, social behavioral model or spatial structure of its basic components within its location. It has multiple possibilities for modeling usage and effectiveness, studying the activities in the dwelling and the routine of life of the family, as well as studying the characteristics of its members such as age and gender.

Lindsay Asquith in her study “Evaluating and Illustrating Domestic Space Use”, 2008, explained that the nature of the family space and the meanings it carries at any time period usually carries a wide range of interpretation that based on the structure of domestic space, and that studying the family within the dwelling is necessary to evaluate and re-evaluate the design process in relation to the social and human aspects of life itself. The study also referred to the mechanism of using Space Syntax instruments and how they can be adapted and evaluated for spatial perception within the space of the family space, based on the theoretical ideas of Haier and Hanson. The study adopted the idea that the cultural characteristics that characterize the family in their behavior in the vicinity of the home provide basic information as a social dimension of the family as well as the space practices of individuals and their interactions in the spaces of the dwelling as a whole, according to age, gender, type and time of effectiveness. Hanson's argument:

"The important thing about a house is not that it is a list of activities or rooms, but that it is a pattern of space, governed by intricate conventions about what space there is, how they are connected together and sequenced, which activities go together and which are separated out "[Hanson, P2, 1998].

The study used j-graph instruments to understand the spatial perception of family space in terms of the collection of behavioral information and the social system of individuals. The houses in which we live are physiological structures that contain daily routines and are a fundamental part of a broader cultural system. The space structure of the dwelling influences the daily behavior of the differentiated family members in their characteristics.

Ching Yang & Bide Lapena Jr, study "A Study on Living Spaces and Daily Interaction and Communication Model of Middle Age Urban Families", 2009, focused on the analysis of patterns of everyday lifestyle and style of a family of middle-aged families in the Philippines and identified a number of factors affecting the pattern and length of interaction between family members and how maturity affects the pattern and quality of interaction and communication between them. In addition to the individual differences in the works of the spaces of the house. The study adopted the idea of investigating the daily lifestyle model by focusing on the behavior of interaction and communication between the family members and how to employ their space according to their living needs, analysis data for the study adopted the perception and understanding of the daily scenario of the events through the interview and environmental observation in order to reach a conceptual and design principles to solve the problems of communication and social needs. The study defined the procedural definition of both interaction and communication, by the fact that communication is an act in any place that someone does or receives from the other person as information about a person's needs, problems, knowledge, and effective situations. [De Valenzuela / 2002]. The behavior of communication to individuals is affected by three main actions: first, physiological needs such as eating and sleeping, and secondly: Restrictive and restrictive activities such as work and school; and third: autonomic free
behavior such as reading, comfort and listening to music [Hong, 2008]. Interaction occurs when there is a minimum required interaction between any two individuals or two interactions. In other words, the interaction occurs when individuals and subjects affect each other. [Sutton / 1999] In the family, the first goal of the interaction is to protect and strengthen family social relationships As much as possible. Based on the study's classification of daily activities, the analysis of living spaces was based on three types of spaces:

1-Private Spaces ... eg bedrooms and reading.
2-Public places Social Communication Area, Living rooms - Dining rooms ...
3-Space assigned to Task Oriented Space, kitchen, garage, laundry.

The process of understanding environmental behavior means answering questions such as who is the individual and with whom and what kind of relationship, the type of socio-cultural context and the physical conditions required [Zeisel, 1997]. In other words, the study referred to the principle of interaction and social communication as the basis for determining the possibilities and family space. It began from measurements of types of events and their time in determining the busiest space and reflecting the possibilities of the options provided by the two operators.

Guney's study, "Analyzing Visibility Structures in Turkish Domestic Spaces", adopted a different approach in the study and analysis of the characteristics of family space away from the social, cultural or even behavioral dimension. The study adopted the visual analysis of domestic space refers to the visual information directed at the user or receiver within any specific location in the space. It is directly related to the geometrical space rather than to the movement and transmission of the receiver in the buildings in general and the dwelling in particular. Privacy-territory, which aims to regulate the quantity and level of personal interaction between residents, and between residents and visitors. The study showed that the analysis of the visual characteristics of dwellings enhances its qualitative characteristics. Therefore, the changes in properties not shown in the permeability analysis may seem obvious in the optical analysis, because of the visual analysis of additional measurements as variables that can not be measured in permeability analysis such as the size of the openings between various functional spaces of the dwelling. The study concluded that the visual structure enhances the structure of the permeability of the spaces and the surfaces of the correspondence between the various types of space relations of the dwelling, since there is a difference between houses with high integration values in terms of having a dual or triple door system that can close or open to control the space of office buildings that have high openings between the spaces in their scheme, where space remains public even if it contains doors to control access, in the housing one of which tests the rules governing the behavior of the occupants is the indicator of space use in itself more than the space organization as a whole. What space can provide from the use options within the overall determinants it possesses in terms of accessibility and visual permeability. [Guney, P. 38, 2007]. This study has adopted the analysis of Isovist visual chart in measuring the possible characteristics of the family space for a selected sample of housing in Turkey.

Capoglu Study, “The Making of Domestic Space at Yesiltepe Blocks- Ankara-Home as a Place”, 2008, presented a comprehensive conception of domestic space through a realistic study of a residential complex in Ankara, the basic idea of the study is that the comprehensive assessment of the house as a place, not limited to the size rankings, location, cost, or even the general biography of users, but take into account the qualitative specifications of the place and experience of its users, and based on this idea, detailed on the physical characteristics of the dwelling in relation to the perceptions of users resulting from their own experiences in that place. The study focused on the discovery of the privacy of the dwelling within the framework of the concept of place-making, the adoption of the social perspective of space, focusing on the interaction of individuals inhabiting that space. The study also provided a comprehensive understanding of the nature of the dwelling as an essential entity in the formation of physical and social assets. The study identified four interrelated and overlapping aspects of domestic space and its relationship with its users:

1. Residential Satisfaction: This is an important factor for conservation with the possibility of living for the building environment. It determines the level of sustainability of the building in meeting the physical and social needs and requirements of individuals.
2. Appropriation or family suitability: which is referred to in the literature as the status of the continuous adaptation of the dwelling within the mass formed, and means matching and harmony of this situation in order to provide a changeable environment that leads us to the process of appropriateness. On the one hand, they represent the external physical additions to the basic parts of the building, and on the other hand, the unstable reorganization of the boundaries of the family space through furniture alternatives and uses for interior decoration.

3. Material Culture: All things that are specific to the family and its laws are to express them, as well as the self-formation of each individual. It includes an environment of signals and signs that are shaped by the user's own behavior patterns that can be observed in context. The study focused on how family practices that are the spaces of familiarity in the dwelling and that maintain a sense of family history are stored and displayed.

4. Time and Space Zoning: The physical and temporal zones of the family, which are specific to family members to control their permeability, conceal behavior from the eyes of others and manage what can be known about all individuals. There are many areas of cohabitation in the dwelling To satisfy the special needs of individuals and to maintain their privacy as individuals or as groups against external individuals or visitors.

The study defined the first principle of population satisfaction and acceptance of three principles to reach it: choice, flexibility, congruity, and what can be offered to its users in order to obtain satisfaction, acceptance, and coexistence. Therefore, one of the choice options for family space will be adopted as an impact on the satisfaction of individuals in the field of study, and to determine local privacy in dealing with the data of the designed housing unit and the level of possible alternatives for daily activities within the family space.

4. Constituents of Domestic Space:

The choice of patterns of living behavior of individuals or groups in the family environment requires the adoption of a comprehensive strategy for all factors, determinants, and possibilities that merge together in shaping the pattern of family behavior both for the individual as well as for the relationship of individuals to each other. In his proposals to test the apparent behavior of any given environment, Seamon referred to the adoption of three main axes: [Seamon, 2007].

1. The objective understanding of the nature of the actual reality of the life experience.
2. The nature of individuals integrated into the reality of life experience.
3. Describe the daily routine of individuals assuming that they are not aware of this routine.

In order to determine the specific pattern of the place structure in which individuals participate in a regular space and implicitly embrace the dynamics of the larger environment, which is called the place of integration (Ballet Place), which sustains the continuity of life and sense of place. [Seamon, 2007]. The holistic framework for determining the living behavior of the basic unit in the dwelling, which is represented by the domestic space, requires defining the basic aspects of it, namely the [life environment - the individual used - the daily routine of the individual being used]. Table (1) represents the main and secondary vocabulary of the theoretical framework of the phenomenon investigated in a study of the domestic family space of the residential environment. The general characteristics of domestic space are as follows:

- Spatial form of activity (space-based living content of activity)
- Privacy of individuals to users of domestic space.
- Model of daily activities of family space.

4.1. Living space content:

It can also be called the environmental or physical content of living behavior, which is the spatial confinement of events, represented by the realistic and flexible boundaries of the private and public spheres. [Lawrence, 1986], Lawrence points out that these boundaries are family spaces that are fairly specific and allow family members Control their activities among themselves. [Lawrence, 1986]. The size of the domestic space, the number, and type of openings, whether doors or windows, the amount of natural lighting and the temperature, all limit the pattern of use and sense of family space as well as its relation to another space. [Asquith, 2007] In general buildings and housing in particular, the
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function of the visual scheme is directly related to the control of information received by the recipient or user, which includes the inhabitants themselves on the one hand and visitors on the other, studies confirmed that the structure of sight is usually seen as a way to enhance the physical permeability structure more efficiently to meet and determine the distances of the different relationship patterns [Hanson, P. 106, 1998], that is, visual permeability should enhance physical permeability. Domestic space governs a model that may not be recognized by individuals who use that space or may be aware of this model when confronted with a different spatial model of another culture or civilization [Hiller, 1996].

4.2. Privacy of Family Users:

That both age and gender directly affect the pattern of behavior consciously or unconsciously, and the house is the place where these fundamentals are evident in the context of space and social. The effect of age and gender on the family space system when testing actual use is not defined as an assumed behavior based solely on cultural values and beliefs, but also as non-specific factors dependent on relationships as they occur within the normal daily routine of life. [Asquith, 2007]. Childhood, for example, is a sophisticated and unstable situation where children of all ages are not passive participants but have the ability to form their own spaces. [Aitken, 1998] Young children prefer public spaces where they are part of the family and feel the importance of confidentiality which obscures strangers. [Asquith, 2007]. The definition of space used by men and women, when, and for what period, is real information that indicates the actual use of housing spaces. It is also necessary to anticipate the pattern of interaction between young people and adults and how their relationships influence the organization of family space. The search for the pattern of life for family members, the interactive communication of individuals and their situations in living spaces requires a substantive understanding of the environment of behavior, which means answering the questions of family communication, the pattern of social relations, the socio-cultural context and the physical situation [Zeisel, 1997 ]. In the family, the primary objective of interaction and communication is to protect and strengthen family relations as much as possible. [Yang, 2007] Rezeanu indicates that domestic space can be studied as an arena for doing and undoing gender, as a context for understanding the contemporary transformations of gender identity. She differs between two items: Doing gender enforces the maintenance of conventional masculine and feminine identities based on the traditional oppositions between mind and body, rational and emotional, and public and private; and, undoing gender enforce the emergence of alternative feminine and masculine identities. She also refers that the emergence of alternative domestic masculinity is supported by the fact that men are orienting towards the domestic space where they involve in domestic tasks (like cooking, raising children, gardening, etc.), decorating their home and using their body to connect with their emotions and sensuality. [Reneanu, 2015]. Capoglu indicated that one of the most important aspects of domestic space is the level of acceptance and satisfaction of family members from the living space of the dwelling, which is based on the sustainability of the building in meeting the physical and social needs and requirements of individuals, and that user satisfaction is a function of three factors (user characteristics, physical space characteristics, the space experience of users), so what the family space achieves is the choice, flexibility and congruity, which determines the level of meeting the domestic space for the multiple and diverse needs of all members of the family and thus raises their level of satisfaction [Capoglu, 2008].

4.3. Model of daily activities of domestic space:

The patterns of life events: eating, sleeping, working, playing, communicating, talking, isolation, hospitality, etc. are shaped by the family's cultural model on the one hand and the individual choices on the other, all of which determine how family space is used [Asquith, 2007]. Life events or what we do, when, and where not only affects the function of the room used but also determines the social-space relations of the dwelling as a whole. The type and assembly of events affects models resulting from practical considerations where special events occur [Plipton, 1987] The specific labels for rooms may assume their function, but that does not mean, For example, the kitchen may be used for many purposes, as well as for food, such as work, play, hospitality, speaking, etc., for the rest of the spaces. [Asquith, 2007]. The Hong study referred to an initial classification of the life events that occur within the domestic space: Physiological needs such as eating, sleeping, Regular and time-bound activities
such as work and school. Free activities independent behavior such as rest, play, leisure activities, watching television, chatting. On this basis, spaces are categorized according to the classification of these life events into spaces of social communication, isolated special spaces, transition spaces and directed missions. [Yang, 2007]. As for the time of activities, the daily life model of the family is shown through the chronology of events, the frequency of events, daily and weekly rituals, all of which show how domestic space is used. Family members use rooms for multiple purposes at different times of the day, the meanings of these spaces change in turn, the analysis of time in relation to the space used may identify indicators of the longer-lived rooms, as well as the space of collective use as opposed to the spaces of a person. [Asquith, 2007]

5. The methodology of research – Case-study:

Based on the above, it is clear that the components of domestic space depend on the diversity of the characteristics of: the spatial content of the family life, the users of domestic space and the daily life routine of family members (nature of the events). Table 1. Can not be limited to a general model because of the diversity of social and cultural provisions of family and the diversity in the desires, preferences, needs and even rituals, so it is necessary to adopt one of the design concepts of domestic space, which starts from the idea of appropriateness for all users full extent of daily activities.

In many of the intellectual propositions of the principle of appropriateness that based on two basic design characteristics for adaptability, and flexibility, adaptive domestic space refers to the difference in the social restructuring of the existing physical spaces, while the flexibility of the dwelling means the suitability of the space for alternatives possible options for possible physical conditions. So what are the reason that people want to adapt and the resilience of the household environment? Logically, if an individual needs to restructure his or her living environment socially or physiologically, a number of non-environmental disabilities must be created that can not meet a minimum requirement. In this case, the user of domestic space will form a number of events to reduce or eliminate those disabilities by using spaces capabilities. We define the ways in which these can be used to achieve several physiological and social alternatives. This is called the appropriateness [Capoglu, P. 1314, 2008]

From this point of view, the researcher identified the research problem in The absence of a determination of physical characteristics effects of the domestic space of a contemporary local house on the degree of choice in the diversity of daily routine activities that it provides for its users. The research hypothesis: The physical characteristics of domestic space (geometric and vision fields – visual graph) affect the degree of choice in the diversity of daily routine activities that are carried out by the family members.

5.1. Practical Study:

In order to test the hypothesis of research, contemporary local dwellings were selected as a field for conducting the application and discovering its privacy. The practical study was designed in five stages:

1. Selection of case study sample, which is the measurement and identification of the local contemporary house, namely (13 houses), with (4-5) individuals and dwellings occupied by them are limited to 300-250 m2.
2. Evaluates by Questionnaire tool the characteristics of domestic space in variables (V1-V8) and the characteristics of family members in variables (V9-V13) and the daily routine of events according to the time sequence of the events from morning to evening at a spring season. Appendix of Form (1).
3. Measuring the degree of choice provided by domestic space in terms of diversity of daily routine activities that occur by the whole family members by adopting the following diversity scale:

   Degree of Diversity = Number of implemented activity type / Number of Implemented activities x 100% [Al-nijaidi, p62, 1985]

4. Measuring the physical characteristics of domestic space of the selected houses sample by using the Depth Map 10 software application (Isovist graph) to measure the characteristics of the vision plan and the characteristics produced by the measurement to achieve a comparative study of multiple cases of contemporary local houses.

Analysis and evaluation of research findings to reach general recommendations.
### Table (1). Basic aspects of domestic space-by researcher

| Basic aspects | Minor aspects |
|---------------|--------------|
| Properties of interior domestic space | |
| Spacial properties as volume | Shape of space |
| | Position of space |
| | Central |
| | Lateral |
| | Isolated |
| | Existence activity zoning |
| | Related of spatial configuration of the house |
| | Physical permeability |
| | Visual permeability |
| | Distance from entrance |
| Spatial properties as surrounding elements | Pattern of furniture |
| | Using flexibility |
| | Choice and multiuse |
| | Suitable for user needs |
| | Degree of response |
| | Thermal comfort |
| | Size of opening |
| | Faucal point position |
| Aspects of domestic space | |
| Properties of user or occupations | Diversity |
| | Converging |
| Age categories | Diversity |
| Gender categories | Converging |
| Social communication and talking | Regular – irregular – explicit |
| The pattern of daily routine | |
| Culture forms of family | |
| Level of satisfaction | |
| Level of modification with spatial properties | High modification |
| | Low modification |
| Properties of activities daily pattern | Activity position |
| Type of activity | Activity volume |
| | Activity nature(restricted-vitual-liberated ) |
| | Level of activity diversity |
| | Level of combination |
| Time of activity | The plurality of activity time |
| | The time sequence of activity |
| | Daily ritual |
| | Activity repetition |
| | Activity overlap |

5.2. Measuring visual Isovist Graph:

The measurement of the visual properties of domestic space based on Benedik's method of describing the space by taking the number of users observations from the moving experience, Isovist's vision graph is defined by Benedik as:

The set of all points visible from a given vantage point in space and with respect to an environment [Benedikt, 1979, p. 47].

That is, all the points seen from the best point in space in relation to the surrounding environment. Visual analysis indicates that optical fields have their own forms resulting from the interaction between space geometry and motion and that the shape and size of the Isovist vision are directly important in relation to the information provided to the viewer. In houses, the information controlled by the field of vision can be described as part of the spatial - privacy of the building mechanism, which aims to regulate the quantity and level of personal interaction between the occupants and visitors. Because the need for privacy is a general requirement of human existence, it may evolve culturally. For this reason, the test of the visual structure of the house may help to understand the level of cultural sensitivity. Therefore, the measurement of the Isovist graph is necessary to study the socio-cultural aspects of domestic space and in relation to physical permeability. [Guney, 2007].
5.3. Data achieves by Isovist Graph is as follows:
- Isovist Maximum Radial: Maximum optical distance from within domestic space (the highest value is the red color and the lowest value is the blue color)
- Visual Control: The visual control level of domestic space (the highest value is the red color and the lowest value is the blue color)
- Visual Entropy: The degree of control of the total space system from the local position, the level of penetration of domestic space visually from the other spaces (the highest value is the red color and the lowest value is the blue color)
- Visibility Integration: or depth of domestic space for the rest of the spaces (the highest value is the red color and the lowest value is the blue color)
- The size of the domestic space vision plan.

6. Results:
6.1. Results of Questionnaire Variables:
The results indicated the values of agreement and standard deviation of the characteristics of domestic space (V1-V8) and the characteristics of the occupants of space (V9-V13), which produced general indicators of the level of interaction of family members with the nature of domestic space characteristics of the local dwelling,
- The sample agrees with the value of (1.538) (0.66), although the characteristics of domestic space are compatible with the family life model according to their social requirements.
- The sample somewhat agrees with the value of (1.69) (1.63). However, in the long run, domestic space satisfies all the needs of family members.
- The sample somewhat agrees with the value of (1.618) (0.506). However, the characteristics of domestic space are consistent with diversity in daily routine activities for all family members
- The sample agrees with value( 1.078) (0.277), although the characteristics of domestic space help create an atmosphere of familiarity and social affinity for family members
- The sample somewhat agrees with the value of (1.798) (0.725), although domestic space ensures the privacy of all members of the family in practice of their daily activities
- The sample somewhat agrees with the value of (1.698) (0.63) although the family members can perform several different activities within domestic space and appropriately
- The sample somewhat agrees with the value of (1.768) (0.83), although domestic space has the possibility of adapting in the style of furniture according to various needs and long term
- The sample agrees with the value of (1.303) (0.48), although domestic space has the possibility of visual communication with other spaces, thus enhancing the diversity of occupancy
- The sample somewhat agrees with the value of (1.768) (0.72), although the family members are committed to practicing the appropriate activities for domestic space without leaving the occupancy of other spaces as appropriate
- The sample agrees with the value of (1.238) (0.43), although individuals reflect their diverse personalities when practicing daily routines within domestic space
- The sample somewhat agrees with the value of (1.698) (0.75) although individuals differ in their level of awareness of the daily activities to be practiced within domestic space
- The sample does not agree with the value of (2.23) (0.59) although the practice activities are mixed by the family members significantly.
- The sample somewhat agrees with the value of (1.618) (0.86), although individuals perform the same activities in more than one space.

The results of the daily routine report of activities of the whole family have shown an important difference in number and type of activities that occur in domestic space, which is reflected in differences in the physical and visual characteristics of housing units selected, which aims to indicate specialty of local houses in the degree of choice provided by space, The diversity of activities, Table (2) and (3) illustrate these results.

**Table (2).** Repetition values of activities on domestic space

| Cases | Daily activities on domestic space |
|-------|-----------------------------------|

9
| number | sleeping | eating | talking | playing | studying | reception | working | total |
|--------|----------|--------|---------|---------|----------|-----------|---------|-------|
| 1      | 11       | 9      | 16      | 8       | 8        | 8         | 8       | 68    |
| 2      | 10       | 0      | 16      | 6       | 4        | 8         | 2       | 46    |
| 3      | 5        | 11     | 16      | 8       | 3        | 5         | 3       | 51    |
| 4      | 2        | 7      | 7       | 0       | 2        | 2         | 9       | 29    |
| 5      | 8        | 12     | 6       | 5       | 9        | 3         | 1       | 44    |
| 6      | 2        | 12     | 4       | 6       | 6        | 4         | 8       | 42    |
| 7      | 1        | 3      | 4       | 0       | 2        | 0         | 7       | 17    |
| 8      | 1        | 1      | 5       | 2       | 8        | 2         | 2       | 21    |
| 9      | 5        | 12     | 11      | 4       | 6        | 3         | 5       | 46    |
| 10     | 7        | 8      | 5       | 8       | 4        | 2         | 4       | 38    |
| 11     | 0        | 8      | 6       | 6       | 8        | 4         | 4       | 36    |
| 12     | 6        | 11     | 8       | 4       | 8        | 4         | 2       | 43    |
| 13     | 3        | 11     | 13      | 0       | 8        | 4         | 3       | 42    |

Table (3). The degree of diversity of daily activities according to a period of day time

| Cases number | 8-11 morning | 12-3 evening | 4-7 evening | 8-11 night | Average |
|--------------|--------------|--------------|--------------|-------------|---------|
| 1            | 46.6         | 38.8         | 46.6         | 36.8        | 41.7    |
| 2            | 40.0         | 40.0         | 31.5         | 37.5        | 37.24   |
| 3            | 54.5         | 43.7         | 53.8         | 36.3        | 47.07   |
| 4            | 42.8         | 50           | 57.1         | 57.1        | 51.75   |
| 5            | 41.6         | 45.4         | 50           | 36.3        | 43.3    |
| 6            | 37.5         | 44.4         | 40.1         | 40.1        | 40.47   |
| 7            | 50.0         | 66.6         | 50           | 66.6        | 58.3    |
| 8            | 70.4         | 75.          | 66.6         | 50.0        | 65.55   |
| 9            | 55.5         | 35.7         | 41.6         | 41.6        | 43.66   |
| 10           | 44.4         | 44.4         | 60.1         | 50.0        | 49.7    |
| 11           | 50.0         | 50.0         | 50.0         | 41.6        | 47.9    |
| 12           | 57.1         | 50.0         | 54.5         | 42.8        | 51.11   |
| 13           | 50.0         | 50.0         | 45.5         | 44.4        | 47.47   |

6.2. Results of visual characteristics (isovist graph) of domestic space for case studies:

The output of the visual analysis of Isovist Graph by Depth Map software, there is a clear contrast to visual characteristics of domestic spaces of the selected residential units, as shown in Table (4), as follows:

Residential units were characterized by a low average value of Isovist Maximum Radial (9.7174), this indicates the limited family space in providing maximum visual distance to the unit as a whole. Residential units were characterized by relatively high values of Visual Control (1.2507), indicating a relatively high visual control of domestic space. Residential units were characterized by relatively high values of the Visual Entropy (1.2605), indicating that domestic spaces have a larger number of reconstructions for visual penetration. Residential units were characterized by relatively high values of Visual Integration (8,113) indicating that domestic spaces are highly integrated with the rest of space, they are not deep relative to the unit as a whole. Residential units were characterized by very high values for the Isovist Area (47.1125), indicating large visual space for the vision graph.

6.3. Results of Statistical Analysis of Variable Relationships:

Table (5) shows the correlation between visual characteristics of domestic space and diversity (as an indicator of the degree of choice) in the daily activities of family members with their different characteristics:
- Reverse median correlation of (-0.343) between the characteristic of diversity and Isovist Maximum Radial dimension is far beyond the visual dimension of domestic space, indicating that the high honor of domestic space with the rest of the space away from it may limit individuals from more daily activities. (Scheme of house 13)

**Table 4.** Output of depth map (Isovist graph) for case studies

| Plan N. | Isovist Maximum Radial | Visual Control | Visual Entropy | Visual integration | Isovist area |
|---------|------------------------|----------------|----------------|--------------------|--------------|
| 1       | Main hall              | 9.01963        | 1.18298        | 1.23423            | 1.29851      | 42.0557      |
|         | living                 | 10.3432        | 1.11797        | 1.5296             | 1.09075      | 40.167       |
| 2       | Main hall              | 11.5514        | 1.38481        | 1.22981            | 9.06403      | 60.0308      |
|         | living                 | 4.88051        | 0.885437       | 1.67006            | 4.25836      | 25.1384      |
| 3       | Main hall              | 8.43517        | 1.35557        | 1.01511            | 12.7446      | 48.8478      |
| 4       | Living                 | 9.10456        | 0.806996       | 1.47696            | 5.89857      | 28.9524      |
| 5       | Main hall              | 9.34531        | 1.61538        | 0.999949           | 10.6198      | 41.1473      |
| 6       | Atrium                 | 10.6788        | 1.34873        | 1.5654             | 7.10219      | 61.533       |
|         | Living                 | 8.53187        | 0.849302       | 1.70156            | 4.62718      | 37.5264      |
| 7       | Main hall              | 8.76425        | 1.26756        | 1.22171            | 8.14361      | 46.1803      |
|         | Living                 | 7.87164        | 1.1538         | 1.59648            | 7.16159      | 49.3106      |
| 8       | Living                 | 9.76122        | 1.08824        | 1.63836            | 6.44762      | 47.4974      |
| 9       | Main hall              | 8.60798        | 1.29038        | 0.935768           | 8.66852      | 37.4092      |
| 10      | Main hall              | 8.84915        | 1.1083         | 1.16028            | 7.85201      | 35.6161      |
| 11      | Main hall              | 9.99075        | 1.29118        | 1.32883            | 8.34142      | 43.2468      |
| 12      | Main hall              | 9.18381        | 1.23605        | 1.31943            | 9.06849      | 51.5518      |
| 13      | Main hall              | 10.6944        | 1.43871        | 0.984145           | 10.8744      | 67.519       |
|         | Living                 | 13.0347        | 1.28234        | 1.26048            | 10.1972      | 68.3942      |
| Mean    |                        | 9.7174         | 1.2507         | 1.2605             | 8.1113       | 47.1125      |

- Reverse strong correlation of (-0.476) between the property of diversity and the visual control of domestic space, which confirms value of the previous link, the desire of individuals to practice some activities of privacy in their spaces designed to avoid them in these activities in a space with visual control high with rest of the dwelling spaces. (Houses scheme 13,2)
- Direct strong correlation of (0.403) between the property diversity and Visual Entropy, which indicates that domestic spaces with difficulty in visual penetration, which require multiple frames to reach, are spaces that have the highest degree of diversity in everyday activities, the highest level of an option, and vice versa for easy-to-penetrate family spaces.
- No significant relationships between the property of diversity, visual integration, and Isovist area were noted. The depth of domestic space and the size of the vision scheme are neutral factors for the phenomenon being investigated.
- Some of the signs of correlation can also be deduced from the same optical properties, for example, the strong correlation between the size of the visual scheme and the maximum optical distance of the space and its visual control, or a strong inverse correlation between Visual Entropy and the spatial depth.

**Table (5). output of SPSS of correlation between diversity and visual characteristics (Depth map)**

| Correlations                                      | VAR00001 | VAR00002 | VAR00003 | VAR00004 | VAR00005 | VAR00006 |
|---------------------------------------------------|----------|----------|----------|----------|----------|----------|
| Pearson Correlation                               | 1        | 306      | 275      | .090     | 724**    | .343     |
| Sig. (2-tailed)                                   | .131     | 13       | 13       | 13       | 13       | 13       |
| N                                                 | 13       | 13       | 13       | 13       | 13       | 13       |
| Pearson Correlation                               | 0.06     | 563*     | .15      | 570*     | 558*     | .476     |
| Sig. (2-tailed)                                   | 13       | 13       | 13       | 13       | 13       | 13       |
| N                                                 | 13       | 13       | 13       | 13       | 13       | 13       |
| Pearson Correlation                               | .303     | .045     | .070     | .995     | 0.172    | 0.403    |
| Sig. (2-tailed)                                   | 13       | 13       | 13       | 13       | 13       | 13       |
| N                                                 | 13       | 13       | 13       | 13       | 13       | 13       |
| Pearson Correlation                               | 0.00     | 570*     | -518     | 1        | 334       | .057     |
| Sig. (2-tailed)                                   | 13       | 13       | 13       | 13       | 13       | 13       |
| N                                                 | 13       | 13       | 13       | 13       | 13       | 13       |
| Pearson Correlation                               | 0.06     | .047     | .986     | 265      | 1        | .234     |
| Sig. (2-tailed)                                   | 13       | 13       | 13       | 13       | 13       | 13       |
| N                                                 | 13       | 13       | 13       | 13       | 13       | 13       |
| Pearson Correlation                               | -3.43    | -470     | 403      | -0.057   | -234     | 1        |
| Sig. (2-tailed)                                   | 13       | 13       | 13       | 13       | 13       | 13       |
| N                                                 | 13       | 13       | 13       | 13       | 13       | 13       |

**Note:**
- Correlation is significant at the 0.01 level (2-tailed).
- Correlation is significant at the 0.05 level (2-tailed).

VAR1: Isovist Maximum Radial, VAR2: Visual Control, VAR3: Visual Entropy, VAR4: Visual integration, VAR5: Isovist area, VAR6: Diversity.

**Table (6). output of SPSS of linear regression**

| Coefficientsa | Unstandardized Coefficients | Standardized Coefficients | t | Sig. |
|---------------|----------------------------|---------------------------|---|------|
| Model         | B | Std. Error | Beta | t | Sig. |
| 1 (Constant)  | 69.785 | 31.930 | -2.185 | .065 |
| VAR00001      | -5.030 | 3.381 | -6.250 | -1.488 | .180 |
| VAR00002      | -12.372 | 17.355 | -3.170 | -7.130 | .499 |
| VAR00003      | 19.988 | 13.652 | 5.910 | 1.464 | .187 |
| VAR00004      | 1.037 | 0.934 | 3.700 | 1.111 | .303 |
| VAR00005      | .185 | .316 | .267 | .585 | .577 |

a. Dependent Variable: VAR00006

SPSS

The results of the linear regression equation of the dependent variable (the characteristic of the diversity of activities) with the independent variables (visual characteristics of domestic space vision) were as follows: Table (6)

The value of (R) for simple linear regression equation was (0.752) which confirms that the independent variables have an important role in shaping the diversity of the daily activities of individuals and the rest of the percentage is for factors external to the phenomenon investigated. Note that the highest negative effect is the Isovist Maximum Radial (-0.625), indicating that the increase in its value reduces the value of diversity in the daily activities of individuals. Note that the variable Visual control comes second in the negative impact of (-0.317), which indicates that any increase in
the value of visual control of domestic space reduces the degree of diversity in the daily activities of individuals. Note that the highest positive effect is the Visual Entropy (0.591) which indicates that the increase in the visual entropy of domestic space or the difficulty in penetrating it enhances the feature of diversity inefficiency, more individuals perform daily activities within it. Note that the variable Visual Integration comes second in its positive effect value (0.379), which indicates that the high integration of domestic space enhances the feature of diversity ineffectiveness, that is, individuals do a greater number of daily activities.

7. Conclusions:
- The results of the variables of the questionnaire variables, the "high agreement," showed their relation to the social aspects of the family life model, such as familiarity and closeness, as they reflect the diversity of their personalities and their conviction that domestic space has the potential to communicate. This indicates the importance of this space in enhancing the social aspect of family members. The results of the "agreement to a certain extent" have been linked to other aspects, such as the variety of activities and the possibility of doing them in the family space and other spaces of the house, and this confirms the role of family space with the rest of the space of the house to meet the needs and needs of the diverse family.
- In general, domestic spaces have been highly flexible in accommodating a wide range of events, and have achieved satisfaction and conviction by the population, despite the existence of design problems can be observed directly from horizontal schemes, meaning that the population was able to adapt their use of family space and characteristics, The designer has a wide ability to alter and adapt the characteristics of these spaces to meet the requirements of the family depending on their ability to adapt to them.
- The results of the visual analysis of the vision plan showed that domestic space has a central location, mostly for the housing scheme as a whole. It possesses high visual control and integration, as well as abundant visual space for vision schemes. However, it has a specific range. Rasterization for visual penetration, and limited provision of optical dimension.
- The results of the statistical analysis of the relationship of the variables, which included the strong inverse relationship between the degree of choice and the visual control, and the strong relationship between the degree of choice and the difficulty of visual penetration. These results produced an important conclusion that domestic space can enhance the population options with a wide range of activities, It has little optical control and difficulty in optical penetration, and this is reflected in design to make it a more specific space than a space connecting other spaces of the house, regardless of its direct connection to the spaces surrounding it and its wide open to it.

References:
[1] Aitken, S., (1998) "Family Fantasies Community space" Rutgers University Press. New Jersey.
[2] Alexander, C. Ishikawa, S. Silverstein M. (1977), 'A pattern language "Oxford University Press. Oxford, New York.
[3] Al-Nigaidi, Hazim, (1985) "Flexibility in the Design of Building "Ph.D. Thesis.Oxford Polytechnic Oxford.
[4] Asquith, L. Space Use and Claim (2003). An Evaluation of the Domestic Spatial Arrangement in Family Homes. Unpublished Ph.D. Thesis, Oxford Brookes University.
[5] Asquith, Lindsay, (2008) "Evaluating and Illustrating Domestic Space Use: Collecting and Analysing Behavioral Data for Space" Syntax Analysis" University of Sydney, Sydney, Australia, lindsay@asquith.com
[6] Benedikt, M.,(1979) "To Take Hold of Space: Isovists and Isovist Fields " Environment and Planning and Design, 6:47-65.
[7] Birdwell-Pheasant, D., Lawrence-Zuniga, D. (1999) “Introduction: Houses and Families in Europe” in Donna Birdwell-Pheasant and Denise, Lawrence-Zuniga (eds.) House live Space, Place, and Family in Europe. Oxford, UK.; New York, USA: Berg, 1-35.
[8] Capoglu, Nazan (2008) "Home As A Place: The Making of Domestic Space At Yesiltepe Blocks, Ankara. Thesis submitted to the graduate school of natural and applied science of middle east technical university. Turkey

[9] Dealenzuela, J.S., (2002), Communication,http://www.unm.edu/~devalenz/handouts/defcomm.html

[10] Guney, Yasemin ince, (2007) "Analyzing Visibility Structures in Turkish Domestic Space" Proceeding, 6th International space syntax symposium, Istanbul, 2007.

[11] Hanson, J. (1998). Decoding Homes and Houses. Cambridge University Press, Cambridge

[12] Hong Yi, H., (2008), Modern Nuclear Family Members Interaction and Communication, National Yunlin University, Taiwan

[13] Irene Cieraad, 2017, “Domestic Spaces”, Chapter · March 2017, All content following this page was uploaded by Irene Cieraad on 18 July 2018. Delft University of Technology, Netherlands, The International Encyclopedia of Geography. Edited by Douglas Richardson, Noel Castree, Michael F. Goodchild, Audrey Kobayashi, Weidong Liu, and Richard A. Marston. John Wiley & Sons, Ltd. Published 2017 by John Wiley & Sons, Ltd.

[14] Lawrence, R. (1986). Redefining Cultural and Historical Studies of Built Environments in D.Saile (Ed.): Essays in Culture and Built Form, University of Kansas Press, Kansas.

[15] Lawrence, R. (1989). Translating Anthropological Concepts into Architectural Practices in S.Low, E. Chambers (Eds.): Housing, Culture, and Design: A Comparative Perspective.University of Pennsylvania Press, Pennsylvania.

[16] Lawrence, R.J. (1987) “What Makes a House a Home?” Environment and Behavior" 19(2): 154-168.

[17] Plimpton, C.L, Hassan, F.A. (1987). Social Space a Determination of House Architecture Environment and Planning B: Planning and Design. (14) 439-449.

[18] Rapaport, A (1978)." Culture and Built Form: A Reconsideration in D. Saile (Ed): Essays in culture and built form. university of Kansas Press. Kansas.

[19] Rezeanu1, Cătălina-Ionela ,2015, "The relationship between domestic space and gender identity: Some signs of the emergence of alternative domestic femininity and masculinity", JOURNAL OF COMPARATIVE RESEARCH IN ANTHROPOLOGY AND SOCIOLOGY, Volume 6, Number 2, Winter, p24.

[20] Schildkrout, E. (1978). Age and Gender in Hausa Society: Socio-economic Roles of Children in Urban Kano in J.S. La Fontaine (Ed.): Sex and Age as Principles of Social Differentiation. Academic Press, London.

[21] Seamon, David, (2007)," A Lived Hermetic of people and place: Phenomenology and space syntax". proceeding, 6th International space syntax symposium, Istanbul.

[22] Sutton,L.,(1999),Interaction,ArizonaStateUniversity,http://seamonkey.ed.asu.edu/~mcisaac/emc703/leah5.html.

[23] Yang, Dr. Ching, Fortunato B. de la Peña Jr. (2009) "A Study on Living Spaces and the Daily Interaction and Communication Model of Middle Aged Urban Families in the Philippines".

[24] Zeisel, J., (1997), Inquiry by Design: Tools for Environment-Behavior Research, Cambridge University Press, USA

Appendix(1) Questionnaire

The esteemed gentleman:
Please provide the following data for the purpose of measuring research entitled "Effect of physical visual properties of domestic space on the degree of choice for occupations daily activities"

1- General Information:

1. Plot Size: 200m2 250m2 300 m2
2. Residential Unit Location: 
3. Number of family members: 4 persons 6 persons more
4. Economic level: Good Low average
5. Head of family work: employ business another
2- Characteristics of domestic space : (living space)

| questions                                                                 | agree | Agree somewhat | disagree |
|----------------------------------------------------------------------------|-------|----------------|----------|
| V1 The characteristics of living space correspond to the lifestyle of family members according to their social requirements |       |                |          |
| V2 In the long run, the living space meets the length of the occupancy period, catering to all the needs of the family |       |                |          |
| V3 The characteristics of living space are consistent with the diversity of daily routine activities for all family members |       |                |          |
| V4 The characteristics of living space help create an atmosphere of familiarity and social affinity for family members |       |                |          |
| V5 Family space achieves privacy for all members of the family in the practice of their daily activities |       |                |          |
| V6 Family members can perform many different activities within the living space and appropriately |       |                |          |
| V7 The living space has the potential to adapt to furnishing according to various needs and in the long term |       |                |          |
| V8 The living space has the possibility of visual communication with other spaces to enhance the diversity of occupancy |       |                |          |

3- characteristics of family members :

| questions                                                                 | agree | Agree somewhat | disagree |
|----------------------------------------------------------------------------|-------|----------------|----------|
| V9 Family members are committed to the appropriate activities of the family space (sit, talk, lesson, play, hospitality, eating ……. |       |                |          |
| V10 Family members carry out the same activities in more than one room |       |                |          |
| V11 Family members conduct their own activities freely and without the intervention of others |       |                |          |
| V12 The everyday activities practiced by family members are strikingly contrasted |       |                |          |
| V13 Family members differ in their level of awareness of possible events within the family space according to the daily life model |       |                |          |

4- Recording the daily routine of the family activities according to the attached schedule.

5- scheme layout of the components of the house according to the suitable scale.

Appendix(2) output of Depth Map – Isovist Graph for (13) houses in Mosul city
| No | Isovist Maximum Radial | Visual Control | Visual Entropy | Visual Integration | Isovist Area |
|----|------------------------|----------------|----------------|--------------------|--------------|
|    |                        |                |                |                    |              |
| House (1) | ![Image](image1) | ![Image](image2) | ![Image](image3) | ![Image](image4) | ![Image](image5) |
| House (2) | ![Image](image6) | ![Image](image7) | ![Image](image8) | ![Image](image9) | ![Image](image10) |
| House (3) | ![Image](image11) | ![Image](image12) | ![Image](image13) | ![Image](image14) | ![Image](image15) |
| House (8) | House (9) | House (10) | House (11) |
|-----------|-----------|------------|------------|
| ![Diagram](image1) | ![Diagram](image2) | ![Diagram](image3) | ![Diagram](image4) |
| ![Diagram](image5) | ![Diagram](image6) | ![Diagram](image7) | ![Diagram](image8) |
| ![Diagram](image9) | ![Diagram](image10) | ![Diagram](image11) | ![Diagram](image12) |
| ![Diagram](image13) | ![Diagram](image14) | ![Diagram](image15) | ![Diagram](image16) |
| ![Diagram](image17) | ![Diagram](image18) | ![Diagram](image19) | ![Diagram](image20) |
