Using the Space Syntax Analysis to Examine the Spatial Configuration of Houses Layouts and Its Transformation over Time in Biskra City

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Abstract
Urban complexity of the Algerian town, in this case the city of Biskra, consisting of a compilation of different fabrics through history (the old city, the colonial fabric, and the post-independence fabric), has produced several housing types. Therefore, a variety of domestic architecture has emerged; vernacular, colonial, self-built (independent), and contemporary houses. Houses architecture is apparently different from one type to other in organization and morphological aspect. The study based on analytical-comparative to examine the transformation of the spatial organization of a sample of houses layouts from different periods of time (pre-colonial, colonial, independence, and contemporary period) in term of permeability, in Biskra city. The aim of this study is to uncover the genotype and the underlying characteristics of different spatial layouts by using the space syntax method. This paper explores the influence of inhabitant's behaviors and the socio-cultural effects on the spatial configuration and space-functions of the houses layouts. In the context of discovering the differentiation and the similarities between the samples that consist of 16 houses: four houses from each period; an analysis has been carried out by applying the "Gamma-analysis" using the A-graph program in detecting the genotypical consistencies in their patterning. Finally, the results of this research suggest that despite all the apparent differences in spatial organizations and configurations of all the houses in the sample, are follow the same rules (invariable principles) organizing the space system; according to the concept of Genotype and Phenotype.
Keywords: genotype/ phenotype, spatial configuration, j-graph, inhabitants behavior, socio-cultural factors

1. Introduction

The city of Biskra has a very rich and ancient history, which have many abounding civilizations dating back to 8000 J.C. Biskra city characterized by its geographical situation, its hot and arid climate, its natural resources, especially agricultural, therefore, it's the pole of all the civilizations, from the Romans while passing by the Arabs, until the French colonization that produced different urban fabrics with several housing types. Therefore, a variety of domestic architecture has emerged; vernacular, colonial, self-built, and contemporary houses. This domestic architecture has generated various typologies inherent to morphology and spatial organization to meet people temporal and socio-cultural needs. This study attempts to understand the spatial interface between the spatial configuration and the inhabitant's behavior, and the effects of the socio-cultural factors through the time. In addition, it leads to explore the relational structures of different spatial systems (Dursun and Saglamer, 2003). The study leads to examine the internal spatial organization and configuration of Biskra houses. Syntactical study was used to investigate the changing related to the spatial organization of the houses. This latter has been strongly guided by the 1- domestic culture that refers to the daily life, 2- social factors such as the privacy; according to Iwan Altman privacy is viewed as a one-way "keeps out" by which people attempt to avoid interaction with each others. And it is also considered as an interpersonal boundary control process whereby people sometimes could be open and accessible to others and sometimes close themselves off from others (I.Altman 1977).

The aim of the study is to explore the similarities and differences between the spatial configurations of a sample of houses that contained 16 houses from the four periods: precolonial, colonial, independent, and contemporary period. The space syntax method was used to define the underlying genotype in terms of configurational consistencies that show themselves under different phenotypes (Hillier, Hanson, Graham, 1987). Hillier and Hanson

distinguish the syntactic analysis for interior spaces (spatial configuration) called "gamma-analysis". Which this analysis described in that paper produce justified plan graph for the specimens which is reflect the configuration of selected properties of these specimens (Ostwald, 2011).

2. Methodology

The space syntax theory has been applied in large studies by some researchers. It used with the aim of understanding the effect of the social and cultural factors on the use of spaces and the spatial configuration. The space syntax approach has applied in several studies: Hillier, Hanson, and Graham (1986) are seventeen houses layouts using space syntax analysis by analyzing the minimum living spaces with and without exterior in terms of function to see how the different functions adapted with the spatial configuration. Yasemin Ince Guney (2008) analyses a longitudinal series of Ankara houses using space syntax methodology to uncover the underlying spatial structure (genotype) of these houses and its transformation over time. Viviane cunha (2012) has studied about the changeability of genotype patterns over time by investigating on apartment plans in Brazil from the 1930s until the end of the 20th century.

A syntactical study was used to investigate the changes of the houses layouts on the sample of 16 houses from the four periods: precolonial, colonial, independence, and the contemporary period over time in Biskra city. The reason for adopting this methodology is its ability to combine the inhabitant's behavior and the socio-cultural factors in interpreting the spatial configuration and functions in order to identify the genotypical consistencies of the houses layouts. The syntactical characteristics as: symmetry, asymmetry, distributedness, non-distributedness; is used to facilitate the process of analyzing, understanding, and comparing the different spatial configurations of the system. And the quantitative parameters that included in the analysis are: the relative asymmetry (RA), the Real relative asymmetry (RRA), the base different factor (BDF), the space link ratio (SLR), the control (Cv) were used to investigate and compare the data for each house with other houses.
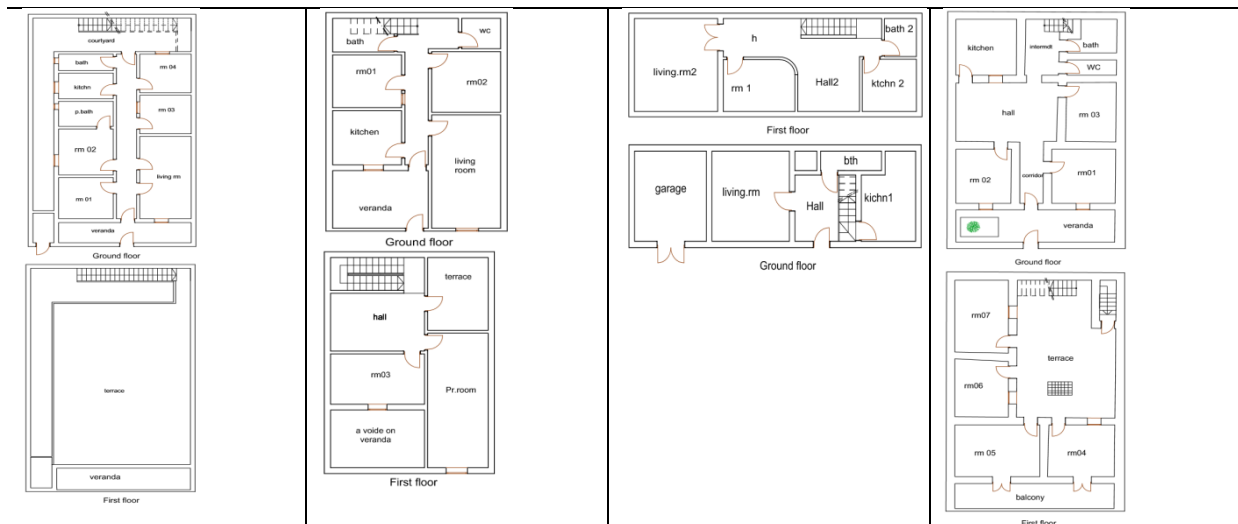
In the context of this paper, the study based on the justified plan graph, whereby the houses plans were subdivided into its component elements that represent the spatial configuration, each node in the graph refers to the functional spaces and the line that links between the nodes represents the connections and the relations between these elements in the graphs, whereas only the relations between the rooms are focused. The space syntax method considered as an effective tool for examining the socio-spatial pattern and their correlation with the spatial configuration and inhabitants' behaviors, as well as the correlation with the genotype and the physical shape of the spatial arrangements in the houses layouts.
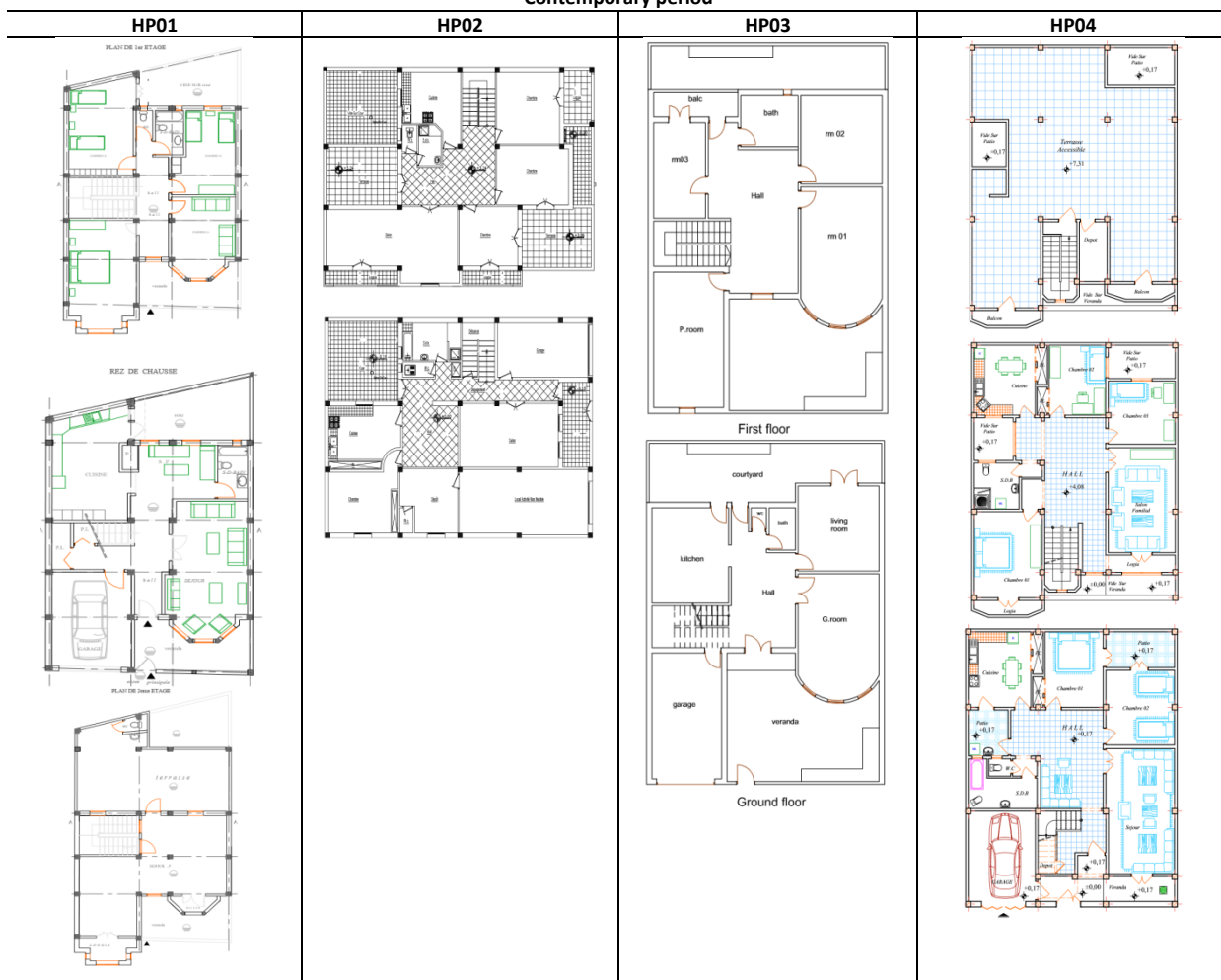
3. The procedure of the analysis

This study focuses on the socio-spatial pattern and the influence of inhabitant's behaviors on the use of space and studying the relationships between the interior spaces in the houses layouts which form the permeability into the house (Fares, Ahmed 2010), in term of discovering the genotypical consistencies within the spatial configurations of the sample of houses. The aim of this part is to explore how to measure the different variables and components that related to the main features of the spatial configuration of the houses layouts. The techniques of space syntax have been applied to provide comparative results between the different spatial structures. This study reviews a number of houses layouts were conducted by the survey includes 16 houses (re-drawn by the author) from different periods of time: pre-colonial (Vernacular), colonial, independent, and the contemporary period (Table-01), these houses are from three different neighborhoods; Gueddacha, M'cid, and Bab dareb situated in the core of Biskra city as old fabric. As a starting point the selection of houses was based on the temporal and historical criteria and the architectural value (the structure, materials of construction, and the architectural aspect) where the residential tissue adapted to its context. The strategy for sampling is to take 04 house layouts from each period to analyze and compare, whereas the sample will analyze as a whole without grouping them to periods. The table below shows the house plans.

Table 01. Shows the different house plans from the four periods.

Pre-colonial			
HV01	**HV02**	**HV03**	**HV04**

Ground- floor (HV01)

Ground -floor (HV02)

Ground –floor (HV03)

Ground –floor (HV04)

First- floor (HV01)

First -floor (HV03)

Colonial period			
HC01	**HC02**	**HC03**	**HC04**

Ground floor (HC01)

Ground floor (HC02)

Ground floor (HC03)

first floor (HC04)

First floor (HC01)

First floor (HC02)

First floor (HC03)

Ground floor (HC04)

Independent period			
HI01	**HI02**	**HI03**	**HI04**

Ground floor / First floor	Ground floor / First floor	First floor / Ground floor	Ground floor / First floor

Contemporary period

HP01	**HP02**	**HP03**	**HP04**

The syntactic analysis that will make in various houses plans of different periods will examine the main transformation and analyze the similarities and differentiation between the spatial patterns in terms of syntactic parameters.
A diachronic analysis of the habitable-spaces of the sample houses is carried out in this study (Mehmet, and Alper, 2003). This analysis has related to the changes in the social structure of the houses ; social and cultural factors must be considered to indicate the changeability of the spatial configuration of the sample. The analysis deals with only the functional spaces in the system with and without its exterior.

The application of the A-graph program provides the mathematical data and the different variables of measurement concerning the syntactical characteristics of the spatial organization of the houses (Faris.A, 2014), through five indicators : the relative asymmetry (RA), the base difference factor (H), space-link ratio (SLR) the real relative asymmetry (RRA). In addition the analysis considered the syntactical characteristics as the symmetry, asymmetry, and distributedness, non-distributedness as an important measurement for the process of the investigation and for specifying the features of the justified graphs.

The analysis destined to the identification of the genotype of different types of houses and its transformation over time, focusing on the habitable-spaces including the balconies, whereas the analysis has distinguished main possible levels:

1. The analysis reported in this study focused on the habitable spaces including the balconies, with and without its exterior. In this analysis we are interested in the interior pattern.
2. Before the construction of the justified graphs, a convex map must be created, then its converted to justified graphs (gamma maps) with considering the exterior as a root, by breaking the spaces into elements in order to draw the justified graphs using "the A-graph", the nodes represent the rooms and the lines is the relationships between the rooms.
3. The spatial organization were analysed by calculation the different syntactical parameters : the relative asymmetry (RA), the real relative asymmetry (RRA), the control value (Cv), the space-link ratio (SLR), the base difference factor (H).
4. Using basic data to the determination of the genotype for all the houses of the four periods, taking into consideration all the qualitative and quantitative variables and measurements.
5. Finally, this step constituted the comparison between the phenotypes from the different periods, because at the first stage we analysed all the specimens together without grouping them into periods.

The individual syntactic analysis of each house layout has been carried out by comparing the specimens with each other in order to identify the recurrences as well as the differences in the spatial configuration. Once the results are revealed, it can be combined to produce various genotypes to compare (Ostwald.J, 2011).

4. The configurational analysis

The procedure adopted in this syntactic analysis started by drawn the justified graphs of each house using the exterior as a root to illustrate the configurational properties (Hillier, Hanson, and Graham, 1987) the graphs shown in (figure. 01), wherein each space has a specific a depth value from the original space « the carrier » (Faris, and Ahmed, 2010), the carrier space represents the exterior.
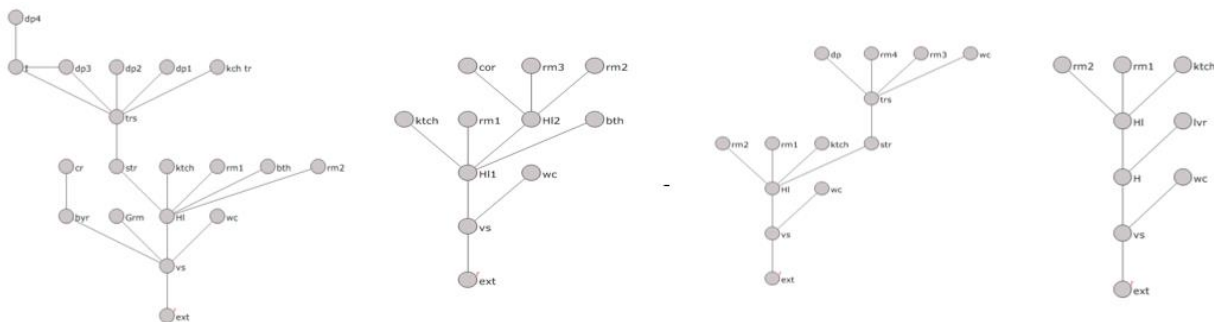
-The JPG of the house HV01   -The JPG of the house HV02   -The JPG of the house HV03   -The JPG of the house HV04

a- The justified graphs of the houses of the pre-colonial period
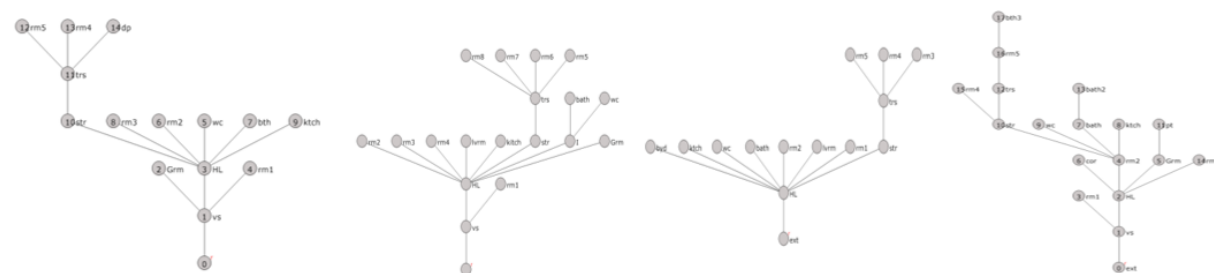
-The JPG of the house HC01   -The JPG of the house HC02   -The JPG of the house HC03   -The JPG of the house HC04

b- The justified graphs of the houses of the colonial period

-The JPG of the house HI01   -The JPG of the house HI02   -The JPG of the house HI03   -The JPG of the house HI04

c- The justified graphs of the houses of the independent period
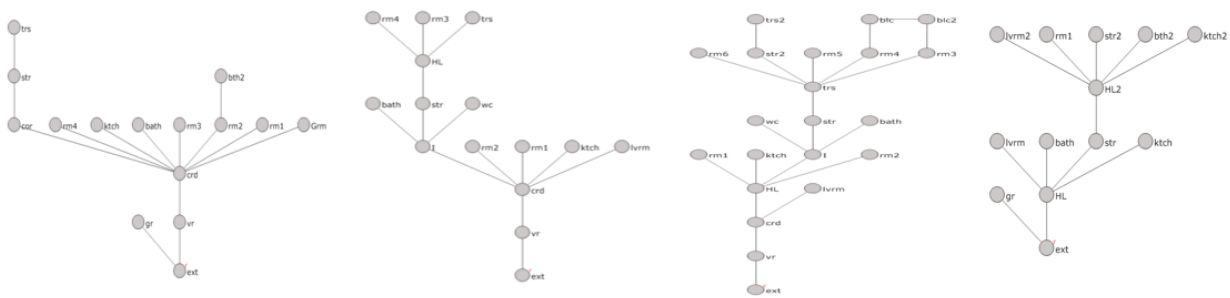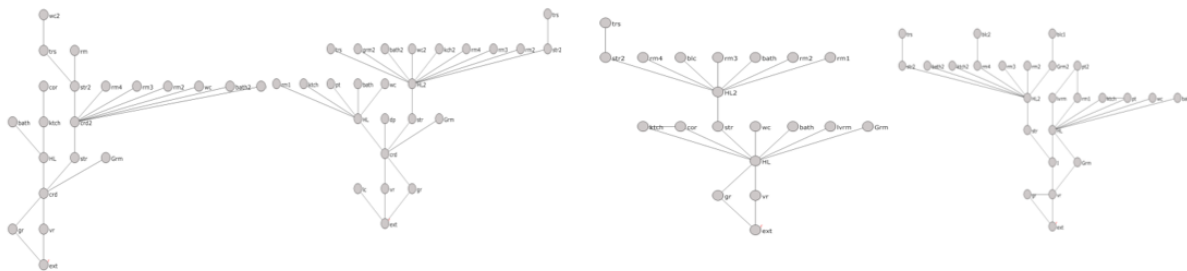

-The JPG of the house HP01   -The JPG of the house HP02   -The JPG of the house HP03   -The JPG of the house HP04

d- The justified graphs of the houses of the contemporary period

Figure 1. The justified graphs of the sample of each period.

The j- graphs in (figure. 2) show a certain striking resemblance between them, most notably the graphs have a tree-like structure which they deep from the original root. The graphs from the pre-colonial to independence period tend to lack in distributedness in general, and for the contemporary period is noticed that the graphs are so deep and the penetration into the house from an outer ring, is done according to two points : the veranda and the garage of c-type space are provide a flexibility of movement whereares circumscribing the circulation in a well-defined circuit. The graphs develop in the inferior part in sequences linear thus giving to branches of the tree-like structure. The topological spaces of a- and b-type have the highest percentage in all the graphs according to c- and d-type which means that the graphs offer a guided path where there is no through movement within the house. The interpretation focuses on the decortication of the results of the syntactic analysis that carried out individually (house-by-house analysis) on the justified graphs (figure. 1) in order to obtain a possible recurrences in the sample. This configurational analysis leads to uncover the underlying genotype and the socio-spatial configuration of the houses. To highlight this genotype we will separately interpret the spatial configuration from the social logic that underlies these patterns (Boutaba, 2013). Table 02 below shows the mathematical data of different measurements.

Table 2. The data of the syntactical analysis.

House number	SLR	MD	Integration (RRA) (With exterior)			BDF with exterior	Integration (RRA) (without exterior)			BDF without exterior
			min	mean	max		min	mean	max	
HV01	1.05	3.21	0.56	1.13	1.67	0.67	0.59	1.15	1.77	0.62
HV02	1.00	2.40	0.60	1.05	1.43	0.37	0.36	1.05	1.63	0.28
HV03	1.00	2.82	0.60	1.20	1.59	0.44	0.63	1.20	1.79	0.35
HV04	1.00	2.38	0.56	1.25	1.69	0.19	0.58	1.27	2.03	0.07
Total	**1.01**			**1,15**		**0.41**		**1.16**		**0.33**
HC01	1.00	2.78	0.37	1.00	1.42	0.56	0.39	1.01	1.41	0.52
HC02	1.00	2.90	0.36	0.92	1.30	0.73	0.33	0.95	1.26	0.69
HC03	1.00	3.50	0.29	0.89	1.34	0.52	0.35	0.96	1.36	0.46
HC04	1.00	3.27	0.54	0.99	1.61	0.60	0.61	1.19	2.09	0.57

Total	**1.00**			**0,95**		**0.60**		**1.02**		**0.56**
HI01	1.00	2.62	0.60	1.13	1.75	0.54	0.78	1.89	8.09	0.27
HI02	1.00	3.00	0.37	1.05	1.43	0.53	1.12	2.16	7.71	0.49
HI03	1.04	2.74	0.57	1.16	1.62	0.40	0.57	1.16	1.61	0.18
HI04	1.00	3.70	0.72	1.26	2.00	0.69	0.71	1.23	1.68	0.69
Total	**1.01**			**1,15**		**0.54**		**1.61**		**0.40**
HP01	1.04	3.45	0.59	1.14	1.40	0.70	0.58	1.27	2.03	0.67
HP02	1.04	3.36	0.50	0.99	1.60	0.80	0.92	1.72	1.70	0.47
HP03	1.10	2.91	0.48	0.92	1.42	0.69	0.47	0.89	1.38	0.65
HP04	1.06	3.59	0.60	1.10	1.50	0.83	0.63	1.10	1.46	0.80
Total	**1.06**			**1,03**		**0.75**		**1.24**		**0.64**

4.1. The mean depth

The table above sets out the values of the mean depth (MD) for the sample of houses, is an indication of the layering of different spaces in the system (Primali.P, 2013). Whereas all the spaces with the same value are placed on the same line. The average depth value of all the specimens of the sample is 3.03, is represents a hight value of depth, as the depth increases the houses become less accessible and more private. In the houses is noticed that each of the vestibule "*sguifa*" and the hall in the houses of both periods pre-colonial and colonial, and then the veranda, the corridor, and the hall for the houses of the independence and contemporary periods are considered as the public zones with the lower depth and are marked an easy access. However, the rooms and the service spaces (where the women carry the daily activities) are the deepest spaces in the houses that indicate an increase in privacy (Mehrdad, Mohammad, Afsaneh, 2018).

4.2. The integration (RRA)

The integration value (RRA) describes how closely the space is accessible from all the spaces within the system. The values of RRA lead to the privacy level of each house of the sample. The more the degree of integration is high the house tends to be more isolated and private (segregated system), thus when it's low value of RRa the house will be more accessible and less private (integrated system). The value of integration of all the specimens when the exterior in included is 1.07, and when it is not 1.26. In this case, the spatial configuration of the specimens becomes more integrated when the exterior is included is indicates that the exterior plays a role in bringing the layouts together, where the house layouts are described as extraverted. The houses from the colonial period have the lowest value of RRA 0.95 when the exterior is included and 0.54 when the exterior is excluded indicating the high integration of the specimens in that period and means are more permeable and accessible. The houses from the precolonial and independence period have the same value 1.15, and the contemporary houses have 1.03, which are showing a degree of segregation in the system indicating to the privacy of the houses. From the table 03, the houses: HV01, HV02, HV03, HV04, HC01, HI01, HI02, HI03, HI04, HP01, HP04, have a high value of RRA (more than 01) thus, refer to the segregation of the system which makes it less accessible and more controlled, therefore, the houses tend to be more private. The houses: HC02, HC03, HC04, HP02, HP04 have a low value of integration vary between (0) which refers to the integration of the system. Whereas, tend to be more accessible. It is notable that, when the system becomes more integrated, is an indicator of the high-efficiency of spaces, and when the system be more segregated that indicates the low-efficiency of the spaces.

4.3. The space link ratio

This indicator is used to assess the distributedness and non-distributedness properties to each space and the house layout, if there is only one non-intersecting route from a space to another in a system is said to be non-distributedness, if there are more than one non-intersecting route for any two spaces in the system here we talk about a distributed system. Table 01 shows the results of the SLR of each house from the sample. As can be observed the value of SLR is highest in the contemporary period 1.06, followed by the precolonial and independence periods with an equal value 1.01 which makes them tend to distributedness (ringy structures) this in turn refers to the high functional efficiency. The colonial period has a value 1.00 means that the system tends to the non-distributedness which refers that the system takes a tree-like form, and provides a guided path starting from the carrier space (the exterior).

4.4. The base different factor (H)

It Is used to provide a measure of the degree of differentiation between spaces in terms of integration, when the value of BDF tending towards 0, that indicates a strong differentiation and more structured and when the value tending toward a 1 means a weak difference between the spaces .The value of the BDF (H) for all the sample is 0.57 when the exterior is included and 0.48 when it is not, it's notable that the lowest value of BDF indicating to the strong functional differentiation for the sample. From Table 03 all the specimens in all the periods have the lowest value of

BDF refer to the strong functional structure of each house in the sample. Whereas these low values of BDF refer to the strong genotype in the sample.

4.5. The indicator of space-type "spaceness"

The degree of the spaceness is one of the important measurement in space syntax methodology in addition to the measure of integration, depth, Base different factor... provides a way to class the types of spaces in the systems depends on the topological features of the houe's spaces that meet functional requirement of occupation and movement through it (Faris,2014). Four topological spaces are characterized the spatial configuration : the a-type space which has one link, the b-type space has more than one link and lies on a tree, the c-type space which has more than one link and its linked to a ring, the d-type space is linked to more than two rings and has more than one connection. From the justified graphs of the specimens in the four periods; the a-type spaces are the most appropriate spaces for the occupation in all the houses because there is no through movement. these types of spaces represent each of the private spaces in the house such as the spaces that destined for the women use for daily activities, then the b-type spaces which are through spaces and suggest that there is no choice of movement to and from this space. The c-type spaces are also a through space but the fact that is falling on a ring suggests a degree of choice of circulation within the house. The d-type spaces are offering the most choice of movement. The degree of spaceness of a-type in the precolonial period is 64%, b-type 33% c-type 3.7 % and d-type 0%. For the colonial period the a-type spaces 67%, the b-type space 33%, the c-type spaces 0%, and d-type space 0%. The independence period the a-type space 62%, the b-type space 37%, the c-type 5% d-type 0%. The contemporary period a-type spaces 54%, the b-type spaces 20%, the c-type spaces 8%, and the d-type spaces 18%. The a- and b-type spaces are the highest in all the periods while the c and d-type are the lowest. Only the houses of contemporary period have the four topological spaces whereas; the rings are formed around the functional spaces : the hall «wast eddar», the living room, the guest room, the kitchen, the veranda, the patio, and the bedroom, which provides an alternative path and flexibility of movement around the house. The penetration to the house is done according to two points the veranda and the garage from the exterior which forming an outer ring. And it's notable that the colonial houses have no rings which means there are any alternative paths within the house but characterized by a guided path.

5.The order of integration as a mode of structuring the systems

The space syntax method seeks to discover the socio-spatial structure of the spatial arrangement (the genotype). The ordination of the spatial configuration leads to a better understanding of the morphology of the spatial configuration and organization of the sample and the mode of structuring the interior domestic space (Boutaba,2013). If the rank order of integration values in the system is in consistent order then a cultural pattern is existed "genotype".

The rank order from the most integrated to the most segregated space in each house from the sample shows that the spatial arrangements are structuring around the transition spaces. In the precolonial period the houses are structuring around the 'Hall'. For the colonial period HC01, HC02, HC03 are structuring around the 'Hall', and HC04 around the room (rm2). In the independent period the houses structured around the corridor (HI01), the intermediate space (HI02, and HI04), and the staircase (HI03). And finally, in the contemporary period the houses HP01, and HP02 structured around the corridor, HP03 around the Hall, and HP04 structured around the intermediate space.

Therefore, from the rank order of integration we grouped the specimens according to the structuring space of each house as follow:

HV01, HV02, HV03, HV04, HC01, HC02, HC03, HP03 ➜ structuring around the 'Hall'.

HI01, HP01, HP02 ➜ structuring around the 'Corridor'.

HI02, HI04, HP04 ➜ structuring around the 'Intermediate space'.

HC04 ➜ structuring around the 'Room'.

HI03 ➜ structuring around the 'Staircase'.

The number of houses that structured around the Hall is important according to other groups therefore stands at 8 houses, while the number of those structuring around the corridor and the intermediate space is equal ; 3 houses in each group. HC04 structured around the 'Room' and HI03 structured around 'stairicase', does not seem to belong to any group. The houses that structured around the hall 'wast eddar' represent the dominant group.

6. The space-link ratio as an element of refinement the genotype

Looking for genotyping means observing a quantitative recurrence as well as qualitative order. The space-link ratio must be added to see if there are only linear paths indicative of a tree structure. or of several paths indicative of closed circuits, of rings. This is what the SLR can highlight to some degree (Boutaba, 2013). All the groups observed above, whether dominant or minimal, must be revisited in the light of the SLR ;

Table 3: Using SLR in classified the groups of structured mode .
a-structuration around H   b-structuration around crd   c-structuration around I

Groupe01	SLR
HV01	1.05
HV02	1.00
HV03	1.00
HV04	1.00
HC01	1.00
HC02	1.00
HC03	1.00
HP03	1.10

Groupe02	SLR
HI01	1.00
HP01	1.04
HP02	1.04

Groupe03	SLR
HI02	1.00
HI04	1.00
HP04	1.06

In the table (a) that represents the dominant group whereas the spaces structured around the 'hall', shows a recurrence in the value of SLR (1.00) that features an arborescent (tree-like) justified graphs. In that case we can say that a genotype exist in that group. It is notable that there are two houses HV01 and HP03 as an intruder within the dominant group with a value of SLR 1.05 and 1.10 respectively. In the second group where the corridor is the structured space, HP01and HP02 identified a recurrence show an equal value 1.04 of SLR that represent a ringy justified graphs, while the HI01 has a value of SLR 1.00 which is an arborescent graph, it has the same characteristics of the first group. The third groups where the intermediate space is the structured space ; HI02 and HI04 show an equal value 1.00 of SLR therefore, they represent a tree-like structure of justified graph which they have the same features of the first group. The analysis of these specimens according to SLR, it suggests that there are three underlying spatial-functional 'genotype' defined under configurational consistencies that showed under differents 'phenotypes' (Hillier, Hanson, Graham, 1987). In which the first group can be demonstrated as dominant genotype (the first type), and other groups considered as secondary genotypes. As the last step, the base different factors were used to identify the strength and the homogeneity of genotypes. The BDF was explored for the second time to check the solidity of the graphs shown in Table 04 below :

Table 4 : Used the BDF as a tool for determination of homogeneity of the groups that indicate the genotypes

Groupe01	SLR	BDF H
HV01	1.05	0.67
HV02	1.00	0.37
HV03	1.00	0.44
HV04	1.00	0.19
HC01	1.00	0.56
HC02	1.00	0.73
HC03	1.00	0.52
HP03	1.10	0.69

Groupe02	SLR	BDF H
HI01	1.00	0.54
HP01	1.04	0.70
HP02	1.04	0.80

Groupe03	SLR	BDF H
HI02	1.00	0.53
HI04	1.00	0.69
HP04	1.06	0.83

From the Table 04 the first group of houses that structured around the Hall, the values of BDF (H) comprise between 0.19 as min value (HV04) and 0.73 as the max value (HC02), the second group whereas the corridor is the structured space in the system the value of BDF comprise between 0.54 (HI0) as min value, and 0.80 (HP02) as max value. The last group shows value varied between 0.53 (HI02) and 0.83 (HP04). For each group is notable that the values of BDF are less than 01 in the systems, as refered to Billier et al (1987) theses values are considered low which refers to the strong functional differentiated and the spatial configuration is more structured and homogeneous.

6. Discussion and conclusion
After analysing the different spatial arrangement of 16 houses from differents periods, the results were examined which indicate that there is an underlying spatial structure within the sample based on the justified graphs analysis by looking for recurrences within the houses. The finding in this research indicates the important role of the exterior to bring the layouts together in which the houses become more integrated when the exterior is included and that leads to the significants of the exterior to the overall spatial configurations for all the periods. The analysis of houses

demonstrates that the integration value increase when the exterior is included, which means that all the houses share the intwrad-looking (yasemin,2008).

The finding also demonstrate, that in the precolonial and colonial period there is the vestibule called '*sguifa*' considered as the boundary and one of the main characteristic elements of the houses that separate between the interior and exterior word, it's the filter and the transition space (zerouala, and Adad, 2002). And in the independence and contemporary house we noticed the disappearance of this space and replaced by the veranda that has the same role of the '*sguifa*' which represents a boundary between the exterior and the interior. The Hall '*wast eddar*' is the main central space that characterized the vernacular houses especially as first and is the pivot of the movement and the transition within the house, it is the space through which the whole house is articulated. In the independence period, we notice the emergence of a new space as s structured element for the houses in the 'corridor' which play a role of transition and articulation the spaces, whereas, the hall 'wast eddar' becomes one of the most important spaces that structured the Biskra houses.

After the examination of the order of integration and the different indicator as to the base different factor and the space-link ratio for whole the sample ; three groups of structuring modes are identified, the first dominant group is structured around the hall 'wast eddar' which is the main central space and has a strong functional-efficiency of spaces and more structured. The values of integration (RRA) with and without exterior is showing a minimal variations which reveal that this dominant group that structured around the Hall essentially structures internal relationships and highlights the supremacy of the interface residents – residents, and from the justified graphs is materialized by a tree-like path guided without any circuit. Which this group forming the genotype « A » for the sample. The second minimal group structured around the 'corridor' which is an element that emerged in the independence period considered as the main transition space within the house layouts. The examination of the data of RRA values for the second group showing that there is big variation between the values when the exterior is included and when it is not (distributed system).Is structure the relationship between the residents-visitors which forming the genotype « B ». The third minimal group is structured around the intermediate space, is structured the relationships of the interface residents-residents, which is forming as well the genotype « C ».

In conclusion, space syntax expresses the meanings of the social factors and lifestyle in the spatial system. It allows to compare the spatial arrangements of a sample of houses through differents time that formed under the influence of the same cultural factors. Three genotypes are defined according to the structural mode, the difference factor, and the degree of ringiness with taking into consideration the exterior when it's included and not. Despite the change in the social life and lifestyle over time, the house layouts still preserve the underlying characteristics within the spatial configurations. The main central space the Hall « wast eddar » is one of the most important elements on the composition of Biskra houses, as well as the '*sguifa*'in the first two periods and the veranda in the last periods, these two spaces considered as the boundary between the exterior and interior spaces. From analysing the syntactical data is notable that the house layouts provide a kind of privacy to the occupants. The spatial configuration of houses in each period shared the underlying characteristics in terms of privacy.

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