International Journal of Spaces and Urban Territory
p-ISSN : 2534-8183 / e-ISSN: 2382-3011

www.knowledgejournals.com

Article

An applied approach based on the space syntaxe program for decoding the interior spatial constants in traditional dwellings in south of Oued El Abiod in Algeria

Abdelhalim Assassi,
Achitecture department, Batna 1 university, Batna, Algeria.
abdelhalim.assassi@gmail.com
Tahar Bellal
Achitecture department, Setif university, Setif, Algeria.
bellal56@yahoo.fr

Abstract
The housing heritage in all countries of the world reflects social images and daily-domestic practices within the lifestyle which crosses the community prevailing logic based on social relationships. That framework of housing heritage with his privacy is characterized by historical, technical and technological values which guarantee him the fanciest place in the policies based on the real governance. Interesting on heritage in general, and on housing heritage in particular attracts a large number of tourists and leads to be an essential economic source, which is considered as an effective and sustainable alternative sources of obsolescent oil. The traditional houses in south of Oued El-Abiadh are characterized by those values which make him eligible to be strongly one of the important sites of housing heritage in the world, and generates a lot of money for the Algerian economy as an alternative of sedition oil. Behind those values within the phenotype shared by traditional houses in south of Oued El-Abiadh make us wonder what are the constants related to the genetic pattern inside those houses.

The research is based on the hypothesis which says that despite the topographic, natural, climatic and tribal variations but versus urban and architectural constants that characterize traditional houses in south of Oued El-Abiadh, we find spatial constants inside these houses which unifie all of this valley areas, thus giving it the common traits and make them a Berberian -Chaouia- model in Aures region whether on the phenotypic level or at the genetic level.

The approach of this paper is based on the quantitative type of research which exceeded the descriptive and qualitative field, this quantitative approach is

represented by the syntactic and visual analysis, using A-graph and depth map programs applying on different surveys layouts of houses before independence from five areas was chosen from south of Oued El-Abiadh. Interpretation of analysis results come to define spatial constants digitally in full south of Oued El-Abiadh area

Keywords
traditional dwellings, berber heritage, Oued El Abiod, space syntax.

1. Introduction

Who watches human dwellings that were born from nature feels nostalgia to the pure past where man loves nature, lives with it and lives from it within a real poetic situation. In a natural panel exceeded all creations of artists across all ages, nature and man participate together for drawn it. Of that, it is very important in such intangible heritage multidimensional due to the community's historic and moral benefits as well as economic interest to appraisal this potential, and leads learners to discover the facts proven by history and location because traditional populist construction was a model of human genius through time and space [1].

As a real sample of that human genius the smooth integration of different settlements of Aures in their natural context, characterized by four valleys (Oued El-Abiadh, Oued Abdi, Oued El-Kantara, and Oued El-Arab), four lifelines gatherings Berberian -Chaouia- communites, where some houses are still inhabited. In the south of Oued El-Abiadh, we find important settlements which proved themselves throughout history and has inspired poets, artists and scholars of different specializations to looking for the mysteries and secrets of this obvious harmony between nature and Chaouia houses, and what this houses hide in their inner space.

2. Problematic

If the urban landscape and the architectural perspective of traditional houses in south of Oued El-Abiadh is indicated by the urban and architectural constants that can be read easily in the outer shell of this traditional houses, does it reflect the existence of spatial constants inside it which makes many impressions which are required and associatet with the post utilitarian and the various humanitarian needs housing, and that express the close contact with the Berber -Chaoui- community of this region ? If yes, what are those spatial constants ?

3. Hypothesis

Research hypothesis says that despite the topographic, natural, climatic, and tribal variations and against the urban and architectural constants that characterize residential areas south of Oued El-Abiadh, we find that there are spatial constants inside residential units that gather all the South of this valley areas, thus giving it the common traits and make them a Berberic -Chaoui- model that unifies Aures region, whether on the phenotypic level and at the genetic level.

4. Context of study

4.1. Geographic location

Aures is situated between two poles, north and south, which gave it a special feature based on the contact between a warm region on the one hand and cold region on the other hand (Chelia mountains at an altitude of 2328 m). Aures is located exactly between Constantine, Oum El-Bouagui, Khanchela, Biskra, El-M'sila, and Setif. Aures is characterized by four valleys: Oued El-Abiadh, Oued Abdi, Oued El-Kantara, and Oued El-Arab [2]. The characteristics of the natural environment are diverse and miscellaneous in the Aures region depending on the natural, topographic, and climatic aspects.

Fig. 1. Location of Aures in Algeria [3].

Oued El-Abiadh is an important region in Aures, and along this valley (90 km) we find many settlements, from Chelia mountains to Foum El-Ghorza barrage. Rainwater poured from Aures mountains to Malghigh region in the Sahara, and thus feeds the aquifer in the northeastern desert

upon which the oases of all the valley are based (El-Ouedi, El-M'ghaiar, and Toguort). The area of the top pelvis located north the barrage is 1280 km^2, it receives annually rains average of 365 mm [4]. Near This valley we observe the national road number 31(Batna-Biskra).

What can be inferred generally that this region can be divided into two ranges separated by the gorge of Tighanimine: northern scope consists of narrow closed plains, and characterized by a semi-humid climate with a varied and dense vegetation, and southern scope open from Tifelfel to M'chounech exposed to northern and southern climatic impacts (this southern scope will be our case of study).

Fig. 2. Stream of Oued El-Abiadh [5].

4.2. Brief history about Oued El-Abiadh

The history of the population in this region is linked to indigenous groups that inhabited North Africa and most of them descended from Berber origin. The population of the Aures region is called Chaouia who represent 93% of the total Aures population according to statistics of 1931. Even if the origin of the population in Oued El-Abiadh is the same (Chaouia) but they are divided into tribes, we find, for example, tribe of Bouslimane in Inoughissene, tribe of Ouled Daoued in Arris, tribe of Ahmimoune in Ghoufi, tribe of Ahaaloui in Baniane, and tribe of Ahiahmedh in M'chouneche [4].

The population in Oued El-Abiadh are characterized by the most important feature which is the semi-nomadism, and they reticence of all that is foreign of their culture, with a distinctive style of exploiting the agricultural, the pastoral, and the urban-residential area. In the framework of that activities, a grid of different social relations is formed like

the cooperation (Twiza), and the exchange of grazing areas.

4.3. The urban and architectural constants southern Oued El-Abiadh

Aures region generally and Oued El-Abiadh specially are characterized by an urban and architectural heritage organized within an ancient residential communities rooted in the history. What distinguishes Oued El-Abiadh most is the strong presence of the castle "Hakliath", as a popular grain house of this residential communities in the southern of Oued El-Abiadh, with its important location and integration in the urban organization. The castles "Hikliain" represent as a symbol of the survival for the tribes, as they symbolize wealth and strength and balance as well as social and intensity, they are built for social, economic and defensive purposes, and they were considered as a close loop connecting the population of the same tribe. Although its precious archaeological and historical value which was built with a human genius for hundred years ago, but today those castles are threatened with extinction and disappearing partially or completely after the collapse of large parts of them and the disappearance of others.

4.3.1. The overall appearance

The urban and architectural heritage southern Oued El-Abiadh is characterized by:

- Unity in the formation of the residential communities as an expression of power, the Union and the protection of natural and climatic factors.

- Simplicity: This is in all aspects of the building.

- Positioning of the hippocampus: the nature of the site is a key factor for food security characterized by a rich vegetation (forest, gardens, and palm etc ...), and by different sources of water. The topography of the site made from the latter naturally fortified and helped to control all residential communities from several points.

- Integration in the context: The assemblage between nature declivities and walls of buildings created an unusual morphology, as if all the buildings in the communities studied are an integral part of the natural environment. This was achieved mainly with the respect of the natural barriers during the urban growth of the residential communities without forgetting the use of several local building materials.

- Respect of proportionality between the building and the human.

- Introversion toward the outside: the absence of openings in the outer facade of the building (if they are present, they are characterized by

small dimensions), in order to preserve the inviolability of the home, and as well as to protect against the harsh natural factors.

- Holistic viewing angles: give multiple possibilities to control the gardens.

4.3.2. The Growth and development of the urban conformation southern Oued El-Abiadh

We can read the growth and development of the urban profile southern Oued El-Abiadh through the following:

- Axis of growth: The valley of El-Abiadh.

- Element of growth (built label):

- Simpler label: center of courtyard surrounded by rooms.

- The label can contain two entrances depending on the nature of ground.

- Need of areas containing distinct functions, creating a space for insolation "Hashmmasth" (this space is creating for exposing agricultural and farming products to the sun in order to dry them and store them).

- The label can also take several forms depending on the nature of the ground and the streets.

- The starting point of growth: Reference structures and urban growth is the house of the grain "Hakliath".

- The limits and barriers of natural and urban growth: for example in the site of Howrirth in Ghoufi region the natural growth barriers are the valley in the south, and the edges of the mountains at from the east and the west.

- Directing the growth: It is noted that the urban growth is characterized by two-way:

- Horizontal: horizontal urban communities parallel to the topographic lines.

- Directing to the convergence point: where buildings are directed progressively to the pole (top of the hill). It is therefore conclude that the growth form is linked to the valley, topographic lines, and to the power lines in the convergence points.

- Security and control: As mentioned before, the nature of the site as a factor of food security, as it is characterized by the richness of the forest, gardens, palm trees and other vegetation types, in addition to the sources of water. The topography of the site which made the positioning of urban communities is characterized by a natural positioning of the hippocampus, and provides them a multi-directional control toward the rest of the residential communities, and toward the gardens.

Fig. 3. Photo of Haourirth from Ghuofi region.

4.3.3. The most important elements of Oued El-Abiadh urban structure

- The house of grain "Hakliath": It is an architectural Berber landmark, as a large populist building (castle), and it is one of the foundations of Berber -Chaoui- urbanization (social and defensive role). In general, the house of grain "Hakliath" is a collective grain depot, since each family has an area in to store their products and agricultural farm. The layouts house of grain "Hakliath" are non-uniform due to the nature of the floors, and their external walls are almost deaf (with very small openings).

Their central spatial structure contains a courtyard, and stoic paths. Grain house contains several rooms "Hebeothin", and it is characterized by high exterior wall (equal to six meters high, with one entrance and small openings).

- The prayer building "EL-masdjid or El-djamaa": It is considered as a element key in urban communities, where the prayer take the principle function within. It represents more than one value, and it is based on ethics. In the prayer building "EL-masdjid or El-djamaa" people can contract the marriage, within it we find all kind of instauration of relationships between people, (after conflicts), and so on. The prayer building "EL-masdjid or El-djamaa" has an important location in the urban assembly southern Oued El-Abiadh, and it looks differently from the rest of the buildings.

- The markets: these types of buildings are represented by the shops, which are positioned linearly along the paths to facilitate movement.

- The paths: A special type of paths in the residential communities of this region is represented in the pedestrian ways, which they link between the different elements that the urban residential communities structure. They are often characterized by the declivity, and sometimes they are constructed with stones. We can find also what we call closed paths, which play the role of locomotive gradient axe line from the general to the specific parallel to the

buildings walls, and to the topographic curves.

- The Houses: The steering toward the sun's rays is a principl of house positioning in the most residential areas southern Oued El-Abiadh, and in addition to this we notify the gradual positioning of houses, depending on the topographic level section. We observe also, that the houses have a parallel positioning based on the settlement paths, and on the topographic curves. Most of the buildings take advantage of the sun's rays appear. The settlements are the product of the principle of kinship, (so that each tribe has its own urban positioning). Generally, we find the courtyard as a common space in most of houses with one entry or more. We also note that there is a junction between walls of houses based on kinship principle, and climatic cause, so that the adhesion among them lead to the heat preservation during the winter and reduce the exposing of the walls to the hot sun during the summer (as a principle of sustainability). We refer to the use of natural stones in the largest number of houses, and less for mud (in addition to the trunks of trees, and palm).

5. Methodology of the study

Traditionally, methodologies ranged in the architecture field between the social methodology based on the study of behavior, the topological methodology, the conformation architectural, and so on. Recently, the use of space syntax computer software in the comparative analysis between the residential samples [6] is an important tool for understanding the social-spatial configuration [7] as a new approach based on a methodological theory of the human behavior in the space. For example, the spatial cultural and behavior inherited in Berber housing in Algeria, where we find that the models often appear to the naked eye, and standardized multiple fields of vision.

The body of houses and their several morphology levels and spatial conformations are an interpretation of the cultural legacy meaning through daily practices that have evolved to the level of housing form [8]. As we shall see that the differentiation between the integration of the essential part is the measurement values resulting from the use of space syntax program, which shows that the social relations manifest themselves cross-domain [9]. The "Configurational analysis" as the analysis of relationship between outside spaces and inside spaces, was founded in order to understand the use of the space, the family relationships according to the sex of each individual, the positioning of the permanent or temporary visitor in the inner space of the house, and so on [10].

The analytical study focused on five urban areas (Tifelfel, Ghoufi, Kaf El-Arous, Banyanne, and M'Chouneche) southern Oued El-Abiad, shows the similarities in the spatial configuration, and daily

domestic functions based on the understanding of the social phenomenon withing Berber housing.

Basing on selected areas, and after finding out that cultural, social, climatic, and geological elements which characterize this region we deduce different spatial constants in Berber -Chaouia- housing region.

We surveyed one hundred residential samples, divided on twenty surveys from each residential area (five samples were selected from each region). Also, we supported those surveys by photographs showing the third dimension of the optical field within the residential sampling points mentioned with a specific vision points.

These submitted schemes have been re-elaborated and entered for analyzing by space syntax computer program, so that the quality of the data represented in line in the form of the original plans with quantitative data by applying digital mathematical relations through various space syntax computer program data, in order to reach so careful the extrapolation relations and social behavior within the Berber -Chouia- residential area. To reach spatial constants withing the Berber -Chaoui- dwelling area southern Oued El-Abiadh can do through the repetition of digital results.

The study is based on a representative architectural surveys samples, as the first stage, then we analyzed them according to the syntactic approach using A-Graph and Depthmap program, after that we deduced the genotype of our case of study as third stage, then finally we extracted various constants of Berber -Chaoui- dwelling area southern Oued El-Abiadh, as the final stage which we can call it the stage of the study theory [11]. The selected residential samples were analyzed using space syntax computer software based on several factors, and divided on two levels:

5.1. At the level of domestic spaces

According to Prof. "Tahar Bellal", the use of "Axman" program can strengthen the process of analysis the different layouts of houses. So, after making different surveys of selected houses, we draw a specific graph called "Justified Graph" showing different axial movement relations withing houses [12].

After drawing the Justified Graph, and after distinguishing between four topologic types of spaces, we mentioned different following factors (a sample is detailed in page number 05) [13]:

- Topologic types of space:

- Topologic type of A space: It is the last space within a tree like structure, which indicates that the movement is limited.

- Topologic type of B space: It is the transit space within a tree like

structure, which do not allow the user to move in the space freely.

- Topologic type of C space: It is a space with one annulus leads to an annulus structure, which provides the user the choice of movement.

- Topologic type of D space: It is a space with more than one annulus leads as well to an annulus structure, and which allow the user to move in the space freely.

- The Distributivity and Non-Distributivity:

Calculated to determine the existence or the inexistence of distribution, it equals: (a + b) / (c + d)

- The Asymmetry and Symmetry:

Calculated to know how much the spatial structure is integrated or isolated, it equals: (a + d) / (b + c)

If the resulting value is between 1 and 3, so the spatial structure is moderated, whether for symmetry or for the distributional. If the resulting value is less than 1, it means that the spatial structure is characterized by the asymmetry, the integration, and the distribution. If the resulting value is more than 3, it means that the spatial structure is characterized by the symmetry, the isolation and lack of the distribution.

-The Total Depth:

It is the total number of links between a specific node (path carrier or root) and each node "n" in the group which was calculated in consideration of depth, because the total depth "TD" is related to carrier, sometimes it is abbreviated as "TDn" which means total value of a specific node. The total depth can be calculated as following:

TD = (0 xnx) + (1x nx) + (2 xnx) + ... (X xnx)

- The Mean Depth:

Calculated to know how many stages to reach certain space in the spatial structure of the dwelling, and ach phase has a value depth multiplied by the number of nodes which exist in the stage, these values will be added, the result occurring is divided by the number of spaces "K" containing spatial system minus one. This space which is deleted is the carrier in system. The mean depth equals:

MD = TD / (K-1)

- The Relative Asymmetry:

Calculated to assess if the spatial structure is deep or shalow. Ranging between 0 and 1, the weak value is close to 0, which means that the system is superficial "shalow" (the space which holds the lowest value is the integrated space in the system). The great value is close to 1, which indicates that the system is deep, and thus the system is isolated (with

distinctiveness). The asymmetry factor equals:

$$RA = 2 (MD-1) / (K-2)$$

- Real Relative Asymmetry or Integration value:

It is a global measurement for all spaces of the dwelling. It is calculated to determine the proportion of integration (relative centrality of spaces) in a system. And it ranges from 0 to more than 1, the value of integration which is less than 1 indicates that the spatial structure of the dwelling is integrated, and the value of integration which is more than 1 indicates that the spatial structure of the dwelling is differentiated. Integration equals:

$$i = 1 / RA$$

- The Control value:

It is a local measure which allows the assessment of the control force of space for spaces around him or neighboring spaces. If the control value of e space is more than 1, it means that its control factor relatively is strong, but if it is less than 1, it means that its control factor relatively is weak.

- The Difference factor:

This factor is designed to determine the level of the difference, and to distinguish between integration values of three spaces (or functions) or more, it represents a transit possibilities which allows to determine the type of fundamental social logic. If the difference factor is close to 0, this indicates that the components of the dwelling are distinct and different, and thus structured. But if the difference factor is close to 1, it means that the constituent spaces of the building are homogeneous (the same values of integration), and we do not find any structural differences between them. The difference factor equals:

$$H = \Sigma [- ((a / t) \ln (a / t)) + ((b / t) \ln (b / t)) + ((c / t) \ln (c / t))]$$

Where: $t = a + b + c$

- The Relative Difference factor:

This factor is intended to indicate whether the system is homogeneous and its value approaches to 1, and non-homogeneous it approaches to 0. The relative difference factor equals:

$$H^* = (H- \ln 2)/(\ln 3- \ln 2)$$

- If there is significant difference between the results of the above factors in the case of considering the exterior and the results of the above factors in the case of non-considering the exterior, it means that the spatial structure of the sample is based on the resident / visitor relationship and if the contrary, they it is based on the resident / resident relationship.

5.1. At the level of human establishment

According to Prof. "Tahar Bellal", using a "depthmap" program system "VGA", strengthen the process of analyzing the visibility graph of a spatial context. This program allows to convert layouts in second dimension to the extension "DXF, and fill the open areas of those layouts with a grid of points. Once the graph will be accomplished, the researcher can do various analyzes of this chart (like Point Depth Entropy, and Clustering coefficient, and so on.) [12]. The graph analysis is divided into a global measure (is created by using the information from all points in the graph), and a local measure (is created by using information from the immediate vicinity of each point in the graph). In our research we highlighted two measures which are:

- The Point Depth Entropy:

Allow us to explore the measurements of the distribution depths frequency. The calculation of the point depth entropy leads to knowing if the vision from a particular point is permeable within the spatial system or not. The point depth entropy is less number of edges we need to cross through it from point to another. The point depth entropy is simply the average of less distance or the shortest path from point to another in the system, and thus, it shows the average number of turns per distance traveled by the domain user within the system.

- The Clustering Coefficient:

Gives a measure of intra-visibility of spaces within the visual vicinity of a specific point. It is defined as the rate of points which are actually correlated within the vicinity for a local point which is compared to a number which can be linked.

6. Analytical sample (House n° 03 from Tifelfel region)

Fig. 4. Photos of house n° 03 from Tifelfel region.

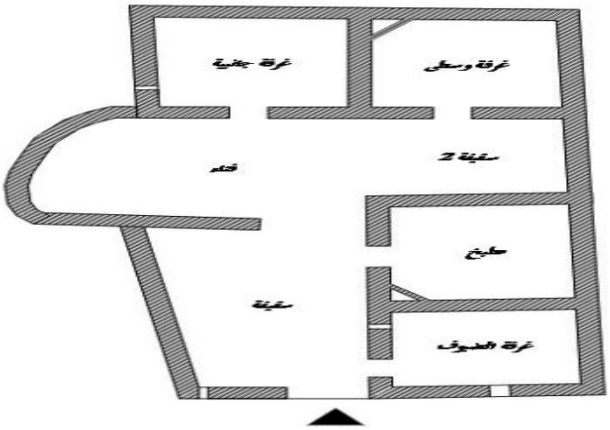

Fig. 5. Layout of house n° 03 from Tifelfel region.

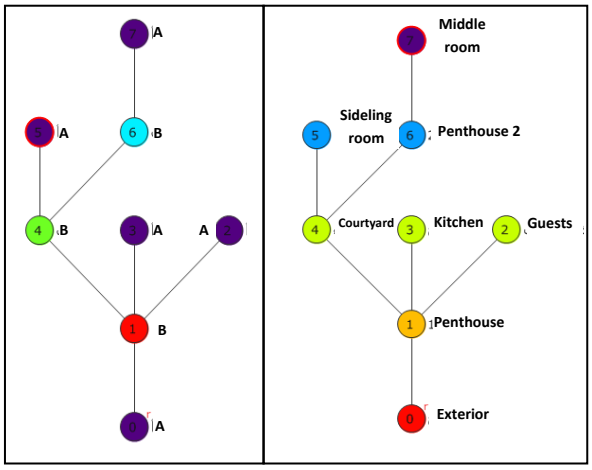

Fig. 6. Right: Justified Graph of house n° 03 from Tifelfel region
Left: Topologic types of house n° 03 from Tifelfel region.

Number of the node	Space	Total Depth TDn	Mean Depth MDn	Relative Asymmetry RA	Integration i	Control value CV
0	Exterior	17	2,42	0,47	2,10	0,25
1	Penthouse	11	1,57	0,19	5,25	3,33
2	Guests room	17	2,42	0,47	2,10	0,25
3	Kitchen	17	2,42	0,47	2,10	0,25
4	Courtyard	11	1,57	0,19	5,25	1,75
5	Sibling room	17	2,42	0,47	2,10	0,33
6	Penthouse 2	15	2,14	0,38	2,62	1,33
7	Middle room	21	3,00	0,66	1,50	0,50
Min		11,00	1,57	0,19	1,50	0,25
Mean		**15,75**	**2,25**	**0,41**	**2,87**	**1,00**
Max		21,00	3,00	0,66	5,25	3,33

Fig. 7. Analytical syntactic results of the house n° 03 from Tifelfel region (With exterior).

- Difference factor (with exterior) H = 0,66
- Relative difference factor (with exterior) H* = -0,07
- Order of integration of functions (with exterior): Middle room= 1,50 < Exterior= Guests room= Kitchen= Sidling room= 2,10 < Penthouse2= 2,62 < Courtyard= Penthouse= 5,25

Number of the node	Space	Total Depth TDn	Mean Depth MDn	Relative Asymmetry RA	Integration i	Control value CV
0	Penthouse	10	1,66	0,26	3,75	2,33
1	Guests room	15	2,50	0,60	1,66	0,33
2	Kitchen	15	2,50	0,60	1,66	0,33
3	Courtyard	9	1,50	0,20	5,00	1,83
4	Sibling room	14	2,33	0,53	1,87	0,33
5	Penthouse 2	12	2,00	0,40	2,50	1,33
6	Middle room	17	2,83	0,73	1,36	0,50
Min		9,00	1,50	0,20	1,36	0,33
Mean		**13,14**	**2,19**	**0,47**	**2,54**	**1,00**
Max		17,00	2,83	0,73	5,00	2,33

Fig. 8. Analytical syntactic results of the house n° 03 from Tifelfel region (Without exterior).

- Difference factor (without exterior) H = 0,69
- Relative difference factor (without exterior) H* = 0,00
- Order of integration of functions (without exterior): Middle room= 1,36 < Guests room= Kitchen= 1,66 < Sidling room = 1,87 < Sakifa2= 2,50 < Penthouse= 3,75 < Courtyard= 5,00

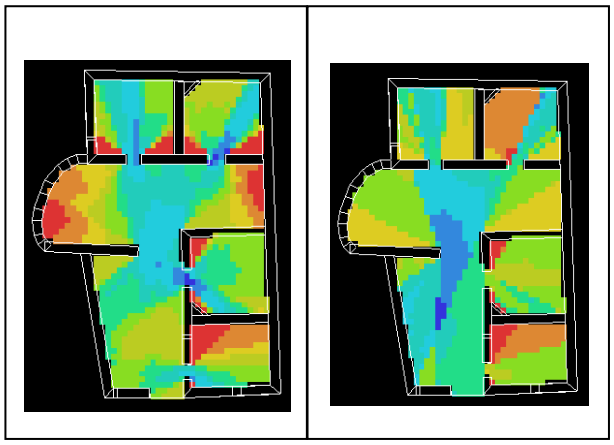

Fig. 9. Right: Point Depth Entropy graph of house n° 03 from Tifelfel region
Left: Clustering Coefficient graph of house n° 03 from Tifelfel region.

According to the figure number 6 (at the right), we observe that there are five levels starting from the exterior, where we can move from the first spatial group (its link is the Penthouse: as a covered transit space after the exterior door to the central space) to the second spatial group (its link is the central space which is the courtyard), and we mention here that the courtyard is the link space as the Penthouse is, and the Penthouse 2 as well as. The justified graph of this sample develop toward the interior with a tree-like form nigh deep, starting from the first spatial group (Penthouse, Guests room, and Kitchen) to the second spatial group (Courtyard, Sidling room, Penthouse 2, and Middle room). According to the figure number 6 (at the left), we find that there are only two topologic types, which are the topologic type of A space with a percentage of 62,50%, and the topologic type of B space with a percentage of 37,50%, this means that the movement within the spatial structure of this sample is limitative and restrictive. In addition to that we can say that the spatial structure of this sample is characterized by the isolation (segregation) with the absence of the distrubitvity principle according to its infinit value, and the spatial structure of this sample is characterized by the moderaty according to the assymmetry factor value which equals 1,67.

According to the figures number 7, and 8, the small difference between the maximal value of the mean depth (which equals 3,00 when we consider the exterior, and it equals 3,83 when wedo not consider the exterior) and its minimal value (which equals 1,57 when we consider the exterior, and it equals 1,50 when wedo not consider the exterior) for the courtyard indicates that ther are only few steps for arriving to the last space which is the middle room. We can confirme that by the mean value of the relative asymmetry which equals 0,41 when we consider the exterior, and it equals 0,47 when we do not consider the exterior, this means that the spatial structure of this sample is less deep and that its spatial system is nigh shallow. We mention that the more integrated space in the spatial structure of this sample is the courtyard, regarding to its relative asymmetry value which is close to 0. And according to the hole of integration values of all space, there are more 1, which means that the order of integration of functions is characterized by the isolation (segregation). We find in other hand that there are spaces characetrized by strong control factor (with values mor than 1), these spaces are: Penthouse (CVwith exterior= 3,33, CVwithout exterior= 2,33), Courtyard (CVwith exterior=1,75, CVwithout exterior= 1,83), Penthouse 2 (CVwith exterior=1,33, CVwithout exterior= 1,33). In general, the spatial system of this sample is not homogeneous, regarding to the relative difference factor which equals 0,07 with exterior, and equals 0,00 without exterior. The architectural program of this sample is based on the relationship resident / resident, regarding to the small difference between different factors values when we consider the exterior and

their values when we do not consider the exterior.

Using the chromatic spectrum for low values from blue, violet, green, yellow to high values from orange, red and purple (the low values mean that the movement within the spatial system is easy, and the inverse for high values) .So according to the figure number 9 (at the right), we find the point depth entropy graph which shows that Sakifa and courtyard hold a chromatic spectrum blue characterized by low values, which means that the movement through different spaces is easy (If we speak about the accessibility criterion), so the visual relations are organised around the Penthouse, and specialy around the Courtyard with multidirectional fields of view.

According to the figure number 9 (at the left), the clustering coeffecient shows that the courtyard is the space which holds the sociologic characteristics regarding to its low values contrary with the rest of spaces which hold high values (unless Penthouse).

7. Results of houses analysis

7.1. At the level of domestic spaces

The nigh deep tree-like justified graph (semi-deep) and the exterior annular justified graph predominate on the spatial structure of residential samples south of Oued El-Abiah, and they show few levels for moving within them (average of 4.20 levels of transition), where the courtyard dominates on the rest of spaces, because from it as a root, the justified graph develops in different spatial structures of the various samples selected from different regions. If we took out the outside and we consider only the inner home, we find that the tree-like justified graph is the most justified graph used (whether it is semi-deep tree-like, or simple tree-like), and we mention here that the system is not deep and it is not shallow as well, but it is semi-deep or less deep (this is confirmed by the most number of justified graphs of different houses, whether with ground floor or more).

The topologic type of "A" space exists 100% in total residential samples selected with the presence of the percentage rate per sample which equals 56.16%, and the topologic type of "B" space exists with a percentage of 88% in total residential samples selected with the presence of the percentage rate per sample which equals 22.41%, and the topologic type of "C" space exists with a percentage of 48% in total residential samples selected with the presence of the percentage rate per sample which equals 34.39%, he topologic type of "D" space exists with a percentage of 16% in total residential samples selected with the presence of the percentage rate per sample which equals 22.61%. From the above it can be said that the dominating topologic types on the spatial residential samples are of the type "A" and "B", which indicates the restricted choices of movement, since the internal space user returns back to the courtyard (or the patio) for passing to the rest of the spaces, because the courtyard (or the patio) is the sociologic central space which the user must use for movement, and only in a few cases, that we find that the inner space user can go through a space to another space (but after using the courtyard).

Oued El-Abiadh samples are generally predominated by the non-distributive character within their internal spatial structure accounting its percentage which equals 56% (the ratio of 92.86% of the housing in which the non-distributive character of samples equals the infinite value), and 36% is the ratio where the non-distributive character is moderated (so as not the non-distributive character exceeds the value 2), and the distributive character represents only 08% of the total of the residential samples (as its values do not exceed 0.50, it means that they approach to the moderation). South Oued El-Abiadh samples are also characterized by moderation regarding to the factor of symmetry, representing the rate of 72% (values range between 1 and 3), and 20% is the percentage of residential samples which are characterized by symmetry character (values range between 3.50 and infinity), and the asymmetry character represents only a percentage of 08% for the total residential samples (with the first value which equals 0.80, and the second one which equals 0.22).

From the above it can be said that the selected residential samples south Oued El-Abiadh are formed basing on a social logic, and which prevails in different areas along its length, this is according to the above factors, and it has a role in determining the outcome of various factors coming.

In the figure number 10 a comparison between the mean of total depth values, the mean depth values, and the relative asymmetry values of the different samples with and without exterior:

Tifelfel region

Sample number	Total Depth (mean)		Mean Depth (mean)		Relative asymmetry (mean)	
	With exterior	With-out exterior	With exterior	With-out exterior	With exterior	With-out exterior
03	15,75	13,14	2,25	2,19	0,41	0,47
04	15,50	13,14	2,21	2,19	0,40	0,47
09	19,11	33,00	2,38	4,71	0,39	1,23
15	13,25	11,42	1,89	1,90	0,29	0,36
19	17,33	15,50	2,16	2,21	0,33	0,40
Average	16,19	17,24	2,18	2,64	0,36	0,59

Ghoufi region

Sample number	Total Depth (mean)		Mean Depth (mean)		Relative asymmetry (mean)	
	With exterior	With-out exterior	With exterior	With-out exterior	With exterior	With-out exterior
02	13,50	19,14	1,92	3,19	0,30	0,87
04	14,75	13,14	2,10	2,19	0,36	0,47
08	20,88	17,75	2,61	2,53	0,46	0,51
13	12,25	10,28	1,75	1,71	0,25	0,28
20	40,28	78,30	3,09	6,52	0,34	1,00
/	20,33	27,72	2,29	3,23	0,34	0,63

Kaf Laarous region

Sample number	Total Depth (mean)		Mean Depth (mean)		Relative asymmetry (mean)	
	With exterior	With-out exterior	With exterior	With-out exterior	With exterior	With-out exterior
04	11,42	15,33	1,90	3,06	0,36	1,03
08	14,66	13,00	1,83	1,85	0,23	0,28
13	18,60	27,55	2,06	3,44	0,26	0,69
14	27,84	25,83	2,32	2,34	0,24	0,26
20	17,75	27,14	2,53	4,52	0,51	1,40
/	18,05	21,77	2,19	2,86	0,32	0,73

Banyanne region

Sample number	Total Depth (mean)		Mean Depth (mean)		Relative asymmetry (mean)	
	With exterior	With-out exterior	With exterior	With-out exterior	With exterior	With-out exterior
02	16,44	24,00	2,05	3,42	0,30	0,80
11	22,00	29,11	2,44	3,63	0,36	0,75
13	13,00	19,14	1,85	3,19	0,28	0,87
14	25,63	22,40	2,56	2,48	0,34	0,37
19	8,33	6,40	1,66	1,60	0,33	0,40
Average	17,08	20,21	2,11	3,53	0,32	0,64

M'Chouneche region

Sample number	Total Depth (mean)		Mean Depth (mean)		Relative asymmetry (mean)	
	With exterior	With-out exterior	With exterior	With-out exterior	With exterior	With-out exterior
01	32,42	30,61	2,49	2,55	0,24	0,28
05	39,20	87,42	2,80	6,72	0,27	0,95
13	13,50	19,14	1,92	3,19	0,30	0,87
15	19,63	30,80	1,96	3,42	0,21	0,60
20	17,63	16,00	1,76	1,77	0,16	0,19
/	24,48	36,79	2,19	3,53	0,24	0,58

Fig. 10. Right: The Syntactic results of the mean of total depth values, the mean depth values, and the relative asymmetry values (with and without the exterior).

In the figure number 11 a comparison between the mean of integration values, the control values, and the difference factor values of the different samples with and without exterior:

Tifelfel region						
Sample number	Integration (mean)		Control (mean)		Difference factor (mean)	
	With exterior	With-out exterior	With exterior	With-out exterior	With exterior	With-out exterior
03	2,87	2,54	1,00	1,00	0,66	0,69
04	3,03	2,54	1,00	1,00	0,63	0,69
09	2,92	0,97	1,00	0,75	0,61	0,69
15	5,38	4,34	1,00	1,00	0,60	0,64
19	3,67	3,03	1,00	1,00	0,59	0,63
Average	3,57	2,68	1,00	0,95	0,62	0,67

Ghoufi region						
Sample number	Integration (mean)		Control (mean)		Difference factor (mean)	
	With exterior	With-out exterior	With exterior	With-out exterior	With exterior	With-out exterior
02	5,26	1,48	1,00	0,85	0,59	0,71
04	3,36	2,54	1,00	1,00	0,65	0,69
08	2,44	2,22	1,00	1,00	0,63	0,67
13	3,06	2,57	1,00	1,00	Can not be calcula-ted	Can not be calcula-ted
20	3,18	1,15	1,00	1,00	0,49	0,56
/	3,46	1,99	1,00	0,97	0,59	0,66

Kaf Laarous region						
Sample number	Integration (mean)		Control (mean)		Difference factor (mean)	
	With exterior	With-out exterior	With exterior	With-out exterior	With exterior	With-out exterior
04	4,34	1,23	1,00	0,83	0,64	0,75
08	6,76	5,56	1,00	1,00	0,56	0,60
13	5,07	1,88	1,00	0,88	0,55	0,66
14	5,13	4,55	1,00	1,00	0,48	0,50
20	2,22	0,83	1,00	0,71	0,67	0,72
/	4,70	2,81	1,00	0,88	0,58	0,65

Banyanne region						
Sample number	Integration (mean)		Control (mean)		Difference factor (mean)	
	With exterior	With-out exterior	With exterior	With-out exterior	With exterior	With-out exterior
02	4,46	1,59	1,00	0,87	0,58	0,69
11	3,27	1,69	1,00	0,88	0,58	0,66
13	5,56	1,48	1,00	0,85	0,60	0,71
14	3,34	3,17	1,00	1,00	0,56	0,59
19	2,08	1,60	1,00	1,00	Can not be calcula-ted	Can not be calcula-ted
Average	3,74	1,91	1,00	0,92	0,58	0,66

M'Chouneche region						
Sample number	Integration (mean)		Control (mean)		Difference factor (mean)	
	With exterior	With-out exterior	With exterior	With-out exterior	With exterior	With-out exterior
01	4,50	4,04	1,00	1,00	0,51	-0,38
05	4,02	1,22	1,00	1,00	0,50	-0,36
13	5,26	1,48	1,00	0,85	0,59	0,06
15	8,11	2,24	1,00	0,90	0,50	-0,12
20	4,91	4,17	1,00	1,00	Can not be calcula-ted	Can not be calcula-ted
/	5,36	2,63	1,00	0,97	0,53	-0,20

Fig. 10. Right: The Syntactic results of the mean of integration values, the control values, and the difference factor values (with and without the exterior).

Basing on the figure number 10, we find that the mean values of Total Depth ranging between 16,19 and 24,48 value, dominated by the largest spatial group with rat of 56.00% (generally the middle room is the most repeated). We register two climaxes at the sample n°05 from M'Chouneche, and at the sample n°20 from Ghoufi (because of the multiplicity of spaces and the irregularities in their layouts forms: thirteen spaces in sample n°05 from M'Chouneche, and fourteen spaces the sample n°20 from Ghoufi). We register also three climaxes at the sample n°14 from Kaf Laarous, at the sample n°11 and the sample n°14 from Banyanne (because of the multiplicity of spaces and the irregularities in their layouts forms, and because spaces surround the central space). In addition to that we register two less climaxes at the sample n°08 from Ghoufi, (seven spaces but with irregularities in their layouts forms), and at the sample n°15 from M'Chouneche (Geometric spaces forms, but their number is equal ten). The above results are reached in the case of considering the exterior. And if we neglect the exterior we register two climaxes at the sample n°05 from M'Chouneche (157) and at the sample n°20 from Ghouf (133) for the same previous interpretations. We register also three medium climaxes at the sample n°15 from M'Chouneche (multiplicity of spaces), sample n°11 from Banyanne (the spaces surround the center), and at the sample n°13 from Kaf Laarous (irregularities in their layouts forms). Finally, we register

two less climax at the sample n°09 from Tifelfel (number of spaces), and at the sample n°02 from Ghoufi (the toilet is outside the spatial group).

According to the figure number 10, and we consider the exterior, we observe that the Mean Depth values ranging between 1,31 and 3,04, and this shows a lack of stages to move to a deeper space (the difference between the minimum Mean Depth value and the value of the maximum Mean Depth does not exceed 2,5 per each residential samples selected). Minimum Mean Depth values for the total samples selected is dominated by the Courtyard equal to (with a percentage of 62,96%), so moving to the rest of the private spaces that of "A" space does not require so many stages, the same thing with for Penthouse, the Patio, and even from the exterior. Also, we register three climaxes, buy with a small Mean Depth, the reason based on the multiplicity of spaces and entrances for the sample n°05 from M'Chouneche, and the of shape the tree-like semi-deep of the justified graph of the sample n°20 from Ghoufi, and the exterior annular justified graph of the sample n°14 from Kaf Laarous. When you cancel the outside, we find that there is more than one entrance (with a percentage of 80%), and the samples which have isolated spaces at the exterior whose registered the maximum Mean Depth values with a difference which did not exceeds the value 3 with a percentage of 48% of residential samples selected, so that confirms an isolation, a shortening of the path to different spaces, and a shortening of the distances within the spatial structure of residential samples in turning points that are few, (we say that although there are some cases which have multiple spaces within it, such as the sample on°09 from Tifelfel).

It is noted that basing on the figure number 10, when considering the exterior that the Relative Asymmetry factor values range between zero and 0,76, with an average ranges between 0,24 and 0,36, which shows that the spatial structures of different samples are nigh superficial and less deep despite there is a percentage of 28% of samples which shows that their unjustified graphs are not deep, but semi-deep, as confirmed by their calculated Relative Asymmetry factor values, (the samples n°03, n°04, and 09 from Tifelfel, the samples n°08 and n°20 From Ghoufi, the sample n°20 from Kaf Laarous, and the sample n°11 from Banyanne).

We point out that the Courtyard is the most integrated in the residential samples as its values near from zero (62,96%), followed by the Penthouse (14,81%), and the Patio (11,11%). When we cancel out the exterior, we notes that there are only four samples which their mean Relative Asymmetry exceed 1 (the sample n°09 from Tifelfel, the sample n°20 from Ghoufi, and the samples n°04 and n°20 from Kaf Laarous). From the above we conclude that the social logic of the population in south of Oued El-Abiadh does not take into

account the principle of depth when they construct their houses.

According to the figure number 11, we note that the mean values of Integration exceed 1, which indicates that all spatial systems of different samples are characterized by the isolation. We note that the outside dominates over the rest of spaces regarding to its mean values if Integration in the first order, and the Courtyard is the space which dominates over the rest of spaces regarding to its maximum values of Integration in the first order. The rest of spaces share the minimum values of Integration. We note that the minimum mean value of the Integration equals 2,08 in the sample n°19 from Banyanne, and the maximum mean value for the values of the Integration equals 8,11 in the sample n°15 from M'Chouneche, and this confirms what we have said in the past that the spatial system of each residential samples selected is characterized by isolation in general, this as we consider the exterior. And when the exterior is not considered, we find that the percentage of mean values of Integration which are more than 1 equals 92% (its values range between 1,15 and 5,56), while the percentage of mean values of Integration which are less than 1 equals to 8% (with two values: 0,83 for the sample n°20 from Kaf Laarous, and 0,97 for the sample number 09 from Tifelfel), so, we observe that despite the abolition of the outside, but the values of Integration exceed 1, which means that the spatial system is characterized by isolation.

According to the figure number 11, we find out that the mean control values which equal to 1 constitute a percentage of 100%, and we point out that the maximum control values which are more than 1 ranging between 2,50 and 8,50 with an average equal 4,53, so, that means that there are spaces which dominate impose strongly their control, we note here that the space which is characterized by an advantage of the Control feature if we compare it to other spaces is the Courtyard (in the most of the samples of south Oued El-Abiadh) with values ranging from 1,03 (the sample n°05 from M'Chouneche) to 8,50 (the sample n° 15 from M'Chouneche), followed by the Penthouse with values ranging from 1,20 (the sample n°14 from Banyanne), to 3,33 (the sample n° 03 from Tifelfel), and the Patio with values ranging from 2,24 (the sample n° 04 from Tifelfel) to 5,75 (the sample n°01 from M'Chouneche).

When we cancel the outside, we find that the mean Control values which are less than 1 equal 40% (where the minimum value equal 0,71), while the percentage of the mean Integration values equal 1 is 60%, so, despite the abolition of the outside, but the values of the spaces characterized by strong Control feature impose their presence, and we note that the Courtyard imposes its dominance when we speak about

the Control factor topping the first place in terms of number and presence in all regions of south Oued El-Abiadh, followed by the Patio instead of the Penthouse, as the central space is not covered (the Courtyard and the patio), So the central space is the heart of social life in Chaoui housing and not the Penthouse, as it gather many functions and roles during the day and even during the night period (the criteria of the control is present strongly despite the cancellation of the exterior).

Since the difference factor is designed in order to determine the rate of the difference, it means the distinction between Integration values of three spaces or functions or more for, and as the Relative Difference factor is intended to indicate whether the system is homogeneous or not, so the Difference values (which can be calculated) of twenty-two from twenty-two samples are more than zero. So that there are two samples values of their Differences factor less than 0.50 (samples n°20 from, and sample n° 14 from Kaf Laarous), and the is one sample with a Different factor equals 0.50 (the sample n°15 from M'Chouneche), and the rest of the Differences factor values are all more than 0.50 (values close to the value 1, which they indicate the relative homogeneity, and the relative difference between their spaces). From the figure number 11, considering the exterior, the Relative Difference factor values (which can be calculated) of two-twenty from twenty-two samples are all less than zero, it means that the system is not homogeneous, but that does not mean that the spatial structures of the selected samples can their spatial segregation and differentiation easily . We point out that the difference factor values that exceeded the just threshold 0,5, their highest value is recorded by the sample n°20 from Kaf Laarous which equals 0,67, as for the Relative Difference factor values are lower than zero ranging from 0,04 (the sample n°20 from Kaf Laarous) to 0,51 (the sample n°14 from Kaf Laarous), this is due especially to a lack of spaces and levels of the transition from one hand, and restrict movement between spaces on the other hand (for the lack of the Topologic types plurality, and if might vary, we find that the topologic types of space A and B dominate on topologic type of space C and D in terms of number).

As can be seen from the figure number 11, when we abolish the exterior, the values of the Difference factor increased from the threshold value of 0,50, as the Difference factor values (which can be calculated) of twenty-two samples from twenty-two samples are all more than the threshold value of 0,50, ranging from 0,53 to 0,75, and the general average equals 0,65, as we register one sample which its Difference factor equals 0,50 (the sample n°14 from Kaf Laarous). From the above, the cancellation of the exterior led relatively to a little difference between the spaces of the samples (Difference factor values close to 1). We record also the existence of five

samples which their Relative Different factor equals zero (the samples n°03, n°04, and n°09 from Tifelfel, the sample n°04 from Ghoufi, and the sample n°02 from Banyanne), and we record the existence of twelve samples which their Relative Different factor is less than zero, in addition to the existence of five samples which their Relative Different factor equals more than zero (the sample n°02 from Ghoufi, the samples n°04 and n°20 from Kaf Laarous, the sample n°13 from Banyanne, and the sample n°13 from M'Chouneche), that indicates a lack of homogeneity on their spatial built. Because the values of Difference factor are close to 1, the values of the Relative Difference which was below zero became close to or equal to or greater than zero, and this demonstrates the role of the exterior in creating differences between spaces (despite the small difference). We point out that the samples that their Different factor values can not be calculated and the samples that their Relative Different factor values can not be calculated (mathematical equation of these factors has a calculations result undefined), this due to the attraction of the rest of spaces to the most integrated space which is the Courtyard, this space is characterized by the central domination (both selected residential samples: n°13 from Tifelfell, n°19 from Banyan, and n°20 from M'Chouneche).

7.2. At the level of human establishment

From the figure n° 12 blogger below, we compare between the values of the Point Depth Entropy of the different selected samples:

Tifelfel region				Ghoufi region				Kaf Laarous region			
Sample number	Minimum Point Depth Entropy	Mean Point Depth Entropy	Maximum Point Depth Entropy	Sample number	Minimum Point Depth Entropy	Mean Point Depth Entropy	Maximum Point Depth Entropy	Sample number	Minimum Point Depth Entropy	Mean Point Depth Entropy	Maximum Point Depth Entropy
03	0,929176	1,39577	1,80541	02	0	1,3939	1,75055	04	0	1,2786	1,73976
04	0,881103	1,56392	1,97333	04	0,885187	1,259625	1,660965	08	0,946422	1,4082	1,76282
09	0	1,27516	1,92385	08	0,999652	1,4361	1,938365	13	0	1,38411	1,87932
15	0,992684	1,32446	1,86879	13	0,839389	1,36849	1,75853	14	0,585935	1,120447	1,69452
19	1,03474	1,60588	1,95228	20	0,642989	1,0844	1,57346	20	0	0,539607	1,235157
Average	0,767541	1,433038	1,904732	/	0,673443	1,308503	1,736374	/	0,306471	1,146193	1,662315

Banyanne region				M'Chouneche region			
Sample number	Minimum Point Depth Entropy	Mean Point Depth Entropy	Maximum Point Depth Entropy	Sample number	Minimum Point Depth Entropy	Mean Point Depth Entropy	Maximum Point Depth Entropy
02	0	1,23215	1,43421	01	1,070794	1,47806	1,895916
11	0	1,4985	1,99512	05	0,846731	1,469195	1,94346
13	0	1,18465	1,80156	13	0,470645	0,635811	1,021380
14	1,071701	1,5289	2,04127	15	0,385083	1,381105	1,858635
19	0,859241	1,22459	1,7075	20	0,623256	0,766205	1,36461
Average	0,386188	1,333758	1,795932	/	0,679302	1,146075	1,616800

Fig. 12. Calculated results of the Point Depth Entropy of different samples.

As the Point Depth Entropy (PDF) leads to the knowledge of the existence or the absence of the vision permeability within the system from a particular point, it is the average of the shortest path distance or path

from a node to another within the spatial system, thus it shows the number of turns rate or twists for each distance traveled by the domain user within the system. Consequently, basing on the figure number 12, we find that the samples which their minimum values of the Point Depth Entropy exceed zero represent the percentage of 68%, while the samples which their minimum values of the Point Depth Entropy equal zero represent the percentage of 32%, and we note that all samples their mean values of the Point Depth Entropy are more than 1, except the sample n°20 from Kaf Laarous, and the samples n°13 and n°20 from M'Chouneche, and we find that the samples which have low values of the represent a percentage of 12%, so, the layouts of these three samples allow internal spatial users to move without any difficulty, it means moving easily within the framework of the vision field.

However, what is visible from the figure number 12 is that the samples that have high values of the Point Depth Entropy represent the largest with a percentage of 88% (all samples except the sample n°20 from Kaf Laarous, and the samples n°13 and n°20 from M'Chouneche), this brings us to say that the layouts of the most selected residential samples south Oued El-Abiadh do not allow the internal spatial user to move easily, as there is a defect in terms of connectivity or permeability and visibility, because among the features of these samples the irregular forms of their layouts or plans with lots of intersections, points of divergence and twists, which lead to the gathering of most of spaces, and which lead to the movement difficulties between the inner spaces of these residential samples, as well as the collision of various visual arrows by physical barriers of different walls.

From the figure n° 13 blogger below, we compare between the values of the Clustering coefficient of the different selected samples:

Tifelfel region				Ghoufi region				Kaf Laarous region			
Sample number	Minimum Clustering coefficient	Mean Clustering coefficient	Maximum Clustering coefficient	Sample number	Minimum Clustering coefficient	Mean Clustering coefficient	Maximum Clustering coefficient	Sample number	Minimum Clustering coefficient	Mean Clustering coefficient	Maximum Clustering coefficient
03	0,470381	0,760778	1	02	0,507359	0,775399	1	04	0,48313	0,762106	1
04	0,450847	0,804113	1	04	0,523686	0,7603815	1	08	0,48258	0,748958	1
09	0,464011	0,78661	1	08	0,536082	0,846891	1	13	0,38726	0,798189	1
15	0,529848	0,798081	1	13	0,425479	0,752649	1	14	0,46961	0,853595	1
19	0,381609	0,765515	1	20	0,45679	0,791594	1	20	0,73254	0,922962	1
Average	0,459339	0,783019	1	/	0,489881	0,785383	1	/	0,51102	0,817162	1

Banyanne region				M'Chouneche region			
Sample number	Minimum Clustering coefficient	Mean Clustering coefficient	Maximum Clustering coefficient	Sample number	Minimum Clustering coefficient	Mean Clustering coefficient	Maximum Clustering coefficient
02	0,490804	0,844257	1	01	0,501056	0,82511	0,998583
11	0,412443	0,834991	1	05	0,495466	0,827549	1
13	0,497957	0,827706	1	13	0,768263	0,901268	0,999935
14	0,472709	0,788138	1	15	0,52178	0,846287	1
19	0,455907	0,853001	1	20	0,395352	0,934395	1
Average	0,465964	0,829619	1	/	0,536383	0,866922	1

Fig. 13. Calculated results of the Clustering coefficient of different samples.

As the Clustering Coefficient (CC) gives a measure for the rate of the spaces intra-visibility within the vicinity of a specific visual point. The Clustering Coefficient is defined on the basis that is the rate of nodes which are actually correlated within the vicinity of a local node in relation with the number which can be linked. So, regarding to the figure number 13, we observe that he minimum mean value of the Clustering Coefficient is recorded in the sample n°08 from Kaf Laarous, as it equals 0,748958. The most private space is specially the Sideling Room, or the Storage Room (we find that their Clustering Coefficient values are high). While the Courtyard, The Patio, and the Penthouse are spaces which allow for multi-directional fields vision (Therefore, we find that their Clustering Coefficient values are low).

We observe basing on the figure number 13 that the percentage of the selected residential samples that have Clustering Coefficient low values equals 88% (values ranging from 0,748958 to 0,853595), where the sample n°08 which has the lowest value within the low values of the Clustering Coefficient is characterized by large vision fields when moving inside it regarding to its value which equals 0, 748958. While the sample n° 14 from Kaf Laarous which has the highest value within the low values of the Clustering Coefficient is tend to minimize the vision fields inside it regarding to its value which equals 0,853595. The sample n°20 from Kaf Laarous and the samples n°13 and n°20 from M'Chouneche have mean values of the Clustering Coefficient (ranging from 0,901268 to 0,934395), which are samples moving more than the sample n°14 from Kaf Laarous to minimize the vision fields inside them. The local measurement "Clustering Coefficient" allowed to gathering the private spaces of the topologic type "A" and social spaces of the topologic type "B", "C", and "D".

In general, it can be said that basing on the Point Depth Entropy values and the Clustering coefficient values of the residential samples selected that spatial system of the houses is uniform in the south of Oued El-Abiadh.

8. Conclusion:

The study resulted that south Oued El-Abiadh area the traditional homes shared the geographically positioning on the banks of this valley, as most of them are characterized by an urban positioning which is not compact, with a choice of location which guarantees the protection from the wind and ensures insolation (full insolation or partial, specially from the south). The relationship between housing and mountains is strong, as the mountains are the carrier and the garrison of different houses, and the gardens separate between the valley and the

housing basing on a warned and reserved relationship. The houses are interconnected if the kinship exists (most often close to each other, and sometimes a few individual regarding to the irrelevant social relationship), based on direct link with organic exterior paths. Because the settlements are sporadic, and because the exterior patches are breadth, so the urban composition do not carry the orientation toward the center, whether this center is Masdjid, Store Castle, Shops or Piazza, but the the different patches of houses are positioned parallel to the topographic lines, heights and slopes which are characterized by a medium heel. The patches of houses mostly are organic with a total area ranging between 100 m^2 and 260 m^2, (horizontal pre-entering). The traditional houses south Oued El-Abiadh share in the fact that the predominant building materials are the natural stones (In southern of south Oued El-Abiadh, we find some houses are built with the mud), in addition to that, in the entire south of the this valley the inhabitances use the trunks of trees and palm. The architectural facades of the traditional houses south Oued El-Abiadh are dominated by the filled surfaces (rarely when we find very small windows), their plots are base on the stones with approximately an equal heights (based on trunks of trees and palm dimensions). The forms of different layouts of the traditional houses south Oued El-Abiadh mostly are organic, with a built areas which dominates on the non-built areas (this later do not exceed the percentage of 40%). Most of the entrances of traditional houses south Oued El-Abiadh is characterized by being rectangular with two doors panels (and we can find an additional door with one panel specific for Guests Room). We note that the average number of spaces in the traditional houses south Oued El-Abiadh is seven with varying sizes.

After the analysis of the traditional residential samples south Oued El-Abiadh basing on the synthetic approach, we found that the average number of levels to moving within the houses is four. The traditional houses south Oued El-Abiadh are not characterized by the total depth nor the total shallowness, but regarding to their justified graphs, they are generally nigh deep or semi-deep (mostly with semi-deep justified graph, and less for external annular justified graph). It is also predominated by the topologic type of space "A", followed by the topological type of space "B", which indicate that traditional houses south Oued El-Abiadh share the feature of the restricted movement and the return to the center which often is the Courtyard, and they are characterized by the non-distribution, and the isolation, with a moderated symmetry factor. The Total Depth values of Oued El-Abiadh indicate the simplicity of the link between spaces due to the limited number of spaces, and due to the indirect movement between spaces across the Courtyard or the Patio (and the difference in this regard is simple whether the exterior is considered or not considered). the traditional residential samples south Oued El-Abiadh lack of stages for moving between space to another

space, especially to arriving to the last spaces which are the Middle Room,The Guest Room, the Toilet, the Storage Room or the Kitchen, as the average of the maximum Mean Depth is approaching to the Value 3 (whether considering the exterior or not considering the exterior).

The average Relative Asymmetry factor which is close to zero with values which do not exceed 0,50 (an additional confirmation the relative shallowness of the spatial structure of the traditional residence houses south Oued El-Abiadh), but when we cancel the outside the average mean of the Relative Asymmetry factor exceeded 0,50, which means that the spatial structure of a traditional dwellings south Oued El-Abiadh is not fully characterized by the shallowness (we point out that the most integrated space is the Courtyard).

The traditional houses south Oued El-Abiadh are segregated (differentiation feature) regarding to the Integration values in this region which exceed 1 (whether considering the exterior or not), with the predomination of the Courtyard on the rest of the spaces regarding to the houses integration order of functions. According to the Control factor, the Courtyard and the Patio are spaces which are characterized by the strong control compared to other spaces. Relatively, the spaces of the traditional houses south Oued El-Abiadh are characterized by the indifference due to the values of the Difference factor which exceed 0,50 and which approach towards the value of 1, so we can say that there are no significant differences between their spaces, and they are characterized by the heterogeneity character due to their values of their Relative Difference factor which are less than 0.

After the analysis of the traditional residential samples south Oued El-Abiadh basing on visual approach, we found that their spatial structures do not allow the internal space user to move easily, which leads to a defect in terms of connectivity or permeability and visibility (among the features of these samples the irregular forms of their layouts with a lot of intersections points, twists points, and turn points, which leads to gathering the most of spaces, leading to movement difficulty between the inner spaces of the residential samples, we say that regarding to the high values of the Point Depth Entropy in all traditional residential samples south Oued El-Abiadh, these later are also characterized by the large vision when moving inside them fields, due to the low values of Clustering Factor in most of the traditional houses of south Oued El-Abiadh, and this parameter allowed to gathering the private spaces of type "A" and social spaces of type "B", "C" and "D". (as we said previously the traditional houses of south Oued El-Abiadh share a unified spatial pattern).

In talking about the Phenotype/Genotype relationship, we say that the private spaces and the service spaces are more located in the third level, while the space of reception is especially located in the

third level or in the second level, and especially in the second level where the familial spaces are located followed by the tampon space (the private spaces are linked by the familial spaces with a percentage which equals of 100%), this in general. When detailing spaces, we find that the spaces of A topologic type are the Rooms, the Kitchen, the Guest Room, the Toilet and the Stable, while the spaces of B topologic type are the Courtyard, the Penthouse, the Patio and to a lesser degree the Roof and the Hallway (Corridor), and the spaces of C topologic type are the Courtyard, the Guests Room and to a lesser extent the Middling Room and the Sideling Room, and finally, the spaces of D topologic type are very rare. We not in addition to that, the spaces which are located in the first level are the Courtyard and the Penthouse (and to a lesser the Guests Room and the Toilet), which means that the familial spaces and tampon spaces have the priority if we compare them to the rest of spaces, while the spaces that are located in the second level are the Rooms, the Guests Room and the kitchen, and to a lesser extent for the Patio, the Toilet, the Roof, and the Stable, we note also that the spaces which are located in the third are the Rooms, the Kitchen and to a lesser extent the Storage Room, the Toilet and the Deaconess, finally there are rare spaces which are located in the fourth level.

The order of the spaces from the most existed space to the least existed space is: the central room (the Middle room or the Room n°1) and the kitchen, then the central non-covered space (the Courtyard or the Patio), then the Guests Room, then the Sideling Room, then the Toilet, then the Penthouse, then the other Rooms and the Stable , then the Deaconess, the Storage Room, then the Hallway (the Corridor), then the Penthouse 2, then the Crossing, and then Chickens space and the Shop.

Acknowledgments

We would like to thank the anonymous reviewers for their constructive comments and suggestions.

References

[1] H. Fathy, Construire avec le peuple, Sindbad, Paris, France, 1970, p 16.

[2] R-J-F. De Lartigue, Monographie de L'Aures, Du 3° Zouaves, Constantine, Algérie, 1904.

[3] www.wikipedia.com.

[4] ص. زرايب، التهيئة القديمة والجديدة والفعالية الاجتماعية الاقتصادية في جبال الأوراس -حالة وادي الأبيض ووادي عبدي-، أطروحة دكتوراه، جامعة قسنطينة، الجزائر، 2011.

[5] www.maps.google.com.

[6] Q. Letesson, Du phénotype au génotype: analyse de la syntaxe spatiale en architecture minoene (MMIIIB-MRIB), UCL presse universitaire de louvain, 2009, p 5.

[7] B. Hillier, Space is the machine, Cambridge: Cambridge university, UK, 1996.

[8] B. Hillier, J. Hanson, H. Graham, Ideas are in things: An Application of the

Space Syntax Method to Discovering House Genotypes, Environment and

Planning B: Planning and Design,14, London, UK, 1987, pp 363-385.

[9] J. Hanson, Decoding homes and houses, Cambridge, Cambridge University
Press, UK, 1998.

[10] B. Hillier, J. Hanson, The Social Logic of Space, Cambridge University Press, Cambridge, UK, 1984.

[11] T. Bellal, Spatial analysis of domestic architecture in the M'zab: spatial configuration and power relationships, Doctorate thesis, Arch, Setif University, Algeria, 2003.

[12] T. Bellal, B. Frank, The visibility: An approach for the analysis of traditional domestic M'zabite spaces, Published paper in the proceedings of the 4th International Space Syntax Symposium, London, UK, 2003.

[13] J-O. Micheal, The Mathematics of Spatial Configuration: Revisiting, Revising and Critiquing Justified Plan Graph Theory , Nexus Network Journal – Vol. 13, No. 2, Kim Williams Books, Turin, 2011.