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SPATIAL SYNTAX: STUDY BETWEEN SPATIAL CONFIGURATION AND SOCIAL INTERACTION IN THE FACULTY OF ARCHITECTURE IN CONSTANTINE

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ABSTRACT

This article deals with the impact of the architectural spatial configuration on the social behavior of its occupants, through the analysis of some syntactic measures. In this regard, several definitions have been considered on this topic where they have defined the spatial configuration as the simultaneous relations that exist between the parts and that constitute the totality (Hillier & Vaughan, 2007). Any physical environment has a close relationship with the social one, without forgetting that space is a fundamental need of the human being and it has to respond to its needs in order to reach an optimal degree of spatial satisfaction. Among the educational spaces, the faculty buildings within the university, present a social environment that allows students to socialize, share interests, develop relationships within groups, and feelings of belonging. Social behaviors, social interactions, and student gathering areas in faculty buildings are important issues from the perspective of architectural programming and architectural design performance.

For this reason we took for this study the method of the spatial syntax that will help us to study this issue, A variety of theories have successfully indicated this method that will facilitate us to study the relationship between spatial configuration and pedestrian movement in various urban structures (Hillier et al., 1993; Hillier,Yang, & Turner, 2012; Sharmin & Kamruzzaman, 2018).

We took for this study the faculty of architecture at the University of Constantine in Algeria.

Using the tool "DEPTHMAP» software will allow us to draw the configurational characteristics of the corpus of our study area.

The confrontation of the results of the analysis of the spatial syntax showed a correlation between the spatial properties and the social movement within the faculty, it has a direct impact of the spatial configuration on the behavior of the students inside the faculty in the use of the spaces of circulations, exchanges and gathering, as well as, on the visibility and the movement the accessibility in the use of the spaces by its occupants.

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1. Introduction

Design thinking has been around since the 1960s, and has been developed and expanded worldwide in the last decade. Design in general and interior architectural design in particular, has undergone a rapid evolution. It is based on spatial design methods that respond to the various changes in spatial social appropriation and behavior during their lives (Brown, 2008; Wetzler, 2013; Howard, 2015; Ngoc& Fassi, 2018).

Design architects are the primary decision makers in the physical design of the built environment and they are the ones responsible for finding the best design patterns and appropriate spatial layout for each situation that promotes the right relationship between the physical framework of the space and the social that must appropriate it (Hillier, Musgov& O'Sullivan, 1972; Golshan, Motalebi & Behzadfar, 2021).

The primary question of this current research is: ***How does the spatial configuration of the built environment affect social interactions within the architecture faculty?***

The objective of this study is to show the impact of the architectural configuration of the Faculty of Architecture on the social behavior of university students and shed light on how they appropriate the space according to their daily needs.

2. Literature Review

2.1. The spatial configuration

Several researchers have considered the concept of spatial configuration they have addressed in a multitude of works in the literature among them, the work of Hillier in his work "space is a machine" defined "spatial configuration" as a set of relationships between spaces that exist in a particular situation at a given time. Also, it can be providing conditions to cope with constraints. It promotes visual and physical relationships, while individuals use environments to try to structure and control them (Hanson, Hillier, 1987; Golshan, Motalebi & Behzadfar, 2021).

Similarly, Hillier in 2007 pointed out that spatial configuration is a set of relationships between objects that have complex and internal relationships in the overall structure of the space, it is a way of formalizing ideas. It is the set of relationships between different spaces in a system (Hillier, 2007; Mokran, 2011).

2.2. Social interactions

According to sociological studies, human beings have multiple needs in their psychological, physiological and cultural life.

Indeed, Maslow approached in his theory the needs of the man in five principal classes to know: the physiological need such as: sleep, nourishment, drinking; The need for safety;

The need to belong (socialization); Self-esteem (Power, or recognition) and finally the need for self-realization (self-actualization) (Goubaa, 2018). (See Figure n° 01)

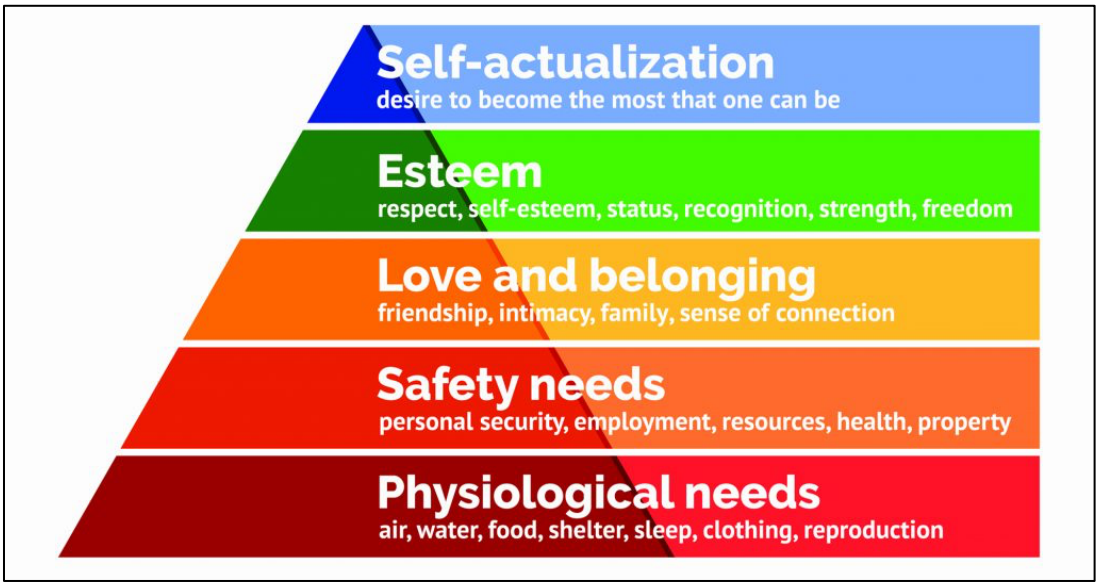


Figure 1: *Maslow's pyramid of needs*
Source : *https://www.futuremanageralliance.com/maslows-pyramid-of-needs/*

From Maslow's theory, social interactions are considered among the basic needs of human beings.

Rummel in 1976 defined these social interactions as the behavior, action and practices of two or more individuals. It is the result of the face-to-face relationships between human beings towards each other. Similarly, he emphasizes that this notion can be defined as a kind of physical relationship and behavior (Siramkaya, Aydin, 2018).

In addition, GoKçe in 2007 and Krueger in 2011, on their part have meant this social interaction as relationships between individuals with each other as well as with its built environment and forming a cultural, behavioral, and sensory means of communication.

To this end, it is essential to think about designing places that promote these social relationships with confidence, and good contact with individuals, not forgetting that these spaces must be characterized by proximity, intimacy, accessibility and functionality (Siramkaya, Aydin, 2018).

2.3. The relationship between spatial configuration and social interaction in the university environment

The relationship of the individual with space according to the psychology of space is conditioned by the cultural and social context in which he evolves, his history, and his wishes. Each individual is different from the others and it depends on his history; beliefs; his culture; reflexes; socioeconomic and professional; training, ..., etc.

The architectural configuration of space can be defined as the relationship between objects and plans that define a limit.

Indeed, for the main activity of the architect it is to create the hollow, to contain, it will give it a concrete form to provide a place to stay and the relative freedom of movement that man needs (Von Meiss, 1985 in Kellou Djitli & al, 2013).

Gokçe, 2007 and Wells, 2009 in their works they stated that there is a close relationship between spatial configuration (physical conditions of space) and social behaviors of individuals par excellence (Siramkaya, Aydin, 2017, 2018).

Several sociological studies have been focused on the topic of students' social relations within the university where they can develop social relations among themselves, weave friendships, and replace the relations of high school with the relations of the university par excellence in contrast to the previous relations which were cold, distant and not very socializing on the human level (Coulon, Paivandi,2008).

According to surveys conducted since the 1980s, the quality of relations between students varies from one university to another depending on the type of institution, the course of study, age and geographical region (Lahire, 1997).

From the results of sociological surveys with students, several forms of relationships between them are evoked, among which there are three types that are presented as follows: the first concerns cooperation within the framework of academic tasks, related to studies (cooperation, collective work); the second refers to extracurricular and socializing activities between students (participation in associative and collective activities); the third aspect is interested in the forms of sociability and friendship developed within the higher institutions (Lahire, 1997).

Galland in 1995 confirmed this result with their synthesis concerning the third form of relationships related to sociability and the development of friendship. The development of the latter is often considered an indicator of students' social integration (O. Galland, 1995).

3. Materials and Methods.

This study is based on a research method that will allow us to show the effect of the architectural spatial configuration on the social interactions between university students within the Faculty of Architecture at the University Salah Boubnider Constantine3.

We took for this study the method of "the spatial syntax" it is an approach of scientific research morphological analytical that appeared in the Anglo-Saxon current during the 80s in several scientific works such as: the work of B. Hillier's work "Space is the Machine" in 1984, J.Hanson in his book: "Decoding Home" in 1998. The book by B. Hillier and J. Hanson in 1984 " The Social Logic of Space", Lettesson in 2009, Hamouda, 2013; Benbouaziz, 2019, ..., etc.

The objective of this method is to show how the spatial configuration promotes social interactions between students and identify how the latter uses the internal space of the Faculty of Architecture.

Because this method explains the bipolar relationship between the built environment and the social through their culture and behavior (Boutaba, 2013).

We based in this study on the visibility of the architectural space of the faculty through the reading and visual field analysis of the set of architectural configurations inside the faculty and the way of appropriation of the space by the students according to their educational social needs. This is the basis of the "Depthmap" computer tool that allows us to establish VGAs (Visibility Graph Analyses). These VGAs involve studying all the Isovists of a spatial system (Mokran, 2011). Also, they will allow the calculation of several global and local measures such as the degree of integration, connectivity, depth, control and intelligibility of the space if it is homogeneous or not. In addition, they will allow studying the social aspect of the architectural space.

We took for this research the architectural design of the Faculty of Architecture at the University of Salah Boubnider Constantine3 with the different levels.

4. Case study

Our study area is located in the new city Ali Mendjeli of Constantine in the University pole Salah Bounider, Constantine 3, more exactly in the Faculty of Architecture and Urbanism.

The University Constantine 3 (UC3) was established by Executive Decree No. 11-402 of 03 Moharram 1433, corresponding to 28 November 2011. It began operating in early September 2013. The latter is registered under the five-year program (2005-2009) and spread over an area of 170 hectares divided into 30 plots (Abada,2021).

The UC3 is located on the extension UV 05, new city Ali Mendjeli 13 km from the capital of the wilaya.

It consists of several faculties and an institute and 3 higher education schools, the faculty of architecture and urban planning among its faculties. (See Figure n°2)

Figure 02: *Overall plan of the Salah Boubnider University Pole Constantine3*
Source: *Abada, 2021.*

4.1. Situation of the faculty of architecture and urbanism in the UC3

The faculty of architecture and urbanism is one of the faculties constituting the university pole of Constantine 3 Salah Boubnider. It is located at the main entrance of the university pole UC3.

It is surrounded by the Institute of Urban Technical Management, the Faculty of Pharmaceutical Process Engineering and the residence N° 4. composed of three departments: the department of Architecture, the department of Urbanism, and the department of Project Management. (See Figures 3 and 4)

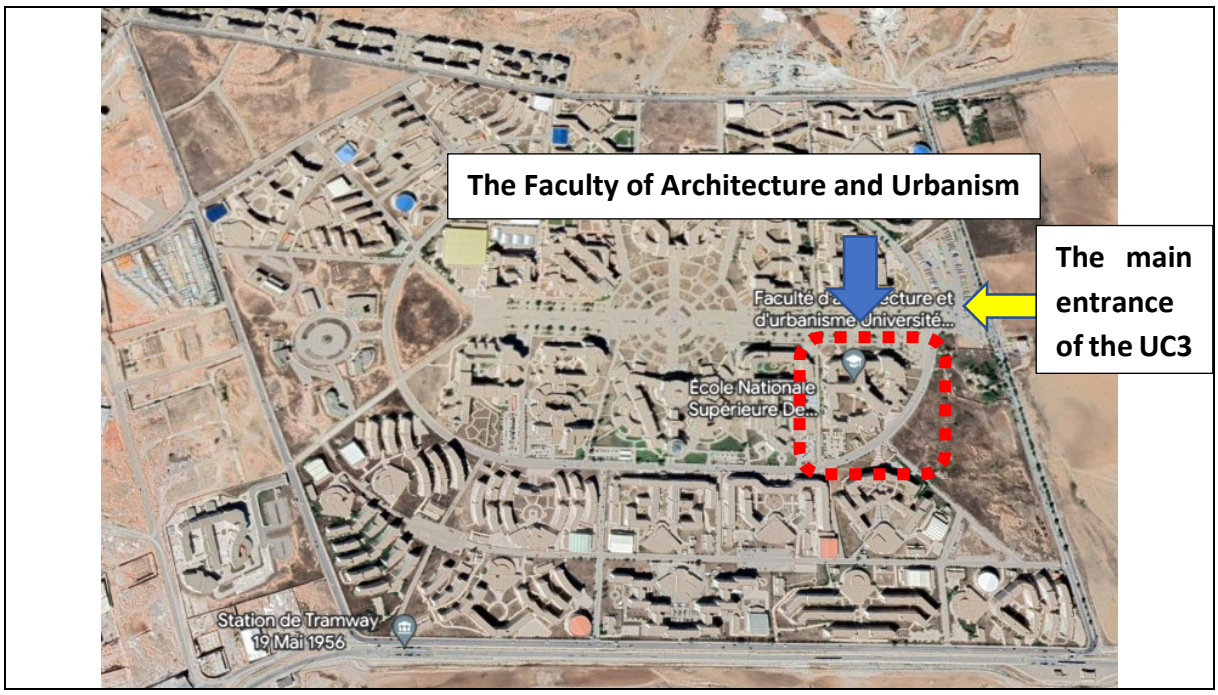


Figure n°03: *Satellite image showing the location of the Faculty of Architecture and Urban Planning in the UC3 in the new city Ali Mendjeli Extension UV5.*
Source: *Google Earth, 2023.*

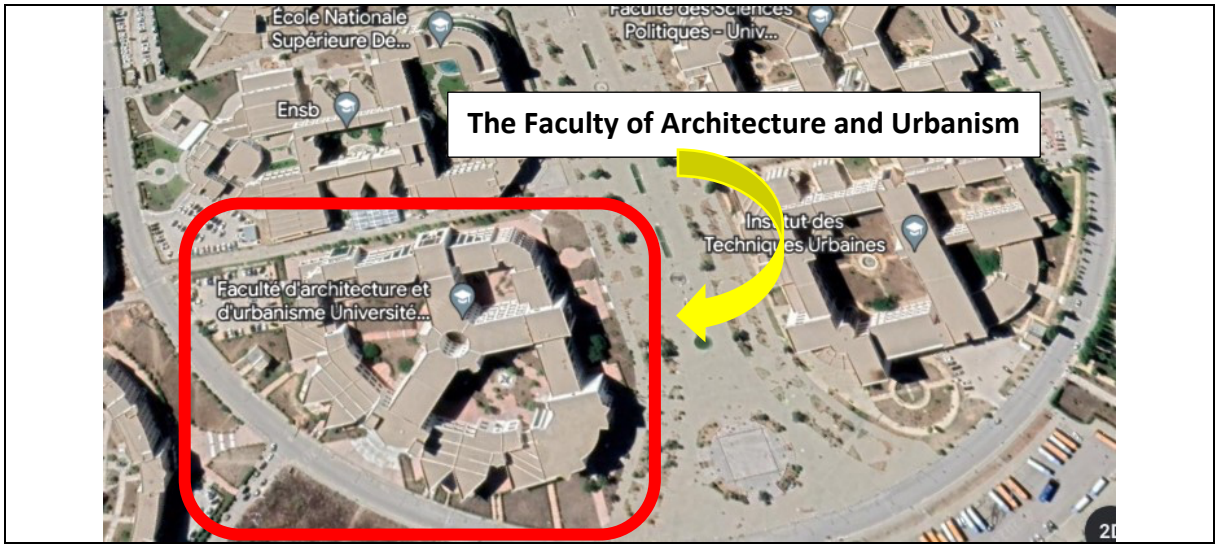
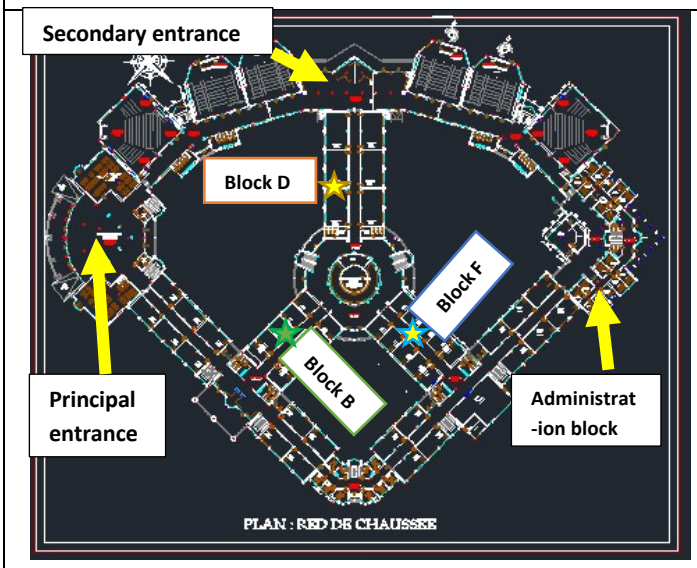
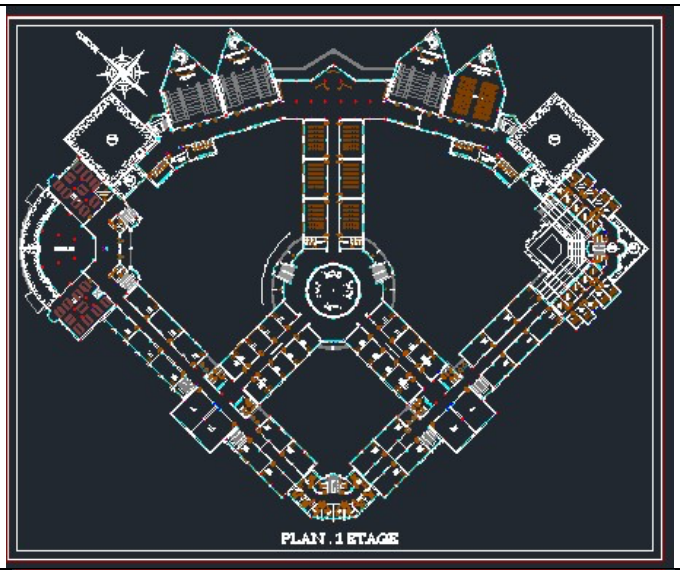
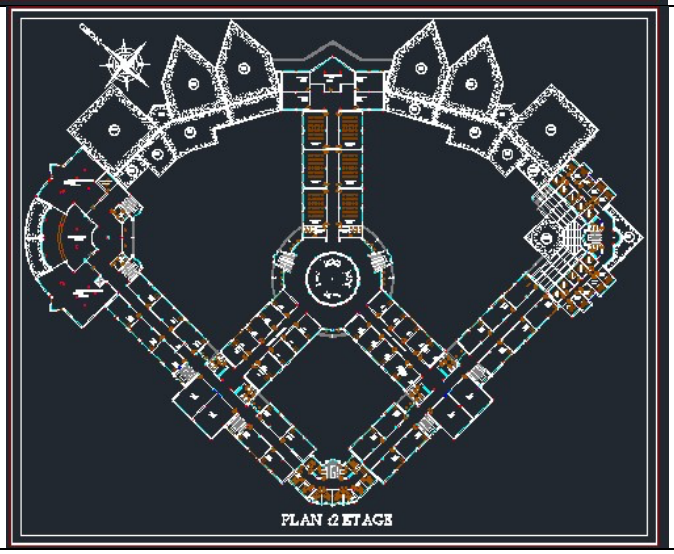


Figure n°04: *Satellite image showing the ground plan of the Faculty of Architecture and Urbanism.*
Source: *Google Earth, 2023.*

4.2. The spatial organization of the faculty

The Faculty of Architecture and Urbanism is characterized by a triangular plan with courses inside this spatial configuration, which is made up of several blocks F/B/D/G/C containing classrooms, workshops for drawing and offices for teachers, research laboratories, internet and projection rooms,

computer rooms and a block reserved for the administration and the infirmary and a block reserved for the amphitheater, the conference room and the defense. (See figure N° 05)

Architectural plan	Description
	The ground Floor plan consists of classrooms, two internet rooms, a conference room, lecture halls, workshops, a large hall at the entrance of faculty with a secondary entrance and a block reserved for teachers' offices, and a block for administration.
	The 1st Floor plan is composed of Same as the ground floor with a patio over the main entrance of the faculty, two reading rooms where the two internet rooms of the ground floor were, classrooms, and four lecture halls.
	The 2nd and 3rd Floor plans are composed of classrooms and, an office block for teachers and a space reserved for the library storage room, a lending room for books and periodicals and laboratories.

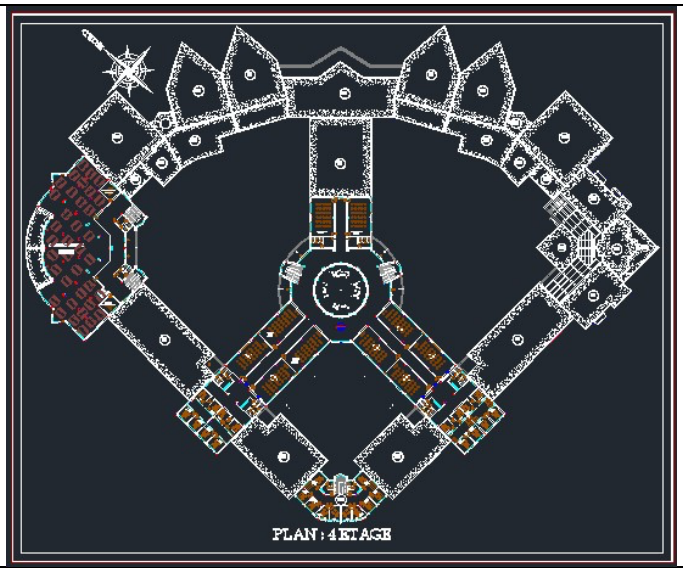
	The 4 th Floor plan consists of the following spaces: A reading room, labs, workshops, and faculty offices.

Figure n° 05*: Spatial configurations of the different plans of the Faculty of Architecture and Urbanism at the University Salah Boubnider Constantine3.* ***Source:*** *BET*

5. Analysis of the results

According of the observation on the whole spatial configurations of the faculty with the different levels, we have noticed that all the floors of the internal architectural plan of the faculty are composed of spaces that favor these social interactions within the educational equipment.

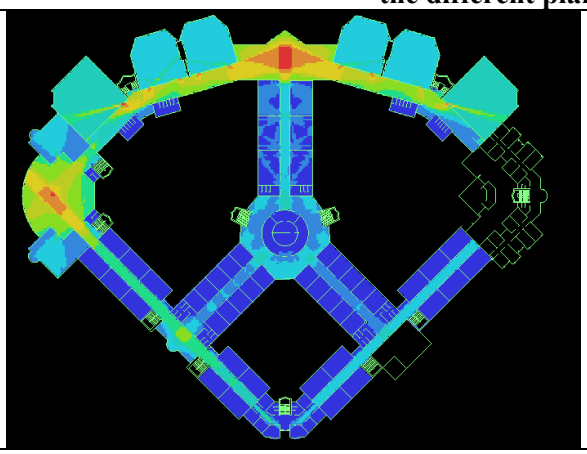
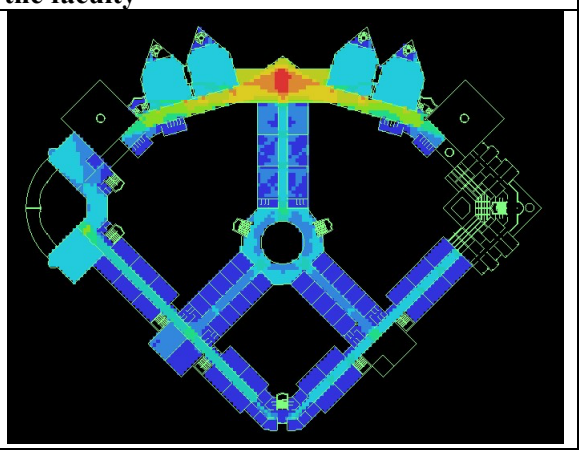
Such as the two entrances of the main and secondary faculty, which is the place of contact and leisure par excellence, the two internet rooms, and the library on the upper floors.

The analysis and reading of the graphs established by the spatial syntax through the software "Depthmap" allow us to identify the following measures:

5.1. Visibility graph analysis (VGA) of The measure of the connectivity

From the VGA (Figure N° 06) of the set of plans we found that the spaces in red are the most connected in this architectural configuration of the faculty, they contain the spaces as follows: the two main and secondary entrances of the faculty and the reading room on the 4th floor. With less degree by a yellow color the corridors that lead to the different blocks from the two halls

On the other hand, the other spaces are weakly connected, especially the spaces with a blue color that are represented in the plans: classrooms, workshops, teachers' offices and research laboratories.

VGA of The measure of the connectivity of the spaces constituting the spatial configuration of the different planes of the faculty	
	
Ground Floor plan	1st Floor Plan

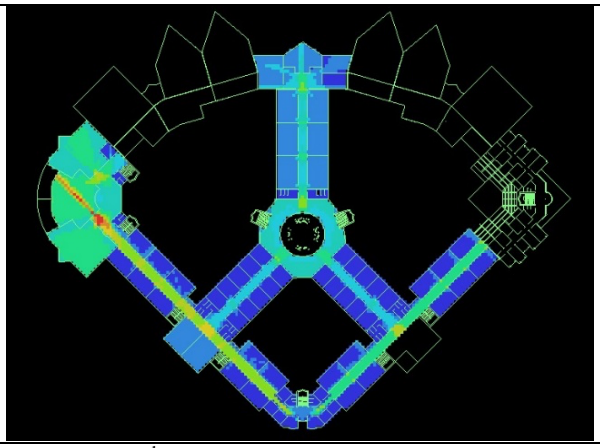
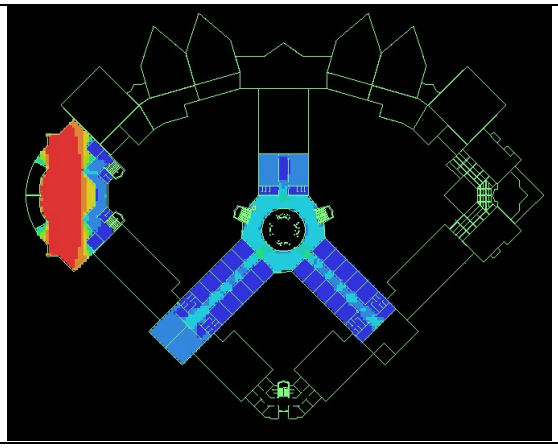
	
2nd and 3rd Floor Plan	4th Floor Plan

Figure n°06: *VGA Connectivity measure in the Faculty of Architecture and Urban Planning at UC3.*
Source: *Benkechkache & Kaghouche, 2023.*

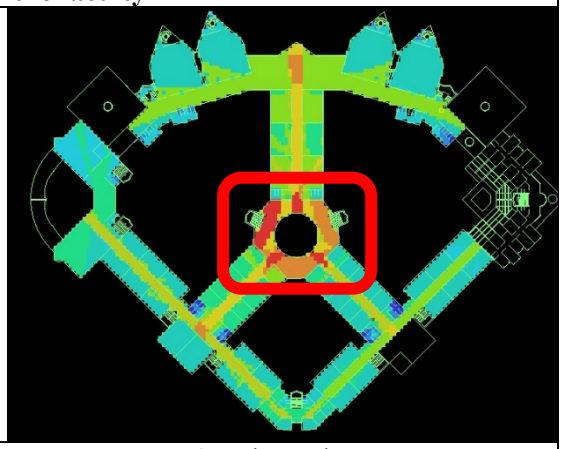
5.2. Visibility graph analysis (VGA) of The measure of the integration

The analysis of visibility graphs of integration measure (Figure N° 07) of all levels of the faculty showed that: The integration of space is located mainly in the two entrances of the faculty with a very important degree (presented with red color) in the DRC, in addition in the roundabout: it is the point of intersection of the three Blocks B-D-F of the 1st floor and a small part in the same location in the second floor, and in the reading room for the last floor.

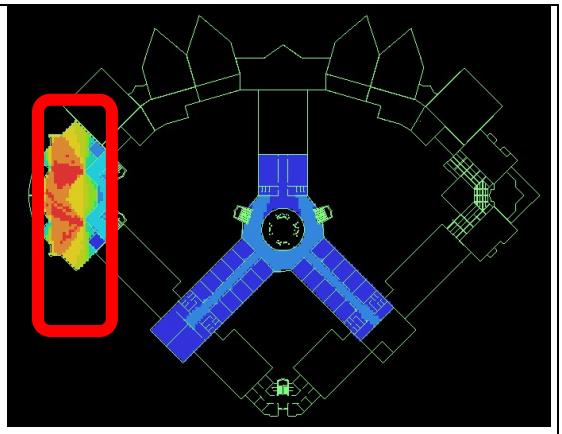
Also, we noticed from the VGA of integration with less degree presented in the graphs with a degraded color from red to yellow in the spaces as follows: the two main corridors that lead to the classrooms and workshops from the two entrances to the faculty.

The VGA of the rest of the space is presented with gradient colors from green to blue are represented by medium to low integration. The spaces in blue are considered isolated spaces in the spatial configuration of the equipment.

In addition, we have noticed according to the observation tool in our study area that, the spaces of social interactions are coincident with the same places where the integration value is high, these spaces are marked by a very important frequentation of students during their days in the faculty, and they are places of social interaction par excellence. (See Photos n°1,2 and 3)

VGA of The measure of the integration of the spaces constituting the spatial configuration of the various plans of the faculty	
	
Ground Floor plan	1st Floor Plan

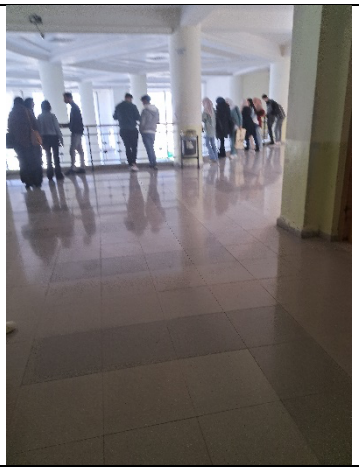
2nd and 3rd Floor Plan



4th Floor Plan

Figure n°07: *VGA Integration measure in the Faculty of Architecture and Urbanism at UC3.*
Source: *Benkechkache & Kaghouche, 2023.*

Photos n° 01: view on the main entrance of the faculty with a high degree of social interaction. **Source:** Authors, 2023



Photos n° 02: View of the students next to the reading room with a high degree of social interaction. **Source:** Authors, 2023

Photos n° 03: photos next to classrooms with little social interaction between students. **Source:** Authors, 2023.

6. Discussion of the results

From the analysis of the different VGA (Visibility graph analysis) and the observation on our study site, we have noted that the architectural spatial configuration of the faculty has a direct impact on the behavior of the students as well as on the way they appropriate the educational space according to their needs.

This is confirmed by the research method used in this study through the comparison that was made between the VGA (the values of integration and connectivity of spaces and the degree of social interaction of students during their occupations of the space).

We found that the values of connectivity and integration are very high, especially in areas of high student interaction.

They are represented precisely in the following spaces: the two main and secondary lobbies, the traffic circle that coincides with the intersection of the three blocks B-D-F and the main axis corridors that lead to the classrooms and the reading room. They are marked by significant student traffic during the day. They are spaces of grouping par excellence with a very high degree.

On the other hand, the areas with degraded colors from green to blue presented in the VGA, are considered unconnected spaces with a low integration and isolated spaces such as: classrooms, workshops, and laboratories.

We found from this study that these spaces are illustrated by a good location in the architectural plan of the faculty because their spaces require isolation and quiet at the same time.

7. Conclusion

From the observation of the different spaces constituting the faculty of architecture and urbanism as well as the results of the analysis of the syntactic measures such as the connectivity and the measure of integration, we were able to obtain answers to our questioning posed at the beginning of our research, that indeed, there is a close and direct relationship between the architectural configuration of the interior spaces within the faculty and the social behavior of students. It was also found that the concentration of students and the social relationships within the faculty are mainly found in the connected areas and the areas where the integration is maximum.

On the other hand, the classrooms are considered quiet spaces par excellence, they are completely isolated from the faculty as a whole with a low frequentation by the students, and they are places of teaching only. Therefore, they are marked by low connectivity and low integration.

To this effect, we concluded through its results, that it is essential, that the designer in its reflection on the architectural elaboration of the projects of the university faculties, take into consideration the criterion of social interaction through methods and techniques of constructions that favor these social relations within the faculty because it is considered as a fundamental need of the human being.

Declaration of Interest Statement

The author declare that she has no conflict of interest

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