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Space Syntax Analysis on Indoor Sports Center Jules Ladoumegue France

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Abstract

This paper studies and reviews the level of permeability and wayfinding of indoor sports centers by using space syntax analysis. The case study selected is Indoor Sports Center Jules Ladoumegue, France, which has an office and public access. This study applies the labeling system using alphabets and numbering systems and then turns into space syntax analysis of measurable scale graphs on the level of permeability and wayfinding. This analysis classifies the measurement into nine levels of the Likert scale's permeability. The finding shows that it has two separate access spaces: the office and the indoor sports center. The office consists of two floors while the sports center consists of four floors. This study shows that this indoor sports center has moderate wayfinding and permeability levels. Each space is easy to access, and some spaces are linked with another space. This building is neutral in its space syntax analysis. The top level of permeability is at the rooftop, the patio, squash area, dance, and gym space.

Discipline: Architecture Engineering.

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1 Introduction

This research paper aims to better understand of space syntax by analyzing and providing an in-depth study of the selected case study area. Space needs to consider the capacity to regulate and not only depend on the degree of privacy (Yusoff and Hassan, 2019). This building is a public building and an indoor building that provides a place to play sports and live a healthy lifestyle.

People are known to spend most of their time indoors (Mehdipour & Nazamian, 2013). This building is analyzed based on its wayfinding, permeability, spatial arrangement, and space hierarchy. This theory of space syntax analysis is widely used in space planning such as wayfinding. (Beck and Turkieniez, 2009).

At the end of this research, the findings will show how this sports complex can navigate inexperienced users throughout the complex. The findings will include the design weakness and strength of the spatial arrangement. In this case study, space syntax will help identify the connection between human activities and the habited spaces (Bafna, 2003). This research will help in the future designing process of the spatial arrangement in a sports complex and as a reference to others.

2 Literature Review

Space syntax proposes a reverse approach to studying urban morphology and human behaviors. (Vaughan, 2007). Space syntax is defined as a method to study the relationship between space, spatial structures, and human behaviors. (Liu et al. 2018). The common practice by architects is spatial configuration, and it represents the consequential process regarding the function (Mustafa and Hassan, 2010). The objective of space syntax is to investigate human movement transition from one space to another. A proper space syntax will ensure the building functions efficiently over time (Mustafa and Hassan, 2010). In architectural design, space syntax is one way to collect information and analyze it, which is later translated into drawing format (Asif et al., 2018). It is the process of transforming abstract design ideas into physical spatial installations. Lawson (1997) discussed the meanings inherent in the word "design" vary according to different career groups, and its only common point is that it is an unusual and complex activity. A justified graph is an analysis from space syntax according to syntactic step, and depth (Hillier et al., 2016). From this justified graph, the depth levels will influence the shape at the end (Natapov et al., 2015). This sports center focuses on sports activities where the public will enjoy a healthy lifestyle. In planning successful spatial development, it is a must for public space, and private space configurations must be designed accordingly. (Hassan, 2019)

According to Hiller and Hanson (1997), the design is a process that moves from an unknown state into one that is known. Architecture is a practice of "thinking by doing" led by data from various sources and different types of information in which intuition and science are brought together (Dursun, 2007). When it comes to the architectural design tool, it is about a set of methods, mechanisms, tools, and apparatus that help translate the idea from one mind to another. The designer uses these tools in the thinking process and so such tools are not limited to the kinds of physical objects we use while designing the ideas that are first conceived in our minds (Şişman, 2015). The permeability is known as the satisfaction of peoples' opinions based on the environment's properties (Hölscher, 2012).

3 Case Study: Indoor Sports Center Jules Ladoumegue, France

The case study chosen is a sports center located at 37 Route des Petits Ponts, 75019 Paris, France. This sports center has sports facilities consisting of a soccer field, rugby field, indoor wall climbing, tennis court, basketball court, gym, dance studio, fitness room with grandstands, changing facilities, and offices. The sports center was completed in 2014 and designed by Dietmar Feichtinger Architects. This sports center is integrated with the stadium next to it, making it complete as a public sports center. According to Hiller and Hanson, the design integrates intuition and reasoning (Hiller and Hanson, 1997). The Tennis Courts are part of the Jules Ladoumegue Sports Complex, which was awarded a Bronze medal in 2015 by the International Olympic Committee.

3.1 Design Detail of the Sport Center Jules Ladoumegue

This building was selected because it was designed vertically upwards, making every floor have different sports facilities. The rooftop is where the sports fields for soccer and rugby are located. This sports complex consists of a few blocks with different sports usage such as a block facing the East with four floors dedicated to sports activities. This sports center is designed for public usage as it is located next to public transport, the tramway line T3, and the RATP (transport service Ile-De-France), which makes it easy to access.

Figure 1: Sport Center Jules Ladoumegue
(Courtesy of Dietmar Feichtinger Architects).

4 Methodology

In this part of the methodology, the case study selection is crucial as it needs to align with the design thesis topic. A proper case study will have useful information on space syntax, the level of permeability, and wayfinding. Wayfinding is the consistent use and organization of definite sensory cues from the external environment. (Lynch, 1960). There are two types of methods used to study the space syntax and level of permeability. This paper used a common integration value (Hillier and Hanson, 1984). First, the labeling system's method uses alphabets and numbers. This system applies in determining the level of permeability from public to semi-public to semi-private and private. In this method, the labeling will start from 0(Public) up to 7 (Private).

Every number represents the space arrangement within every floor plan. For example, the

common area or the lobby will be represented with the Number 0, and then the next space will be labeled as number 1 and up to offices with the number 7(most private). For spaces such as the main entrance, and lobby, linkage to other spaces will be represented by the alphabet P. (P1, P2, P3, etc.) The sports facilities such as the gym, dance studio, and fitness room will be represented by the alphabet S, (S1, S2, S3, S4, etc.) For toilets, it used alphabet (T1, T2, T3 etc.) staircase (SC 1, SC2, SC3 etc.) elevators (L1, L2, L3 etc.) and offices (O1, O2, O3 etc.).

The second method to be used is the Justified Graph method. The numbering and alphabet labeling are then translated into the Justified Graph to obtain permeability and wayfinding in space syntax study. In this Justified Graph, a graph is drawn to obtain the result for conclusion later.

3.1 Method of Analysis

The spatial building structure is analyzed based on the type of users. From the types of users, the depth levels of permeability will be obtained and can determine access from public to semi-public to semi-private and private. It was found out that the users of this Sports Center were divided into four types. There are public users, specific users, office staff, and visitors. The levels of depth or steps will directly affect how the justified graph looks at the end, whether deep or shallow (Natapov et al., 2015).

4.2 Synthesis of Data

The result is then categorized according to hierarchical order to identify permeability and wayfinding levels. The wayfinding will be analyzed from very easy to medium to difficult and to very difficult from the findings. For permeability, access is categorized from primary to secondary, tertiary, and other levels.

5 Results of Analysis

The result for permeability and wayfinding will be divided into each case study floor. The floors are the ground floor, first floor, second floor, and third floor. The permeability depth is translated into a measurable scale graph for better understanding.

5.1 Ground Floor Plan

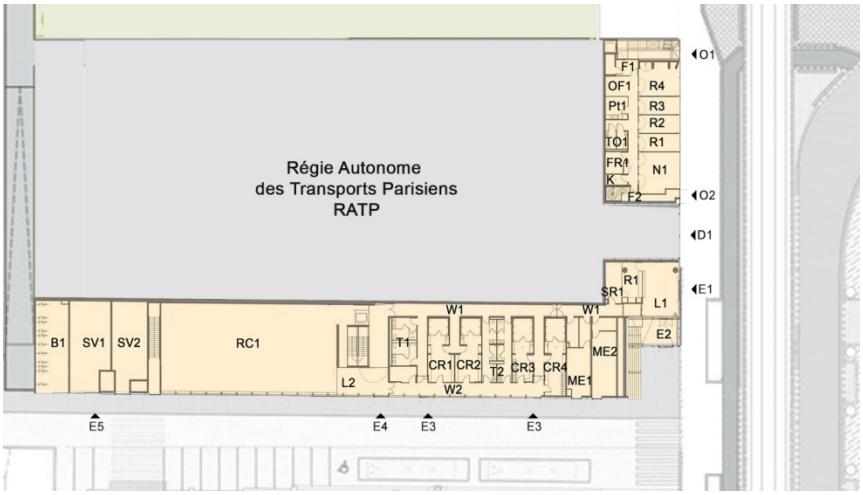

Figure 5: Site Plan of Sports Center Jules Ladoumegue.

The analysis of the case study will start from the Ground Floor Plan. Figure 5 shows the site plan, and Figure 6 shows the measurable scale graph for the ground floor. Table 1 is the schedule of accommodation for the ground floor plan.

Table 1: Schedule of Accommodation Ground Floor Plan

CODE	SPACE	CODE	SPACE
E1	Entrance 1	K	Store
E2	Entrance 2	T1	Toilet 1
E3	Entrance 3	T2	Toilet 2
E4	Entrance 4	CR1	Changing Room 1
E5	Entrance 5	CR2	Changing Room 2
D1	Entrance to RATP (Régie Autonome des Transports Parisiens) Hub	CR3	Changing Room 3
L1	Lobby 1	CR4	Changing Room 4
L2	Lobby 2	ME1	Mechanical Room 1
R1	Reception 1	ME2	Mechanical Room 2
SR1	Staffroom 1	RC1	Rock Climbing Space
W1	Walkway 1	B1	Bicycle Room 1
W2	Walkway 2	SV2	Service Room 2
SV1	Service Room 1	R1	Room 1
OF1	Office 1	R2	Room 2
O1	Office Entrance 1	R3	Room 3
O2	Office Entrance 2	R4	Room 4
F1	Foyer 1	FR1	File Room 1
F2	Foyer 2	N1	Meeting Room Office 1
Pt1	Pantry 1	TO1	Toilet Office 1

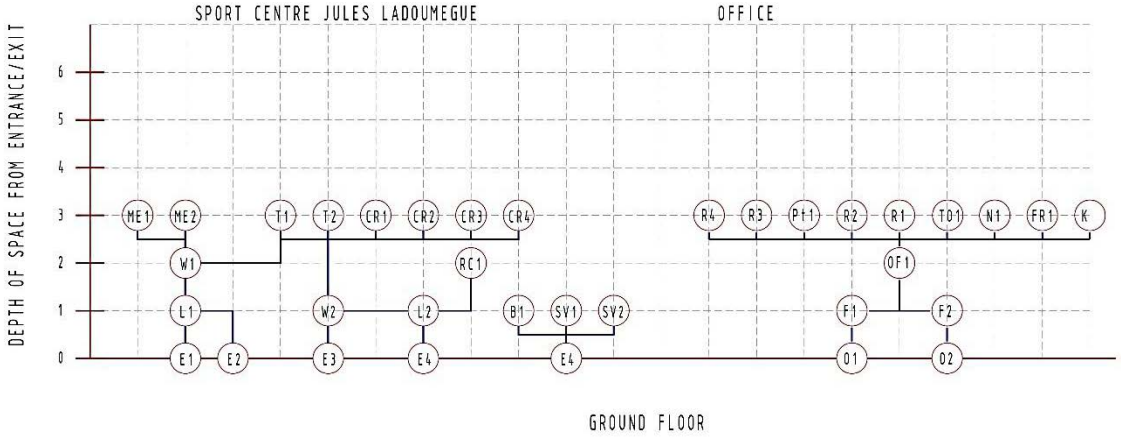

Figure 6: Measurable scale graph for ground floor

The depth levels of the justified graph are three levels. The analysis of the ground floor can be divided into two separate functions. The offices for the staff and the sports facilities are for the public. The office entrance is separate from the sports facilities as it enters O1 and O2 referring to Figure 5. As the staff enter, they will direct foyer 1 and foyer 2. From the foyer 1 and 2, the staff will move to the office area. They will be directed to other rooms from the office area: the meeting room, file room, pantry, and toilet. In this office, the depth levels of permeability are considered private and separate from the public. The depth levels of wayfinding are straightforward as the staff enter and only 3 levels of depth.

It has multiple entrances for sports facilities from E1, E2, E3 and E4. The visitors come from E1 and E2 will go to Lobby 1. Visitors coming from E3 will go to walkway 2 while entrance from E4 leads to Lobby 2. From Lobby 1, visitors will go to walkway 1 and then to changing rooms and toilets. Visitors in Lobby 2, will go to the Climbing space. Visitors at walkway 2 will enter directly to changing rooms and toilets. The depth level of permeability for sports facilities is from public to semi-public. It is considered easy and straightforward for visitors to easily access spaces for wayfinding levels.

5.2 First Floor Plan

Figure 7 shows the first-floor plan, and Figure 8 shows the measurable scale graph for the first-floor plan. Table 2 is the schedule of accommodation for the first-floor plan.

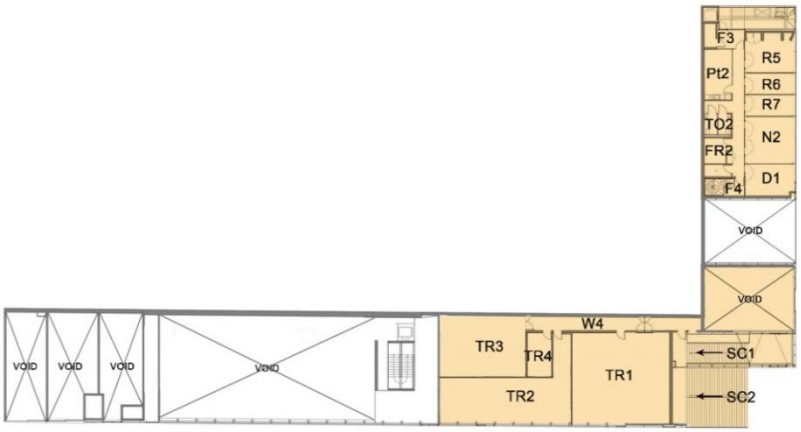

Figure 7: First Floor Indication

Table 2: Schedule of Accommodation 1st Floor Plan

CODE	SPACE	CODE	SPACE
SC1	Staircase 1	TR3	Technical Room 3
SC2	Staircase 2	TR4	Technical Room 4
TR1	Technical Room 1	OF2	Office 2
TR2	Technical Room 2	W4	Walkway 4
F3	Foyer 3	FR2	File Room 2
F4	Foyer 4	R5	Room 5
Pt2	Pantry 2	R6	Room 6
TO2	Toilet Office 2	R7	Room 7
D1	Director Room 1	N2	Meeting Room Office 2

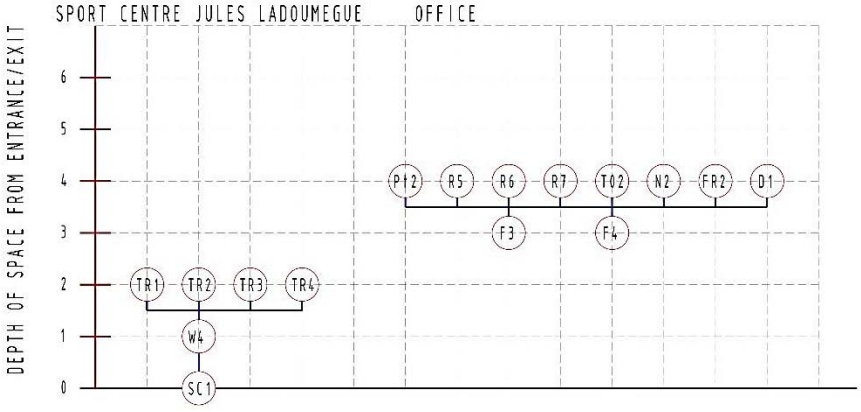

Figure 8: Measurable scale graph for first-floor plan

The depth levels of the justified graph are 4 levels. As the staff move, they will enter foyer 3 and foyer 4. From foyer 3 and 4, staff enter the office and then to other rooms such as pantry 2, room 5-7, meeting room 2, file room 2, and director room. The depth levels of wayfinding are straightforward as the staff enters only 4 levels of depth. For sports facilities on the first floor, only consist of technical rooms 1-4. Technicians enter from Staircase 1 and are directed to Walkway 3 and then to technical rooms 1-4. It is considered very easy for wayfinding as technicians can easily access spaces.

5.3 Second Floor Plan

Figure 9 shows the first-floor plan, and Figure 10 shows the measurable scale graph for the second-floor plan. Table 3 is the schedule of accommodation for the second-floor plan.

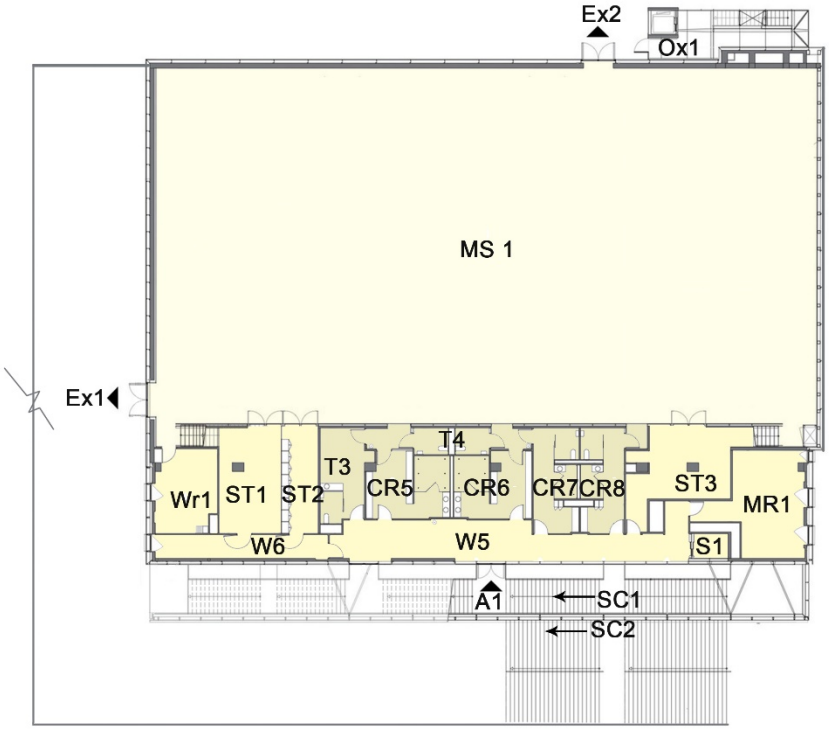

Figure 9: Second Floor Indication

Table 3: Schedule of Accommodation 2nd Floor Plan

CODE	SPACE	CODE	SPACE
SC1	Staircase 1	MR1	Meeting Room 1
SC2	Staircase 2	T3	Toilet 3
A1	Access 1	T4	Toilet 4
W5	Walkway 5	CR5	Changing Room 5
W6	Walkway 6	CR6	Changing Room 6
Wr1	Workshop 1	CR7	Changing Room 7
ST1	Storage 1	MS1	Multisport Hall 1
ST2	Storage 2	Ex1	Emergency Exit 1
ST3	Storage 3	Ex2	Emergency Exit 2
S1	Service 1	Ox1	Office Exit 1

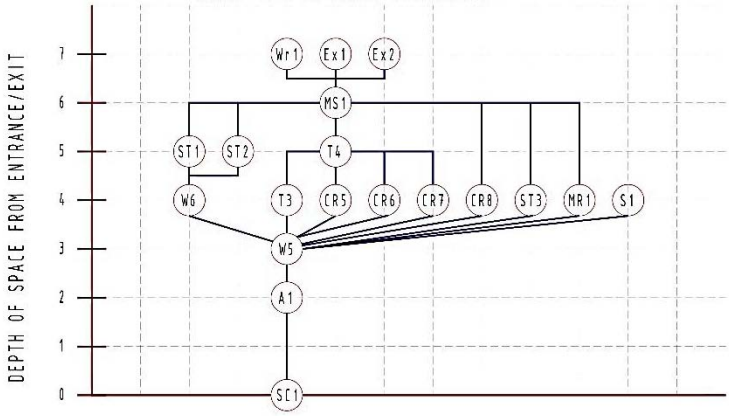

Figure 10: Measurable scale graph for second-floor plan

The justified graph's depth levels are 7 levels for sports facilities on the second floor. To access the second floor of the sports facilities, visitors need to use Staircase 1, which is mainly used by the public. Staircase 1 is the main access from the ground floor to the top floor. From Staircase 1, the visitor will enter Walkway 5, and it is for the public. From Walkway 5, the visitor will move to the next depth of permeability which is semi-public consisting of toilet 3, changing rooms 5-7, walkway 6, storage 3, and meeting room 1. From Walkway 6, visitors can move to Storage 1-2 and separate from Walkway 5. Storage 1-2 is considered as semi-public. Visitors can access Multisport Hall from storage 1-3 and changing rooms 5-7 only, making the Multisport Hall semi-private for visitors only. One private space is the workshop as it is only accessible from the multisport hall. There are two emergency exits Ex1 and Ex2 from the multisport hall. It is considered a medium for wayfinding levels to enter the main Multisport Hall the visitors need to pass through 2 levels of depth that have many spaces. It can be confusing sometimes.

5.4 Third Floor Plan

Figure 11 shows the first-floor plan, and Figure 12 shows the measurable scale graph for the third-floor plan. Table 4 is the schedule of accommodation for the third-floor plan.

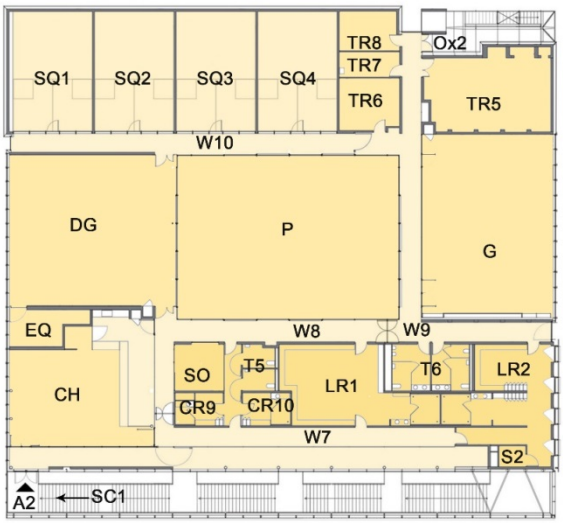

Figure 11: Third Floor Indication

Table 4: Schedule of Accommodation 3rd Floor Plan

CODE	SPACE	CODE	SPACE
SC1	Staircase 1	LR1	Locker Room 1
A2	Access 2	LR2	Locker Room 2
W7	Walkway 7	CR9	Changing Room 9
W8	Walkway 8	CR10	Changing Room 10
W9	Walkway 9	P	Patio
W10	Walkway 10	DG	Dance & Gymnastics
T5	Toilet 5	EQ	Equipment Room
T6	Toilet 6	G	Gym
SO	Small Office	TR5	Technical Room 5
CH	Clubhouse	TR6	Technical Room 6
SQ1	Squash 1	TR7	Technical Room 7
SQ2	Squash 2	TR8	Technical Room 8
SQ3	Squash 3	Ox2	Office Stairs 2
SQ4	Squash 4	S2	Service 2

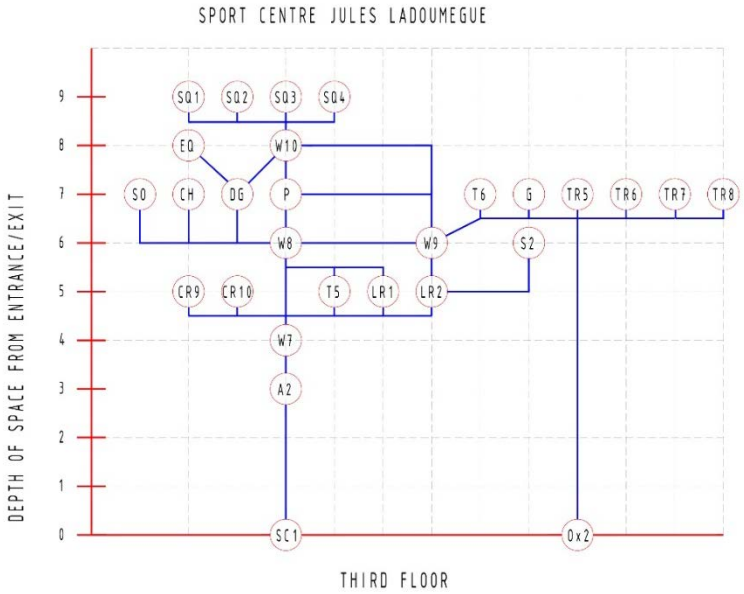

Figure 12: Measurable scale graph for third-floor plan

The justified graph's depth levels are 9 levels for sports facilities on the third floor. To access the third floor of the sports facilities, visitors need to use Staircase 1, which is mainly used by the public. Staircase 1 is the main access from the ground floor to the top floor. From Staircase 1, the visitors will enter the Walkway 7, and it is for the public. From Walkway 7, the visitor will move to the next depth of permeability which is semi-public consisting of changing rooms 9-10, walkway 8, and locker rooms 1-2. From walkway 8, visitors move to the clubhouse, dance & gymnastics, patio and walkway 9. The small office is accessible from walkway 8, but it is private only for staff. The clubhouse, patio, dance, and gymnastics are considered semi-public and only accessible by the sports center's visitors. Toilet 6 is semi-public as the access only from walkway 9. The workout gym is accessible only from walkway 9 and is considered semi-private. Walkway 10 is accessible from the patio and walkway 9. It is a private walkway as it leads to squash 1-4. Squash 1 to 4 is considered private as it is the highest in permeability depth.

It is quite clear that wayfinding is considered a medium for entering each space. Visitors can

easily access every walkway, and each walkway leads directly to the spaces. As it went in-depth, the visitors will find it difficult to find the squash 1-4 ais separate by walkway 10. Technical rooms 5-8 are accessible from office stairs 2 directly from the ground floor.

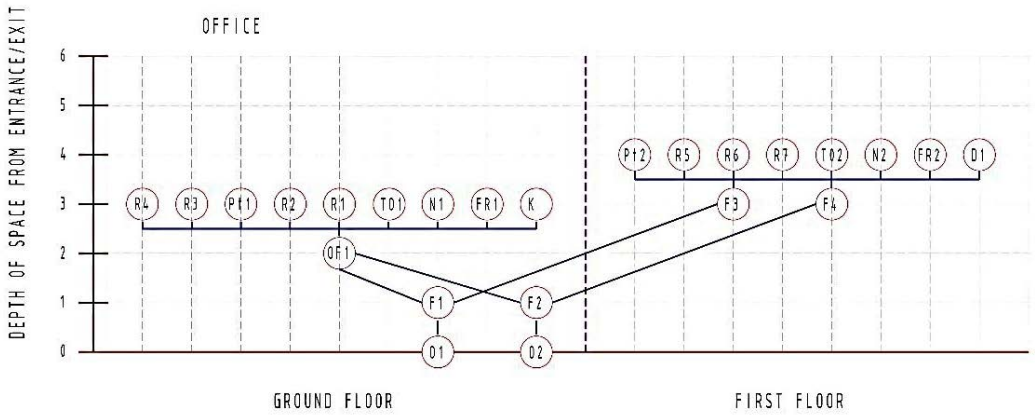

Figure 13: Overall measurable scale graph for Office

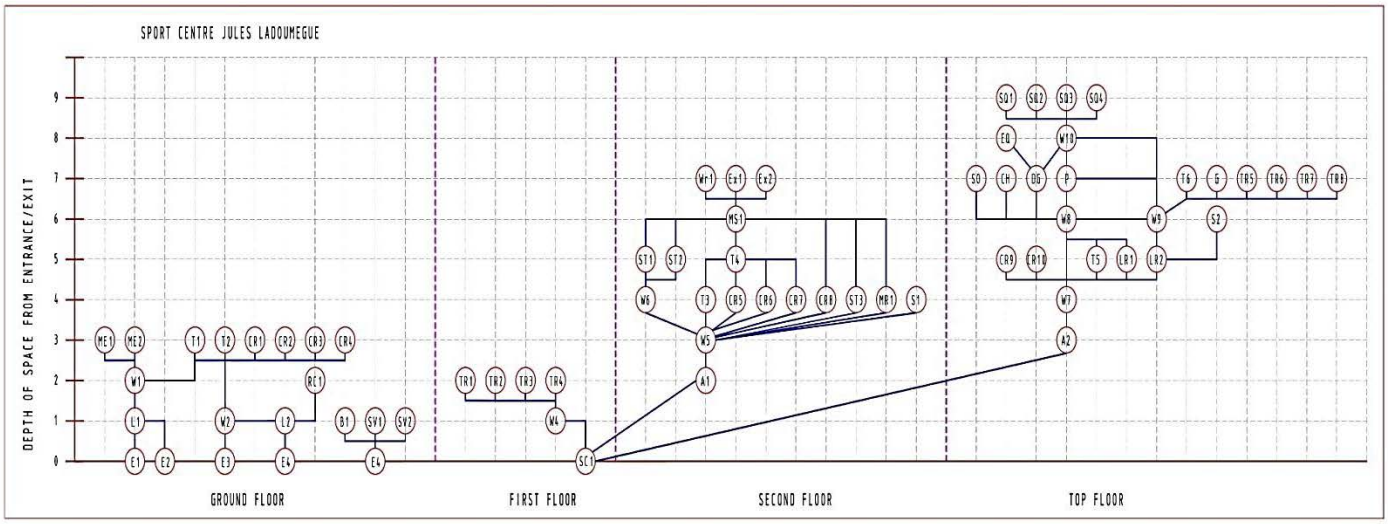

Figure 14: Overall measurable scale graph for Sport Center Jules Ladoumegue

6 Discussion

The analysis sports center is divided into two functions: one for the sports center and another for offices. It shows that Staircase 1 of Sport Center Jules Ladoumegue is the only pathway connecting the ground floor to the top floor. From the overall result of justified graphs of the sports center, the wayfinding is medium. It is not hard to find every space in the sports center. The wayfinding is designed so that every space is linked to other spaces and better control of permeability. Most spaces are located on the second floor and the top floor. From the ground floor, it is the primary level of permeability. The first floor only consists of technical rooms. On the second floor, walkway five and changing rooms are the secondary level of permeability while on the top floor, walkway seven, locker rooms, clubhouse, and changing rooms are the tertiary level of permeability. Patio, dance gymnastics, and squash are the highest level of the sports center's permeability.

The overall office justified graph shows that it is for staff only. It is easy to access and has direct wayfinding. The level of permeability for the office is up to level 4. There is two access either from foyer 1 or foyer 2. This foyer 1 and 2 links to the first floor where space is private. The level of wayfinding for the office is easy and direct. It is easy for people to understand.

Table 5: Summarized permeability of Sports Center Jules Ladoumegue, France

Element	Very easy	Easy	Neutral	Hard	Very Hard
Ground Floor		✓			
First Floor	✓				
Second Floor			✓		
Top Floor			✓		

7 Conclusion

Sports Center Jules Ladoumegue is a public building that provides a place for the public to play sports and live a healthy lifestyle. This study concludes that it answers this research's objective where the space syntax and level of permeability are understood now. The building typology for this Sport Center Jules Ladoumegue is separated into two parts which are the public space and private space. The overall space syntax of this Sport Center Jules Ladoumegue is considered public and satisfactory. The level of permeability for the public spaces is higher as several spaces are connected. To reach the highest permeability, ones need to go through different spaces. The overall wayfinding for this building is neutral. This sports center visitors can find their way to each space without lost as it is designed from one medium to another medium.

This case study helps to understand how sports centers are designed. It shows the level of permeability from the entrance to the highest permeability. The Space of Accommodations divides every floor with different functions, which is good for separating the users. The spaces are arranged to correspond to its function and are easily find by the visitors. Although the spaces are arranged correspondingly to the sports center's function, the level of permeability is a little bit depth. For visitors to find the squash court, they need to go up to the third floor, go through spaces before reaching the squash court, and confuse visitors as they enter several spaces before reaching the court.

8 Availability of Data and Material

Information related to this work is present in this research paper.

9 References

Asif N., Utaberta N., Sabil A. and Ismail S. (2018). Reflection of Cultural Practices on Syntactical Values: An Introduction to the Application of Space Syntax to Vernacular Malay Architecture.

Bafna, S. (2003). Space Syntax: A Brief Introduction to Its Logic and Analytical Techniques

Beck M. P. and Turkienicz B. (2009). Visibility and Permeability Complementary Syntactical Attributes of Wayfinding. *7th International Space Syntax Symposium*. Stockholm

Dursun, P. (2007). Space syntax in architectural design. In *6th international space syntax symposium* (pp. 01-56).

Hillier, B., Hanson, J., Bartlett, T., & Benedikt, M. (2016). What is Space Syntax, (June), 3–5.

Hölscher, C., Brösamle, M., & Vrachliotis, G. (2012). Challenges in multilevel wayfinding: A case study with the space syntax technique. *Environment and Planning B: Planning and Design*, 39(1), 63-82.

Lawson, B., & Loke, S. M. (1997). Computers, words and pictures. *Design studies*, 18(2), 171-183.

Liu, P., Xiao, X., Zhang, J., Wu, R., & Zhang, H. (2018). Spatial configuration and online attention: A space syntax perspective. *Sustainability*, 10(1), 221.

Lynch, K. (1960). The image of the environment. *The image of the city*, 11, 1-13.

Mehdipour, A., & Nazamian, P. (2013). Psychological Demands of the Built Environment, Privacy. *International Journal of Psychology and Behavioral Sciences*.

Mustafa, F. A., & Hassan, A. S. (2010). Using Space Syntax Analysis in Determining Level of Functional Efficiency: A Comparative Study of Traditional Land Modern House Layouts in Erbil City, Iraq. *Green Infrastructure: A Strategy to Sustain Urban Settlements*. Bali.

Natapov, A., Kuliga, S., Dalton, R. C., & Hölscher, C. (2015, July). Building circulation typology and space syntax predictive measures. In *Proceedings of the 10th international space syntax symposium* (Vol. 12, pp. 13-17). London: Space Syntax Laboratory, The Bartlett School of Architecture, University College London.

Vaughan, L. (2007). The spatial syntax of urban segregation. *Progress in Planning*, 67(3), 199-294.

Yusoff, N., Hassan, A. S., Ali, A., & Witchayangkoon, B. (2019). Public space and private space configuration in integrated multifunctional reservoir: case of marina barrage, Singapore. *International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies*, 10(9), 1-12.

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