Journal of Mechanical, Civil and Industrial Engineering
ISSN: 2710-1436
DOI: 10.32996/jmcie
Journal Homepage: www.al-kindipublisher.com/index.php/jmcie

JMCIE
AL-KINDI CENTER FOR RESEARCH AND DEVELOPMENT

| RESEARCH ARTICLE

Analysis and Research of Space Syntax in Urban Commercial Space: Taking the Bank of China Tower and Edificio Comercial Si Toi in Macau as Examples

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| ABSTRACT
Space syntax is one of the important methods of city analysis and calculation. Based on the theory of space syntax, this research takes two important commercial and financial buildings of Bank of China Tower and Edificio Comercial Si Toi in Macau as examples to analyze their internal spatial structure and import Depthmap for calculation. Combining with related topological calculation methods, by analyzing the topological values of the overall integration degree, local integration degree, global depth and selectivity of the space, quantitatively explore the structure of the space, understand the relationship between the overall space and local space of commercial buildings, and discover the spatial structure And proposed corresponding optimization strategies to provide a reference for the future reconstruction of the typical commercial building space in Macau from the 1980s to the 1990s.

| KEYWORDS
Space syntax, Spatial structure, Commercial Building, Macau

| ARTICLE DOI: 10.32996/jmcie.2022.3.1.4

1. Introduction

1.1 The background of the construction of commercial buildings before Macau's return to the motherland

Before the return of Macau to the motherland, commercial buildings (office buildings) were built in the 1980s and 1990s due to the needs of economic development.

In 1983, a total of seven commercial buildings were completed and constructed in Macau. They are: ①Wing Hang Bank Building, completed in October 1967, with 11 floors, a commercial area of more than 27,400 square feet, and a total of 22 office buildings. Restaurants and nightclubs, etc. ②The Tai Fung Bank Tower, completed in December 1974, has a total building area of 48,600 square feet, a 12-storey building, and 95 office buildings and shops. ③The Centro Comercial Praia Grande, completed in July 1982, has 23 floors and a commercial area of approximately 57,000 square feet. When it was sold in the 1980s, it was about six hundred patacas per square foot. ④The Edificio Comercial Si Toi, built in April 1983, has 23 floors. Below the sixth floor is a full-floor commercial land, and there are more than a hundred office units above the sixth floor, with a total area of about 320,000 square feet. The selling price ranges from 1,200 patacas to 2,500 patacas per square foot, which is the highest selling price among several commercial buildings. ⑤At that time, there was also the Nanyue Commercial Center under construction. The 18-storey building has a commercial area of about 15,000 square feet. The office space is 75,000 square feet, and the price is about 850 patacas per square foot.⑥The Macau International Bank Building has 34 floors and a total area of 250,000 square feet. ⑦The Hang Seng Bank Head Office Building at Rua do Campo is composed of three connected buildings, one with 23 floors, one with 20 floors, and the other with 17 floors. The office area has 56,500 square feet, and the shopping mall has 5 floors. 1,000 square feet, while the Hang Seng Bank owns 15,000 square feet.

It can be seen that the Edificio Comercial Si Toi is a typical representative of the largest area, the largest floor height, and the highest selling price among the four earliest commercial buildings built in Macau in the early 1980s.

2. Research Method: Space Syntax

The concept of space syntax was born in the 1970s and was first proposed by British Prof Bill Hillier. He believed that space could affect human behavior to a certain extent. Space syntax is a spatial analysis method based on topological theory and quantitative research on space. It is based on people's perception of space and the connection between people and space and adopts different space division methods to analyze different space types. Space syntax, as a calculation method, clarifies the complex relationships and activity attributions between individual elements and social elements, as well as the overall space. Through the study of economic phenomena, the spatial relationship between buildings and blocks, blocks and cities, and buildings and cities are analyzed—benefit impact. The "space" in the space syntax not only refers to the spatial region in the geometric sense but includes the distance between individuals, the actual precision algorithm, the spatial topological relationship and the correlation influence of the entire region. The role of local space is also the division of space. And scale processing plays the role of measurement and rule determination.

Nowadays, in the era of big data, space syntax has become a complete space analysis and research and data calculation law, and it is applied to architectural design, social activities, and theories of urban divisions. It has been widely used in the design of various commercial buildings and engineering practices internationally. Based on the analysis of space syntax theory and the analysis of the social and economic impact of typical commercial buildings in Macau, this research puts forward reasonable suggestions for its application in the subsequent maintenance or renovation of commercial buildings.

Macau's commercial buildings, office buildings and financial business management buildings serve as people's social and economic activities and social places. Its good spatial structure and beautiful spatial environment can indirectly meet people's spiritual needs and promote communication and exchanges. Therefore, how to enable people to quickly understand and feel space in space has gradually become the focus of research. In the era of global attention on the economy, with the prosperity of the social market economy, commercial buildings with office, financial, commercial and social functions have become an indispensable part of the city, and they are an important part of Macau's current tertiary industry. Composing a place, its spatial construction gradually enters people's field of vision and occupies an important position.

There are three mathematical models in space syntax: convex space, axis model and line segment model. This paper uses Depthmap software to analyze the global integration, local integration, global depth, comprehensibility, selectivity and other values inside the commercial building and visualize the calculation result data. The overall integration degree, selectivity and global depth describe the structural characteristics of the overall space, and the local integration degree and intelligibility describe the structural characteristics of the local space.

3. Analysis Results: A typical commercial building in Macau in the 1980s- Edificio Comercial Si Toi

3.1 Location Analysis of Edificio Comercial Si Toi

Edificio Comercial Si Toi is located at No. 619, Avenida da Praia Grande, Freguesia da Sé of Macau Peninsula. The appearance is almost the same as that built-in in April 1983(Fig.1). The building is 23 stories high.

Due to the proximity to the Largo da Sé(Cathedral) and the important commercial road, Avenida da Praia Grande, there are many bus routes nearby. There are currently 2, 5, 6 loop lines, 7 roads, 16 loops, 26A roads, 12 roads, 2A roads, and 7A. Road, 18A road loop, 19 road loop, 25X road loop, 25 road, 4 road loop, 9A road, 9 road, etc. The current commercial format distribution of the main floors is shown in Table 1 below.

Fig. 1. 1989 Surveying and Mapping Map of the Cartography and Cadastre Bureau of the Government of the Macao Special Administrative Region(Image source: Cartography and Cadastre Bureau)

Fig.2. Current location: almost the same as the survey and mapping in 2022

(Image source: https://webmap.gis.gov.mo/InetGIS/chn/index.html,Cartography and Cadastre Bureau)

Fig.3. The surrounding environment of the Edificio Comercial Si Toi: the city's main roads and commercial office buildings are numerous (Image source: Photographed by the author)

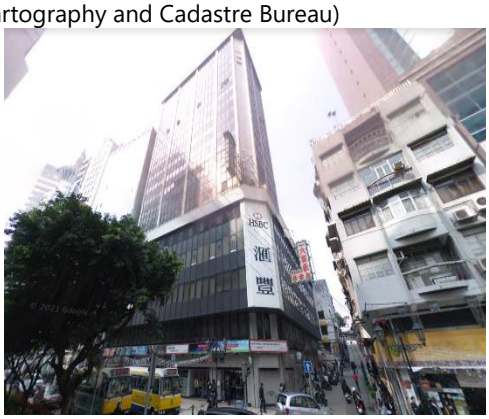

Fig.4. The appearance of Edificio Comercial Si Toi(Image source: Photographed by the author)

Table 1. Distribution of Commercial Types of Edificio Comercial Si Toi.

Floor distribution	Main store
Ground floor	HSBC Bank, Edificio Comercial Si Toi Management Company, Edificio Comercial Si Toi Owners Association
1F	The Hongkong and Shanghai Banking Corporation Limited, HSBC Insurance (Asia) Company Limited, HSBC Life Insurance (International) Company Limited
2F to 3F	Big Rich Sauna
4F to 6F	leased
7F	Macau Yusheng International Real Estate Co., Ltd., Tracker Financial Advisory Co., Ltd., Tracker Financial Group, Tracker Education Co., Ltd.
8F	Commercial company, Doctoral Translation Co., Ltd., Babel Ophthalmologist, Macau Scholars Development Association
9F	Burdi Property Co., Ltd.
10F	Decoration company, medical center, Le Tao Art Center, LDG Dance Studio
11F	Real Estate Purchase
12F	Accounting Firm
13F	Macau Foundation
14F	Fashion, Jewelry and Jade Testing Co., Ltd.
15F	Dance Company
16F	Macau Huaxia Medical Rehabilitation Center
17F	Savings Center
18F	Macau Shippers Association, Macau Finance Bureau
19F	Shimeilan Group

3.2Analysis of Agent Robots in Edificio Comercial Si Toi: People in the corridor of the core tube have higher activity

First, analyze the internal space of the Edificio Comercial Si Toi by proxy robots. The red represents the most number of paths passed, and the blue is the least. From Figure 5, it can be seen that the high pedestrian activity in the central plane is concentrated in the middle corridor of the plan, which is the commercial area. The core tube in the centre has three elevators on the left and a staircase on the right. Three elevators and stairs can connect the ground floor and the 19th floor above the ground. The internal staff of the commercial centre must take the elevator or take the stairs down to the ground floor when they get off work in this area. Therefore, the number of paths that the corridor has been traversed. If there are more, more people can be gathered during peak periods, forming a "back" glyph. The second is the corridors on the upper and lower sides of the core tube. This corridor is the necessary area for internal staff to go out of the elevator or stairs and pass through the core tube corridor to lead to various limited companies, groups, offices, finance bureaus and different centres. As a result, the number of people "turning around" in this corridor has also increased. Relatively speaking, the stairs on the left are relatively light in colour, which means that people go

down the stairs less frequently and the frequency of crowds in the commercial centre is lower. The darker blue areas are at the end of each corridor, and the corners have the lowest values, indicating that few people will walk in these areas throughout the year.

Fig.5. The connectivity of Edificio Comercial Si Toi

Fig.6. The integration of Edificio Comercial Si Toi
(Image source: Drawn by the author)

Fig.7. The concentration degree of the view field of Edificio Comercial Si Toi

3.3Analysis of the integration degree of the Edificio Comercial Si Toi: the strongest flow of people gather at the junction of the horizontal and vertical corridors

Horizon integration is to combine the perspective of the crowd to analyze the degree of possibility of being observed by people. It can well reflect the potential in the space. The value can be expressed by colour. The warmer the colour, it represents the integration value of the space. The higher, the stronger the agglomeration effect of the flow of people. The same is true for the axis analysis. The warmer the colour, the higher the integration of the space, which attracts more people to gather. The colder the colour, the lower the integration of the space, and the more difficult it is to attract people to the space.

It can be seen from Figure 6 that the areas with a higher degree of visual integration are on the north side of the core tube corridor, the junction of the north side corridor and the west side corridor, and the junction of the north side of the toilet corridor and the circular public area, followed by It is the south side of the plan, at the junction of the corridor and the corridor. The value of the integration degree of the field of view in this area is relatively low. From the perspective of the map, the colour is relatively lighter than the three areas on the north side. Syntactic analysis has errors in certain conditions. From the author's point of view, the centre has 19 floors, and people move towards the core tube when commuting. Because the three areas on the north and south sides are all around the central core tube, the corridor, and At the junction of the corridor, after syntactic analysis finds that all the values of the 19th floor are averaged, the values can be considered similar within a certain range, so there are 6 areas with higher global integration.

The core tube is located in the centre of the building. It is composed of public toilets, evacuation stairs, elevator shafts and some equipment rooms on each floor. People in the business centre and outsiders are scattered around the office. When they go upstairs, downstairs, and the bathroom, they will be concentrated at the junction when there are a large number of people in a short period, so they will gather more people in a short time. , The visibility of this area is strong, and things in three directions can be seen. Compared with other places, the degree of integration will be higher, and the colour will also become warmer. The colour of several corridors is light blue, which is relatively average, and the degree of integration of the visual field is low, indicating that these areas are usually crowded, showing a "sparse" state. At the same time, the visibility of the area is average. There are fewer types and numbers of things. The last thing with poor visibility is the dark blue at the end of the four corridors in the plane. The overall integration of the four corners is relatively low, there is almost no flow of people, and at the same time, the visibility is poor.

3.4Agglomeration Coefficient of Edificio Comercial Si Toi 's Horizon

The agglomeration coefficient of the field of view is a judgment of the visual limitation effect of the space boundary. The agglomeration coefficient is judged and distinguished by analyzing the cold and warm colours of the picture. The warmer the colour, the higher the agglomeration coefficient, indicating that it interfaces with the surrounding space. The less limited the vision, the weaker the occlusion in the system. The colder the colour, the lower the value, the lower the aggregation coefficient, and the more obscuration in the system, that is, the more intense the line of sight is oppressed in the space.

It can be seen from Figure 7 that the areas with a high concentration coefficient of view are mainly concentrated in the external corridor of the elevator, an office on the left, a circular public area on the northeast side and a corridor on the south side, followed by the corridors on the east and west sides and the north side. The office area on the left may be a company, a centre or an office. More people are working inside, so this area has a strong agglomeration effect. The outer corridor area and public space have more people flow in the morning, middle and evening rush hours. Walk around and gather at the elevator entrance to wait for the elevator, or go down the first floor from the stairs on the right. Therefore, the colours of these areas are relatively bright. The colder colours are at the intersection of the six corridors and the upper right corner of the circular public area. People flow through the intersection during the rush hour. After a short stay, they enter the elevator and wait for the elevator to make the agglomeration coefficient of the corridor outside the elevator shaft. Increase, the convergence coefficient of the intersection is smaller. The result of spatial syntax analysis represents an overall average value, so the result still has a certain reference.

Fig.8. The control value of view field of Edificio Comercial Si Toi

Fig.9. The visual depth of Edificio Comercial Si Toi
(Image source: Drawn by the author)

Fig.10. The agent robot analysis of Edificio Comercial Si Toi

3.5Analysis of Horizon Control Value and Horizon Connection Degree of Edificio Comercial Si Toi

When the visual field control value is related to the analysis of the visual connection degree and the external space characteristics of the commercial centre, the public space is the research object, the closed area of the building is the boundary, and the spatial connection degree within a certain area is measured as a measure, which can reflect the whole The accessibility of the space inside the business centre. The viewing area control value is roughly the same as the axis control value, and the area of the current neighbourhood relative to the total area of the immediate neighbourhood is calculated. The viewing area control value helps to highlight the area where the observer can see the larger view of the spatial layout.

It can be seen from Figure 8 that the colour analyzed by the spatial syntax as a whole is light blue with some green. The internal space of the Edificio Comercial Si Toi is generally accessible, and the place with a higher visual control value is at the six junctions of the corridor. , Plus a corner position in the lower right cor-ner, these 7 areas are warm and bright in colour, so some conspicuous signs can be set up in these areas to facilitate the identification of outsiders, such as which companies and offices are on this floor, and these companies And the house number of the office, and a certain arrow guide is given to facilitate the identification of internal staff and outsiders coming out of the elevator. It can also post specific introductions of related companies and firms here, year of establishment, business scope, etc., so that relevant interviewers can learn more before entering the company for interviews and increase their intimacy. On the walls on both sides of the corridor area, you can also post some mental journeys of the company and the firm in the previous business, as well as photos of employees travel-ling and playing and introductions of each employee of the company, so that when the employees inside see these photos, I can feel that the company is as warm as my home, and I am fully prepared to work harder and serve Macau residents in the future.

In the 7 places with relatively high control value of the viewing area, and the connection degree of the viewing area is also high, the accessibility of these 7 places is strong, and it can walk in two or three directions, and the accessibility of the upper 3 areas The accessibility is stronger than that of the lower area, and the visual field connection value is also higher, indicating that in the future, the walls and ceilings of these three areas can be painted and the logo establishment can be more considered, and the richness is also higher than that of the lower 4 areas are stronger. In places where the control value of the field of view and the degree of connection are low, certain repairs and renovations can also be made to make it more visible to people.

3.6In-depth visual analysis of Edificio Comercial Si Toi

Visual depth represents the accessibility between an element and other elements in an open space. The total number of times the line of sight needs to be turned. The lower the value of visual depth, the less the line of sight in this space can see the space system. The more elements in, the more it can attract people's attention in this direction, and vice versa, it is not easy to attract people's attention. The analysis reflects the relevant characteristics of the public space in the Edificio Comercial Si Toi.

From Figure 10, it can be seen that the place with the lowest depth of view is at the three intersections of the three vertical corridors and the upper horizontal corridor, which is dark blue. This space does not require many turns to see other elements in the space system. , And there are many types of elements. The area with the largest dark blue area is the junction in the upper right corner. This area is an important area leading to the circular public space. The space elements that can be seen are the most, and It is the most complicated, with a wider range, and can attract people's attention in this direction. There is a move to find out. The ceiling position here can be equipped with a camera to ensure the safety of the commercial centre and prevent some people from committing crimes. It can be seen that space syntax also plays a very important role in crime prediction and prevention. The second lower position is the three junctions of the upper horizontal corridor area and the lower horizontal corridor, and the three vertical corridors. The colour of this area is light blue, which means that in this space, the line of sight needs to go through a certain turning point to see the space system—other elements. The warmer area in the picture is an office in the lower-left corner and at the end of the corridor. The office has a strong closed space and a narrow space for people to move around. In addition, there are more desks and chairs, drinking fountains, chandeliers, etc., in the office, which can obscure people's sight to a certain extent and cannot attract people's attention within a certain range, and weaken people's exploration of this space.

4. Analysis result: A typical commercial building in Macau in the 1990s-Bank of China Macau Branch Building (EDF. BANCO DA CHINA)

4.1Construction background of the Bank of China Macau branch

The Bank of China Tower (Portuguese: Edifício do Banco da China) was established on June 21, 1950, referred to as Bank of China Macau, formerly known as the Bank of Nam Tung (Macau). It is the head office of the Bank of China Macau branch, located in the Freguesia da Sé of the Macau Peninsula No. 315, Avenida Doutor Mário Soares, which was completed at the end of 1991.

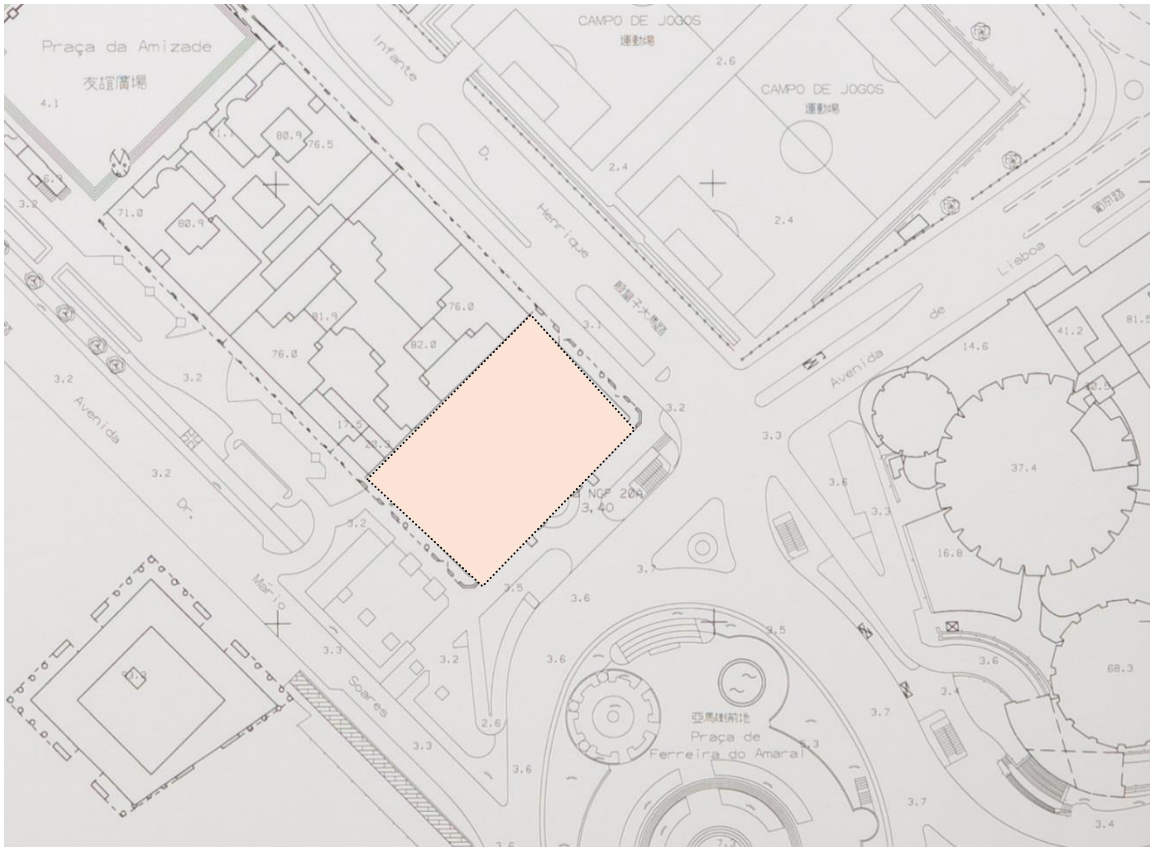

Fig. 11. 1991 Surveying and Mapping Map of the Cartography and Cadastre Bureau of the Government of the Macao Special Administrative Region(Image source: Cartography and Cadastre Bureau)

The 38-storey building was once the tallest building in Macau before the Macau Tower was completed. The location of the building was originally part of the old site of Liceu Nacional de Macau(Middle School). After Liceu Nacional de Macau(Middle School) moved to the Zona Nova de Aterros do Porto Exterior(NAPE) in 1986, a lot at the southeast end of the original site was used for the construction of this building[2]. After its completion in 1991, the head office of the Bank of China Macau branch moved from the Nam Tung (Macau) Commercial Building on Avenida de Almeida Ribeiro to this building. The entire building is more than 160 meters high, and there are also 3 floors of the basement, with a total construction area of 500,000 square feet. It is currently the highest and most modernized Grade A commercial building in Macau. On October 16, 1995, the Bank of China participated in the issuance of notes, opening a new page in the history of Macau's currency issuance. Before and after the return of Macau, it actively cooperated and participated in various important activities to welcome and celebrate the return of Macau and made active efforts to promote the smooth transition of Macau's economy and finance and the smooth transfer of sovereignty. Therefore, the Bank of China Macau Branch is now a branch of the State-owned commercial bank of the People's Republic of China in Macau and one of the largest commercial banks in Macau. It is jointly responsible for the issuance of Macau patacas and the functions of the Macau government's public treasury cashier agent bank with Atlantic Bank. It is worth mentioning that the Macau head office of the Portuguese Commercial Bank and KPMG (24th floor) is also located in the building, which is an important financial activity center in the Nam Van area of the Macau Peninsula.

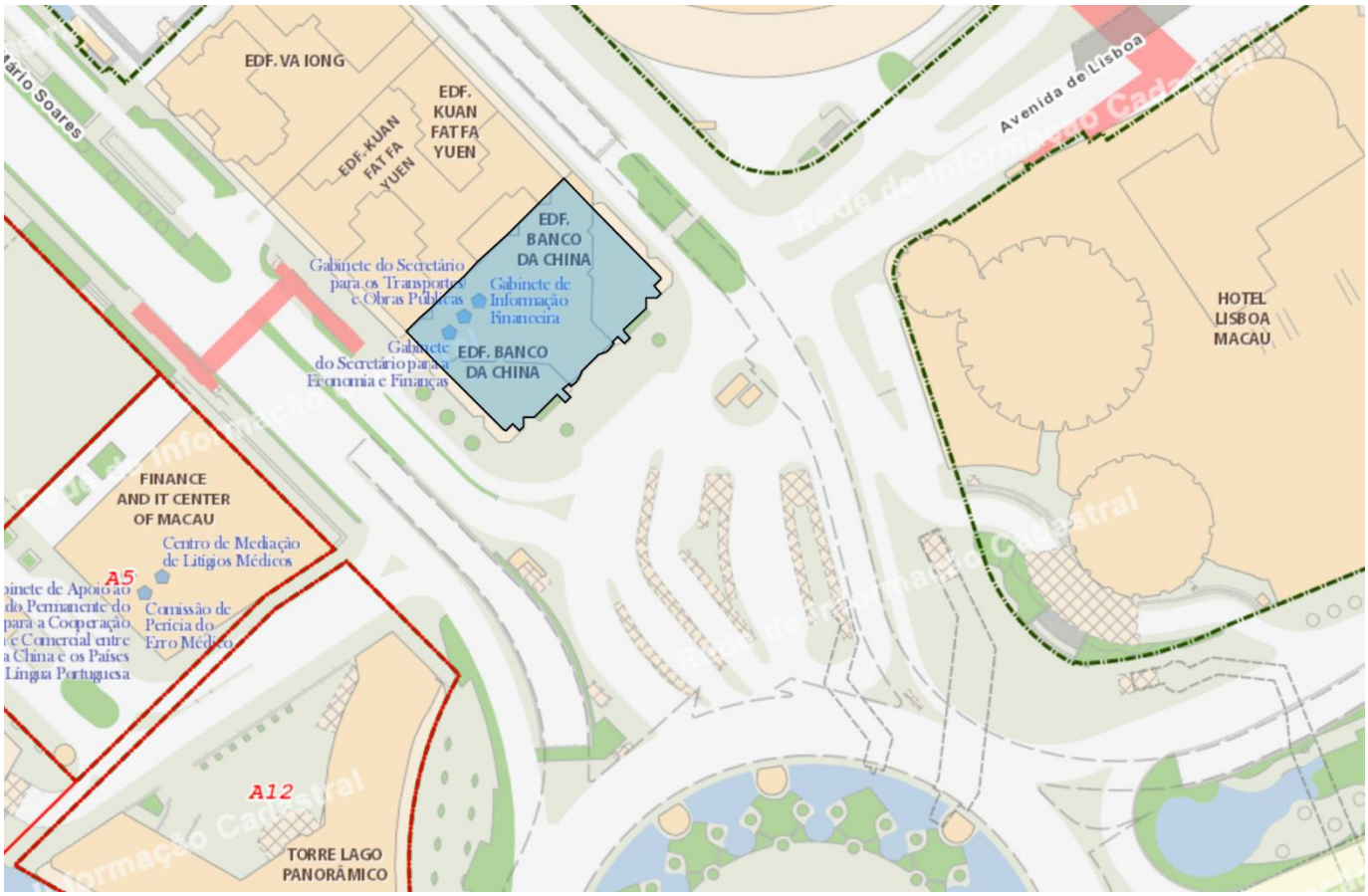

Fig.12. Current location: almost the same as the survey and mapping in 2022 (Image source: https://webmap.gis.gov.mo/InetGIS/chn/index.html,Cartography and Cadastre Bureau)

The building was designed by Mr. Remo Riva, a Swiss architect from P&T Architects & Engineers Ltd in Hong Kong, China (the shape is the same as the Standard Chartered Bank Tower in Central designed by the same person). The building is located in the financial and commercial center of the Nam Van area of Macau. The bottom of the building is a four-story podium, and the upper part is a tower, which looks like a rocket and a fanshaped crosswise view. The outer wall is made of pink granite and is matched with a silver reflective glass curtain wall. It has a multi-functional banquet hall that can accommodate more than 300 people, a lecture hall and a multi-functional meeting room with more than 200 people, as well as a staff club.

Fig.13. Exterior of Bank of China Macau Branch Building: Located at the core transportation hub of the Macau Peninsula (Image source: Photographed by the author)

4.2Analysis of Agency Robots of the Bank of China Tower

It can be seen from Figures 25 and 31 that the Bank of China Tower in the office area, through the simulation analysis of the agent robot of the space syntax, obtained a crescent-like shape, the upper part of the office showed a bright red, the colour upwards The lower two sides gradually decrease. This entire area is the place where the flow of people is higher, and the number of times to walk the "back" font is the most. It shows that the office is the main activity place for the staff of Bank of China, and the interaction between people is also strong-Reflects a good working atmosphere. The core tube on the first floor has six elevators plus a freight elevator, two stairs and two toilets and is equipped with a pantry, ventilation shafts, etc. In the corridor of the core tube, there are relatively few people going to the "back" font, and the colour is also blue, indicating that the staff of the bank are concentrated in the office area for a day and less toward the core tube. Walking around, the overall working atmosphere is still relatively good. It also shows that bank staff seldom walk in the direction of the pantry during work. It can also be guessed that the office area is also equipped with water dispensers, which facilitates the height of office staff. Working efficiently, you don't need to walk in the direction of the pantry frequently, just take the elevator when commuting to and from get off work, which guarantees working time and work efficiency, and plays a good leading role for other companies. At the same time, there are two external platforms on the 29th floor, so that bank staff who have worked hard for a long time can go through the door and jump out of the platform to watch the scenery in the distance. At the jumping platform, you can see Taipa on the opposite side. The main island and Taipa are currently being reclaimed from the sea. They can see the formed land, allowing bank staff to have more confidence in the future development of Macau. Promote their enthusiasm for work.

It can be seen from Figure 19 that on the 33rd floor, there are a large number of guest rooms, which are distributed up and down. There is also a platform outside the guest room for visitors to the lookout. It can be seen from the analysis diagram that the colour of the lobby area is brighter, and the number of people walking "back" has increased. There are three stairs in the middle, which serve as a passage for guests to go up and down, which has a very good service and guidance effect.

4.3Analysis of Horizon Integration of Bank of China Tower

It can be seen from Figure 15 that the areas with higher global integration are concentrated in the outer corridor area of the guest room on the south side, and gradually decrease toward the north side, and the colour gradually becomes lighter, indicating that the space in the lower corridor area is relatively likely to be observed by people. Higher, the scope of observation is relatively wide, and the potential of the space is greater, which can attract more guests to gather here.

From Figures 24 and 30, we can see that through syntactic analysis, the lower side of the office has a red colour of visual field integration. This area is in a wide-angle position of the office. The left and right sides of the area are obtuse angles. The whole office can be observed. The working status of all colleagues is clear at a glance. It is the core area of the whole office. Although the analysis from the above shows that the flow of people will not move in this direction, because the width of the area is not enough to place more offices. A water dispenser can be placed here so that the bank's staff can come over to fill water during a break and take a look at the office situation of their colleagues. To the north, the colour tone gradually becomes colder, and the two sides leading to the external platform on the north side are dark blue in colour, indicating that people in these two areas are less likely to observe other spaces, the range is narrow, and the types of elements are similar. Compared with the area on the south side of the office, it is reduced by more than half.

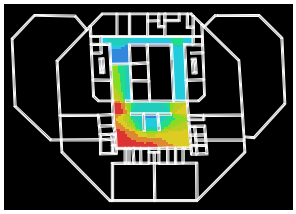

Fig.14. The 33rd-floor connectivity of Bank of China Tower

Fig.15. The 33rd-floor global integration of Bank of China Tower

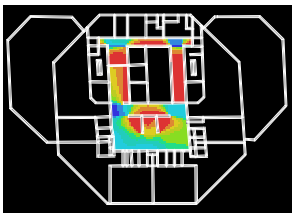

Fig.16. The 33rd-floor visual agglomeration of Bank of China Tower

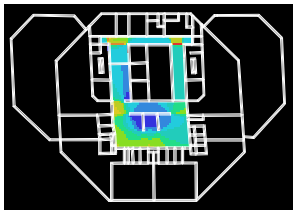

Fig.17. Horizon Control Value on the 33rd Floor of Bank of China Tower

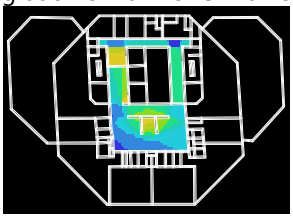

Fig.18. Visual Depth on the 33rd Floor of Bank of China Tower

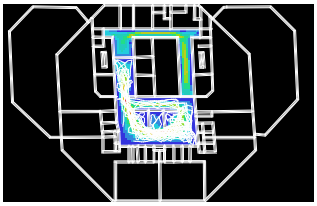

Fig.19. Analysis of Agent Robots on the 33rd Floor of Bank of China Tower

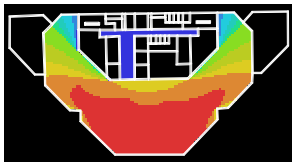

Fig.20. Connectivity on the 29th floor of Bank of China Tower

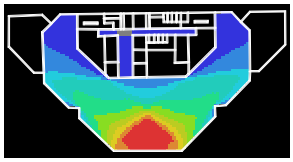

Fig.21. Global integration degree on the 29th floor of Bank of China Tower

Fig.22. Concentration degree of visual field on the 29th floor of Bank of China Tower

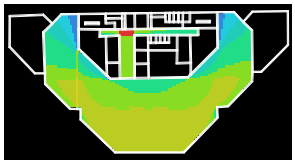

Fig.23. Visual depth control value on the 29th floor of Bank of China Tower

Fig.24. Visual depth of sight on the 29th floor of Bank of China Tower

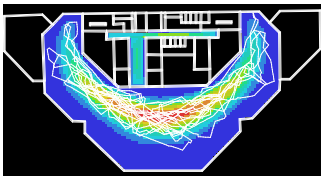

Fig.25. Analysis of Agent Robots on the 29th Floor of Bank of China Tower

Fig.26. Connection degree on the first floor of Bank of China Tower

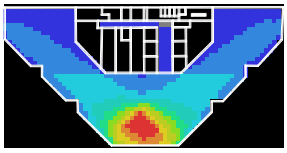

Fig.27. Global integration degree on the first floor of Bank of China Tower

Fig.28. Concentration degree of view on the first floor of Bank of China Tower

Fig.29. 1st Floor Horizon Control Value of Bank of China Tower

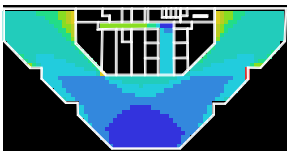

Fig.30. 1st Floor Horizon Visual Depth of Bank of China Tower (Image source: Drawn by the author)

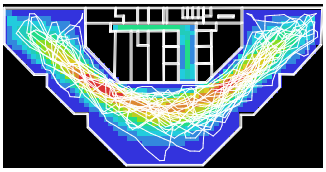

Fig.31. 1st Floor Agent Robot Analysis of Bank of China Tower

4.4Horizon Cluster Coefficient of Bank of China Tower

It can be seen from Figure 16 that the area with the highest concentration coefficient of the 33rd-floor plane view is concentrated in the middle staircase and the two corridors in the north section. As a building component for people to pass through, the staircase is an important part of the building. The less visually restricted the interface with the surrounding space is, the less one space can be connected to another space, and the better it plays the role of "connecting the above and the below". The 33rd floor is mainly for external services. Except for weekends and Chinese New Year holidays, there are usually more outsiders coming. If you want to greet the guests and leave them a better impression, first of all, in the interior design of the lobby, do It is easy to refurbish, including the setting of the lighting coefficient of the indoor lighting, whether it meets the indoor lighting standards, whether the colour matching meets people's preferences, and attracts people's attention. Secondly, in the interior exhibition design, in places with a high concentration coefficient of view, such as the guest room corridor on the north side of the 33rd floor, and the middle staircase, these places can gather more people in a short time under the action of space and space. Some signs and the development history of the Bank of China Macau branch can be set up or broadcast in a soft voice for visitors to listen and watch and improve their awareness.

From Figures 22 and 28, it can be seen that the areas with a high concentration coefficient of view are concentrated on the north side of the plan, at the periphery of the core tube, and inside the corridor of the core tube at the highest point, the colour is bright red when going to the pantry, toilet and elevator. colour. It shows that when bank employees are under heavy work pressure, people will walk to the left and right. After exiting the door, they can reach the observatory. And gather in the direction to the pantry and toilet. Therefore, it is necessary to increase the humanistic care, and in the future, try to give the staff care and love in actual operation as much as possible. In the invisible space, the agglomeration coefficient of the middle part can be increased.

4.5Analysis of Horizon Control Value and Horizon Connection Degree of Bank of China Tower

Observing Figure 23 and Figure 29, it can be seen that the place with a higher view control value is just in the lower middle area of the 1st and 29th floors of the plan, and it is evenly distributed in the larger area of the lower part. The colour shows a yellow-green state, the highest. The area is at the junction of the vertical and horizontal corridors of the core tube. The future update method is the same as the future update method of the horizon concentration above. Based on the consideration of humanistic care, the interior space design should be more suitable for people's offices. It is required to achieve the unity of comfort and harmony. On the display design of the internal office wall, you can post the development of the Macau branch over the years. The photo of each employee is posted on the wall. The content of the photo is as follows: Each employee's self-introduction, a group photo of the company going out for fun, and personal life photos of the employees should also be set up with encouraging slogans. Some snacks can be arranged in the office for people at work to enjoy during their breaks. Food fills up the staff's stomach and can have a better experience to face the next work and life.

It can be seen from Figure 17 that the place with the higher control value of the viewing area is at the two junctions of the lower corridor area and the upper horizontal corridor and the vertical corridor, and the lower place is at the middle staircase. In future indoor space updates, In places where the control value is high, some slogans that conform to the contemporary aesthetics and attract people's attention are set up at the door of the guest room, and the control of the light colour is more in line with people's vision so that the visitors can be physically and mentally comfortable, to achieve "people-oriented" "And "Comprehensively coordinated and sustainable" requirements.

From Figures 20 and 26, it can be seen that the highly connected areas on the 1st and 29th floors are concentrated in the office area, accounting for 70% of the entire plane, indicating that the spatial connection is relatively close, the office is relatively spacious, and the space is accessible The sex is better. The corridor of the core tube shows a dark blue state, the corridor is relatively narrow, the spatial accessibility is poor, and there are fewer spatial elements observed. It can be seen from Figure 14 that the places with better spatial accessibility on the 33rd floor are concentrated on the southwest side of the stairs. The colour of the entire area is warm, indicating that the area surrounding the middle stairs has better spatial accessibility. In the interior design, the accessibility

of the middle and right sides of the area can be improved invisibly. Some eye-catching chandeliers can be set up, or fruit platter and snacks can be placed in the right area to attract more guests to enjoy.

4.6Visual in-depth analysis of Bank of China Tower

It can be seen from Figure 18 that the area with lower visual depth on the 33rd floor is located at the middle staircase. The sight in the staircase space can see other elements in the space system with fewer turns, and the more it attracts people's sight. This direction is concerned, so in the future update design, this space should be better used. The middle platform of the stairs faces the ceiling, and some beautiful drop lights can be set up. The stairs platform can also be placed with a shelf, which houses the Bank of China Macau branch.

The colour configuration of the stairs itself should be more distinctive. In the configuration that matches the overall indoor colour, additional colour is added to attract people's attention, to be unobtrusive and in line with the concept of Macau as a diversified city. It can be seen from Figures 24 and 30 that the lowest visual depth of the office is on the south side of the office, and its changing trend is just the opposite of the connection degree, but the meaning is the same. In the future update of indoor space, it should be consistent with the above view field connection value.

5. Conclusion

Since the two commercial buildings were constructed before Macau's return to the motherland, they have been in use for a long time. Through the calculation of spatial structure and spatial agglomeration, the problems and spatial features currently in use can be found as early as possible for the follow-up effective environmental optimization design provides reference ideas.

Funding: This research was funded by China Youth Elite Project (Foundation) - One of the phased research results of the 2019 Youth China Walk Guangdong-Hong Kong-Macao Greater Bay Area SDGs project "Research on Sustainable Development of Urban Waste Recycling in Macao".

Conflicts of Interest: The authors declare no conflict of interest.

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