Spatial characteristics of semi-detached historical areas and their impact on visitors' turnout
(Analytical study of the Citadel of Salah El-Din in Cairo using the Space Syntax Theory)

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ABSTRACT

Historic areas occupy the pinnacle of global interest because of the historical and social values they contain that reflect the history of human civilization, which gives them an economic weight that helps preserve the historical character of the urban void.

Where the urban fabric of those areas affects their ability to attract large numbers of visitors and, consequently, the economic return to them. This is because the traffic path of visitors is affected by the spatial properties of the urban fabric, which is reflected in the turnout and the length of the visit period, where the turnout of users is one of the most important criteria that shows strengths and the weakness of the region, and thus help in limiting the problems of those regions and developing them in a way that ensures the preservation of the historical.

The research uses the space syntax theory to find out the spatial properties of the area under study and determine its impact on the behavior of visitors by converting the spatial properties into a quantitative form that helps in limiting the spatial problems and better identifying the solution proposals through the use of the depth map program.

The research focused on studying the characteristics of semi-separate historical areas, which are characterized by an independent fabric with clear characteristics and chose the area of Salah El-Din Castle as one of the distinguished models architecturally, planning and historically, with the aim of identifying the problems and characteristics of semi-separate historical areas that affect the efficiency of the visit.

KEYWORDS:
Urban conservation, sustainable tourism, spatial wholesale, historical areas

Research problem:
Lack of morphological studies on historical areas and their relationship to users

The decline in the efficiency of the tourist and archaeological castle of Salah El-Din, despite its enjoyment of exceptional archaeological and international value

Hypothesis:
The impact of the morphology of the site on the course of the visit and the extent of visitors' turnout

The effect of the number of entrances to the site on the efficiency of the movement axes and on the spatial properties of the space configuration

Spatial analyzes of historical sites are the most appropriate ways to develop alternative solutions to the urban problems of those sites

Research purpose:
Develop a proactive approach to study the impact of the morphology of historical sites on visitor turnout and determine the functional efficiency of urban spaces to maximize the benefit of the visitor management plan and maximize resources

Determine the main reasons for the low efficiency of the site.

1. INTRODUCTION

Cultural sites "for many centuries greatly" have influenced our lives because they represent" a unique artistic achievement, illustrate an important stage in history and bear exceptional testimony to civilizations that have disappeared" .

This is because the social, cultural, and environmental heritage of societies is an invaluable asset that cannot be ignored or replaced. That is why UNESCO started the World Heritage Sites (WHS) project more than 50 years ago with the aim of providing a way to implement continuous monitoring to preserve these sites. Therefore, UNESCO does not include any cultural property in the World Heritage Lists unless its nomination file contains a plan A management of historical properties that reflects its economic resources and material needs, which is why Egypt, despite having an incomparable cultural and archaeological stock, has only included only seven sites in WHS and thirty-two sites in the provisional list (UNESCO, 2013) .

Not only that, but some of the sites listed have been included in the list of sites in danger by UNESCO due to being directly threatened due to the lack of security, pollution, and mismanagement of these sites (UNESCO, 2013). This was to be expected due to the negative effects of a tourism industry, which is poorly managed and unsustainably exposes the tourism assets themselves to consumption (El-Barmelgy 2013)

After the announcement of -WHS, some of the international sites included in it began to gain popularity in the form of additional tourist attractions, while other sites suffered from a lack of visitors. It is one of the major sources of threat resulting from mismanagement, which results in a decrease in expected revenues or direct damage to the impact.

Fig. 1: Salah El−Din Citadel

The study chose Salah El-Din Castle in Cairo **Fig. 1.** as an applied case due to its great historical and cultural value and due to its architectural uniqueness represented in its walls and towers and the multiplicity of eras and historical buildings in it. It indicates that there is a problem that needs to be studied and analyzed

2. Salah El-Din Citadel in Cairo

Salah El-Din Citadel is one of the most important landmarks in Islamic Cairo, and one of the most luxurious military fortresses built in the Middle Ages. Its strategic location on the top of Mokattam Mountain afforded a wonderful view of all the landmarks of historical Cairo. Professor Zahi Hawass said, "The Citadel is definitely the fourth pyramid of Egypt. It is the pyramid of antiquities. Islam in Egypt. The fortress lasts more than 837 years (Williams 2002) , from the beginning of construction during the reign of Salah al-Din until now.

Salah El-Din Citadel was founded in 1176 AD, and Salah El-Din Citadel, known as the Citadel of the Mountain, is one of the most important Islamic monuments in Cairo. Major defensive project (Al Sayyad 2011)The location of the fort was carefully selected based on military requirements, as the fortress was supposed to be a strong fortification point. Salah al-Din wanted the citadel to be a new center for his rule, housing (royal palaces), and a fortified place for his army. The castle was completed to its present form in 4 successive eras. (1200-1517) after the era of the Ayyubids and then the eras of the Mamluks, respectively (Williams 2002).

The citadel was built on the lines of medieval cities, a huge wall surrounding the entire castle, interspersed with a number of high-rise towers, and connected planning to a larger wall that surrounds the cities of Cairo and Fustat together, so that one army can protect the two cities against any aggression, provided that the castle is the center of the wall, and I chose Mokattam Mountain as a site Perfect for her, which made attacking her difficult.

The castle was divided internally into northern and southern sectors with internal walls and gates. The first wing is located on the northern side, rectangular in shape, surrounded by walls on the northern and eastern sides. It was built during the reigns of Salah al-Din al-Ayyubi and his brother al-Malik al-Adil. It was used as a military garrison. As for the (The second wing) southwestern sector of the castle, there is the Palace of Government and the residence of the governor.

The castle contains many archaeological buildings, including 4 mosques, 3 museums, 4 palaces, 4 main gates, historical defensive walls, 13 defensive towers, and a number of squares.

(Culture، 2005)

Fig (2) Scheme of the Citadel of Salah al-Din

(https://akhbarak.net/photos/articles-photos/2019/6/10/36867510/36867510-v2_xlarge.jpg?1560186418)

Fig (3) EL-GADEAD door:

Discover –قلعة صلاح الدين الأيوبي Islamic Art – Virtual Museum (museumwnf.org)

Fig (4) EL-MODARG door

2.1.castle doors

The castle has four main gates:

The first: Was known as the Mokattam Gate because it is adjacent to the Mokattam Tower, which dates back to the Ottoman era. Currently, it is known as the Salah Salem Gate (Culture 2005)

The second: Known as the **EL-GADEAD door,** Muhammad Ali Pasha began building the New Gate in 1827 and paved a steep path for it to facilitate ascent and disembarkation from the castle. This road is known today as the **EL-GADEAD door,** Street or the Mahjar Railway.

The **EL-GADEAD door,** was built as an alternative to the inserted door built by Al-Nasir Salah al-Din al-Ayyubi in 579 H / 1183 AD

The third was known as the **Wastani** Gate (Fig5), as it was mentioned in one of the books of the French orientalist "Paul Casanova" in 1894, in which he said that this door was called the **Wastani** because it is in the middle of the two large diwans in the Royal Court, which are the Diwan of Qaytbay and the Diwan of Al-Ghouri. The **Wastani** Gate overlooks the **EL-GADEAD door,** to the north It is one of the inner doors of the castle, which was intended for princes and senior state officials. **Fig (8)**

Fourth: It was known as **Al-Azab**.door It is located in front of the Sultan Hassan School and Al-Rifai Mosque. It is one of the largest and most beautiful Islamic doors. It is very similar in its composition to Bab Al-Futuh and Zuweila. It is composed of two large rectangular towers, with a round front.

Fig (5)Wastani Gate

Fig (6): One of the castle towers

Fig (7) Citadel of Salah El-Din in Cairo

2.2. constellations

The wall of the mountain castle contains 13 towers, ensuring permanent protection for the soldiers and residents of the castle. They are Al-Muqattam, Al-Saffa, Al-Alwa, Karkilan, Al-Tarfa, Al-Matar, Al-Mablat, Al-Muqsir, the Imam known as the Al-Qarafa Tower, Al-Ramla, Al-Haddad, Sahara, Al-Murabba (Azeb 2006).

2.3. palaces

The Castle of the Mountain also includes four palaces, two of them were built during the reign of Muhammad Ali Pasha, namely the Jewel Palace, which was established in 1814, the Harem Palace, which was established in 1826, and a palace dating back to the fourteenth century, which is the Al-Ablaq Palace built by Sultan Al-Nasir Muhammad bin Qalawun in 1314 It is located on the western side of the mountain slope, in addition to the Saray al-Adl Palace.

2.4. mosques

The castle has four main mosques, the oldest of which is the Al-Nasir Muhammad Mosque, which was built in the year 1318 in the early Mamluk Bahri era, the Suleiman Pasha Mosque, which was built in the year 1528 in addition to the Muhammad Ali Pasha Mosque, and the Ahmed Katkhuda Mosque   (Azeb 2006).

2.5. Museums

The castle also contains 3 museums, the Jewel Palace Museum, and the Vehicles Museum, which opened in 1983, and includes a collection of unique royal cars dating back to different historical periods, from the era of Khedive Ismail to the era of King Farouk, in addition to another group of unique antiques, there is also the Military Museum, which is the official museum of the Egyptian army, and was established in 1937 **Invalid source specified.**
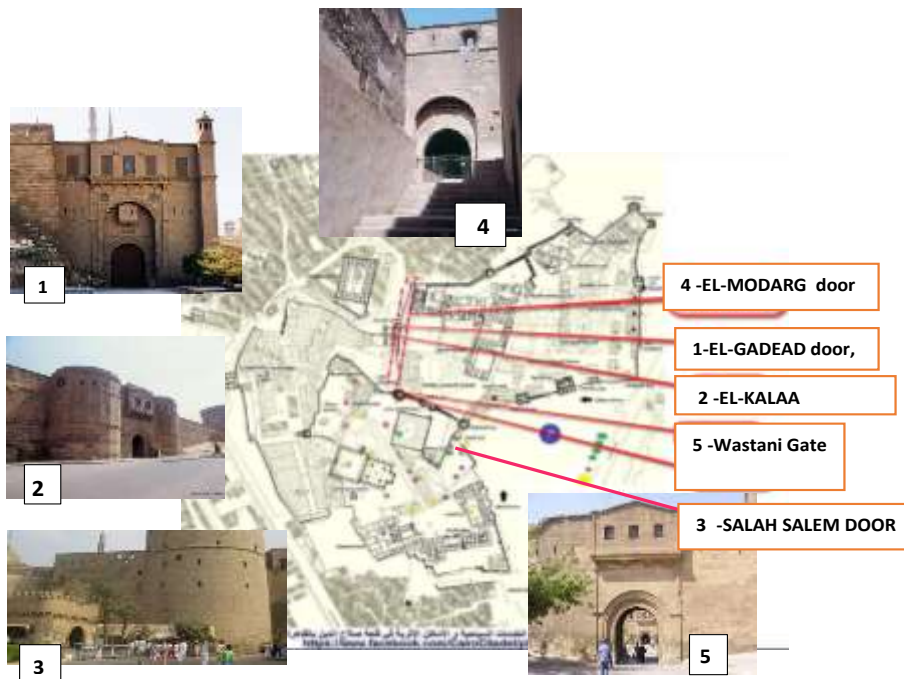

Fig (8) the door of Citadel of Salah El-Din in Cairo(author)

2.6. Despite the outstanding historical value of the castle, it suffers from some problems, including:

- Bad tourism practices, as visiting the castle is allowed without any restrictions or regulations
- Allowing visitors to the castle (international, Arab, local) to roam without any restrictions or even supervision, which threatens the monuments
- The lack of tourist activities, which reduces the demand for visits, as well as the lack of services provided

- The lack of good management of the visit process in a way that ensures the sustainability of tourism

- The tourism experience's lack of a study of the urban properties of the castle and its impact on the behavior of users and its reflection on the tourist turnout caused a lack of revenues despite the high archaeological and historical value. This necessitated an in-depth study to determine the elements of the site's tourist attraction and how to take advantage of the site's properties in a way that activates the efficiency of use

3. Previous studies

The studies dealt with the castle as a distinct archaeological phenomenon, but most of the studies were historically aimed at collecting and recording historical data through monitoring events, their chronological arrangement, and their cultural implications, such as (The Book of Walls and the Citadel of Salah al-Din) **Invalid source specified.**. Establishments such as (The Book of Salah al-Din Castle) (Culture 2005),which dealt with architectural and archaeological studies and previous restoration projects, but despite that, the analytical studies that depend on monitoring the fabric and the urban and social surroundings of the castle are very few, including the study of Dr. El-Barmelgy (El-Barmelgy 2013). Which dealt with the state's plans to increase and improve the level of the visit through the management of the visit plan, and it relied on the research on the use of questionnaires and data collection from users. Decreased visitation rate and the most important recommendations were summarized in increasing the services provided to tourists, setting up guiding boards, and providing unpolluted internal transportation.

The study of Omar Abdulwahhab Khalaf (Omar Abdulwahhab Khalaf 2020) also dealt with analyzing the urban fabric of the castle using GIS 3.3 program and Arc Veiw program.

First: Through the analyzes, he gave a set of measurements related to the urban fabric of the castle without addressing the urban environment.

Second: The study did not show the problems of the spatial organization of the castle and affecting the urban development

The study contented itself with giving quantitative indicators about the spatial properties only, without linking them with the phenomenon of low visitation rate

Therefore, the study adopted the use of one of the precise mechanisms in urban analysis (spatial syntax theory) as one of the quantitative analytical measures in order to reach solutions that increase revenues based on the ability to promote a functionally and visually distinct tourist experience and to maintain and preserve the castle for current and future generations.

4. space syntax Theory:

Space Syntax Theory is a set of techniques used to describe the spatial arrangement of a built environment (Hillier 1984) to understand and validate its urban functions and properties. Space Syntax theory was applied in 1948 by Heller and colleagues at University College London, then used Subsequently, by many scholars and researchers to study the relationship between urban and social formations around the world as a tool to help urban planners simulate the potential social impacts of their designs., Heller considered that the spatial characteristics of urban organizations are one of the effective means through which historical sites express the goals that It was established for it by providing the basic paths of movement, places of meeting, and isolated (private) areas, which the theory considered the material generator of social life.

The spatial syntax theory gives a set of indicators that can be applied individually or completely to urban and architectural spaces to analyze the relationship between space and users. And directing its vocabulary to the required development goals (.Ahmed,Basil , M.Sc.Hadeel Salim 2016) Where the theory deals with how each space (space) relates to the rest of the spaces and the strength of the relationship between pedestrian or vehicle paths and the spatial configuration. Through the use of axial and convex maps to measure some indicators, including the
• Integration
• Average depth and total depth
• The degree of communicativeness and control over space

Where the efficiency of urban spaces is tested using (space composition theory) by using the Depth Map 10 program, which gives the plan a clear picture of the urban system by identifying two types of spaces, which were known by Bill Hillier as integrated spaces and isolated spaces, the main goal is to identify the most integrated and isolated spaces within the urban system, which enables the planner to facilitate the signing of urban activities within the urban context. As well as testing the degree of clarity of the system, clarity is the characteristic that makes the place aware and enables the person to move in it easily and quickly, to find a goal such as finding a specific museum, historical palace, or visiting the specific yard and others.

And since the study focuses on the problem of the extent to which visitors sign the urban activities within the urban system, depending on the spatial characteristics of the system, the urban activities are subject to planning criteria in the spatial signature on the one hand. On the other hand, the ease of access to the activities is subject to the clarity of the system. Thus, space structure theory is an effective tool for discovering the spatial structure of the urban environment and for giving different characteristics to urban spaces. It is a method of describing and analyzing the tissues of spaces that fall under the morphological approach in research at the architectural and urban levels, as it helps to discover the extent of the interconnection of an area with its parts and to measure the extent of accessibility from one place to another within the spatial organization.

4.1. Space Syntax Technique Modules:

Syntax technology is based on the analysis of space as the unit upon which all human activities are based. It reflects the social and cultural aspects of the city. It is an essential aspect of the reality of people's actions and not a background to the activities of the population located within its borders, through the use of two types of maps (axial maps and convex maps) **Invalid source specified.**

According to the space structure theory, urban space is classified into:

• Convex space

• Axial space

• Isovist space

The previous spaces are analyzed using

a- Axial map

The longest and lowest lines covering the space system are drawn, through the axial map. It offers the most comprehensive perspective on the study of motion **Fig (9)**

B- Convex map

It is a term given to the shape of space, where the convex space is defined as the area in which any two points can be connected by a straight line that does not go beyond the boundaries of space. Convex spaces are used when studying the interaction. **Fig (9)**

C- Isovist map

Benedict defines the Isovist concept as "the set of points visible from a distinct point in space and can be created automatically using a program such as Depth map as it is the field of view in which the boundaries of the entire space can be determined by moving the observer's eye around 360 degrees without visual obstruction. The shape of the field of view in isovist maps are sensitive to the location of the point of view in non-convex spaces, where there will be many fields of view of different shapes. It is used when studying complex patterns of behavior. **Fig (10)** (.Ahmed,Basil , M.Sc.Hadeel Salim 2016)

4.2. The three previous maps identify a specific set of numerical indicators that explain

4.2.1. Local (objective) characteristics

They are the characteristics associated with the nature of the relationship of space with the spaces directly adjacent to it, and they appear through the indicator of connectivity, the rate of relative depth, and local integration.

4.2.2. Holistic characteristics

These are the characteristics that determine the nature of the relationship between space and the rest of the system spaces, and they appear through the index of total integration, total depth, and degree of control.
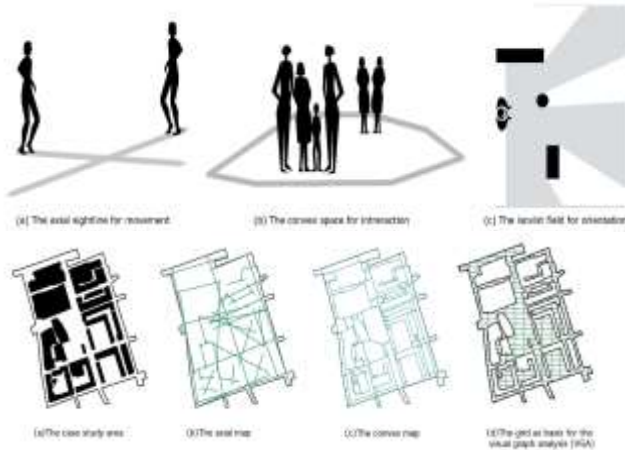
(yamu,claudia –nes,akkelies –garau, chiara, 2021/03/19)

**Fig (9) Convex space representation and axial map**
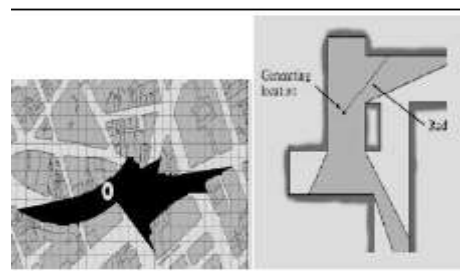
(Batty 2004)

Fig (10) Isovist map

4.3. This technique is used to obtain a number of mathematical indicators

mor depth (less integrated)	less depth (more integrated)
Fig (11) **Invalid source specified.**	

- **depth**
  o Mean Depth (MD)
  o Total Depth Index (TD),
- **Integration**
  o Indicator of the degree of integration value (i).
  o Comprehensive Integration
  o Local Integration
- **Connectivity:**
  o Relative Asymmetry (RA)
  o Control Value (CV),
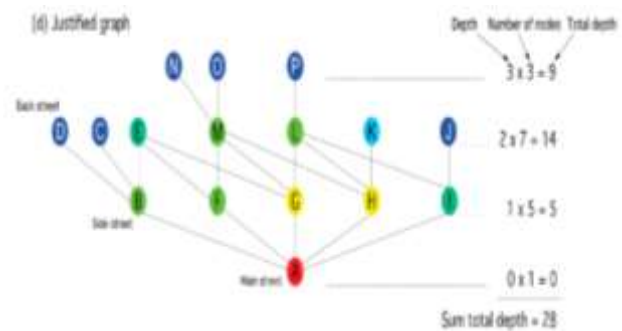
Fig(12) Method for calculating the rate of depth
(yamu,claudia -nes,akkelies -garau, chiara, 2021/03/19)

88

4.3.1. depth:

The term "depth" refers to the number of overlapping lines that must be crossed to move from one space to another, the minimum number of steps indicates a higher degree of (integration), while the maximum number of them indicates a higher amount of separation (isolation). Fig (11) It is the most intuitive analytical method where The regions with the lowest distance depth values are considered to be closest to all other regions and least isolated **Invalid source specified.** (Mustafa 2010)

4.3.2. Relative depth rate indicator

MD = (Mean Depth)

This scale is considered an indicator for measuring the degree of symmetry of global spaces, as it determines the number of visual-kinetic steps that

The space is separated by it relative to the spaces of the system as a whole, and the depth can be calculated from the following equation: Fig (11)

$$MD = (S D K) / (K-1)\ldots\ldots\ldots\ldots(1)$$

where:

MD = Relative depth rate

DK = the depth of the other spaces relative to the base space, and it is calculated from the number of optical steps away from the base space.

K = number of spaces for the system

4.3.3. Total depth standard = (TDn)

It is "the total of the least number of moves from any space to all the spaces in the space structure.

4.3.4. integration

Integration is the most frequently used property in the literature on space construction, and it is obtained by dividing the total depth. on the number of voids in the system (the more integrated lines mean the least deep. The deeper voids are the least integrated) On the other hand, the deeper spaces are the more separated (isolated) and vice versa (Hillier 1984)

4.3.5. integration[HH]

It shows how each space is related to the other spaces within the total system, depending on the largest possible amount of movement change.

4.3.6. integration[HH]R3
It refers to the isolation or integration of space and is related to the idea of depth. The depth represents the least number of steps in the scheme to reach from one space to another. Integration describes the average depth of space, and here three steps are calculated to move from one space to another, and the resulting values are around the number (1), as values less than (1) indicate that the spaces are more integrated, while values greater than (1) indicate that Spaces are more isolated (Hillier 1984)Integration values are indicators of average depth, where the relationship between depth and integration is (Omar Hazem Kharoufa 2011)

4.3.7. Connectivity :
Connectivity is defined as the number of lines or nodes directly related to each line or node, and it is measured by the number of connections of a particular space with neighboring spaces, where the high value of connectivity indicates the flexibility of movement within the system and vice versa (Hillier 1984)

4.3.8. Control : CV
It is defined as the scale that expresses the degree to which a space controls entry into the spaces directly adjacent to it. In general, the dominance of space is inversely proportional to the connectivity of the spaces directly adjacent to it.

Table No(1)		
TDn	: Total Depth (TD) for actual node	
MDn	: Mean Depth (MD) for actual node	MD=TD/(K−1)
RA	: Relative Asymmetry	RA=2*(MD−1)/(K−2)
i	: Integration Value	i= 1/RA
K	: Number of nodes	

The process of analyzing the urban environment requires two basic things: first, defining the elements of the urban structure, and secondly, studying the relationship between the components (synthetic analysis) and then determining the values (quantitative analysis). (Convex map) and to reach the most integrated and isolated spaces in the region, as the quantitative analysis of the site achieves two main goals:

First: It is possible to distinguish and know the places of quiet spaces with high privacy and noisy spaces that have less privacy
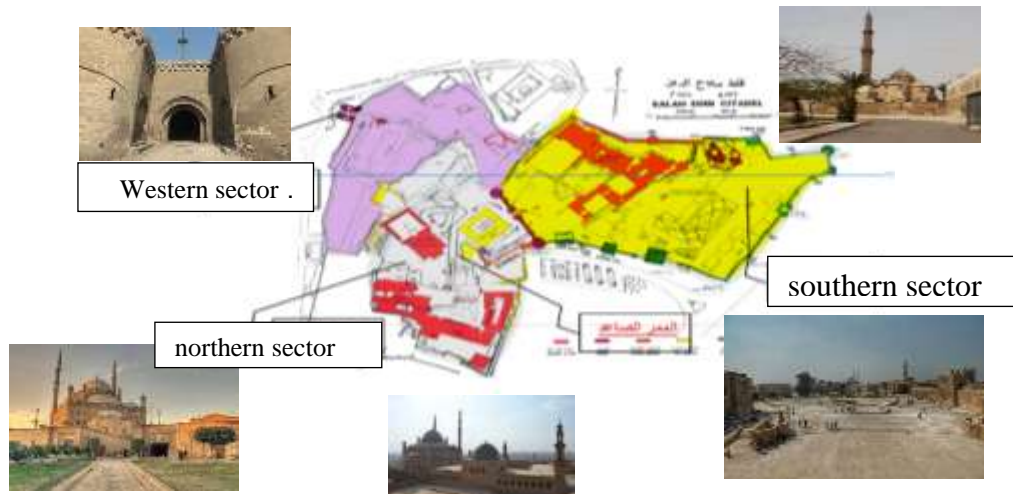
(author)

Figure No. (13) The main castle sectors

Second: The quantitative analysis gives us a clear idea of the locations of urban activities within the system and according to the planning standards for each event. The efficient museum areas must enjoy a high percentage of isolated spaces to give a good environment such as calm and privacy.

As for clarity (intelligibility), it must be high, especially in the places where the archaeological buildings are located, which require good viewing.

5. The spatial structure of the castle

The castle actually consists of three areas.

5.1. The first is the southern sector and consists of two parts on two levels.

Part One: It includes Al-Jawhara Palace, Saraya Al-Adl, and the Mint

Part two: It enters from the ascending corridor that leads to the Muhammad Ali Mosque, the Al-Nasir Muhammad ibn Qalawun Mosque, and (the Police Museum, the Citadel Prison, and Al-Alam Square). They enter through AL ALAM gate.

5.2. The second is the northern sector and consists of two parts.

Figure No. (14) Wastani Gate The entrance to the western part from inside the castle EL AZAB door from outside

Figure No. (15) The entrance to the northern part (KALAA DDOOR) and the Military Museum

The first part: The Military Museum and (Harem Palace).

The second part: contains an open theater for the citadel, Sariat al-Jabal Mosque, and the chariot museum (some of the army buildings that include 12 buildings from the nineteenth century were used in the past as a camp and housing). For English soldiers during the colonial period as well as the Red Palace, the Royal Chariot Museum, the Salhdar Building, and the castle gate. The second part of the northern sector entered from outside the castle through the EL-MODARG door (currently closed) and from inside the castle through the castle tower door.
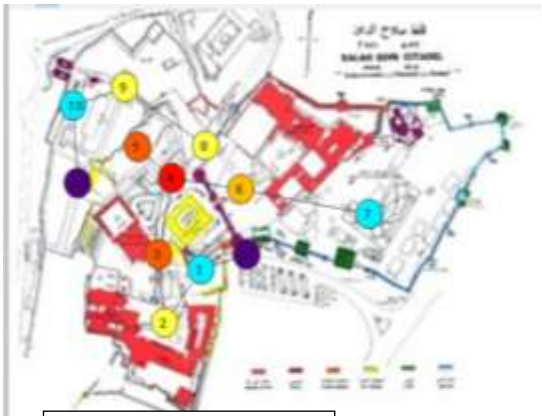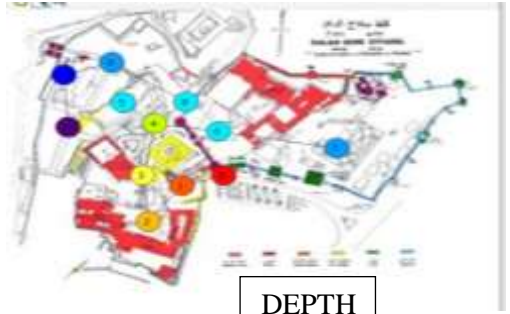
5.3. Western sector

Entry is through the Wastani Gate from inside the castle and the EL AZAB door from outside the castle. It includes the Radwan Katkhuda Mosque, weapons factories, soldiers' clothes, the remains of the Al-Ablaq Palace, and the royal stable. It is closed and in poor structural condition due to neglect.
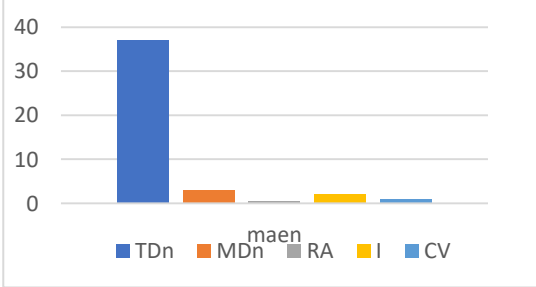
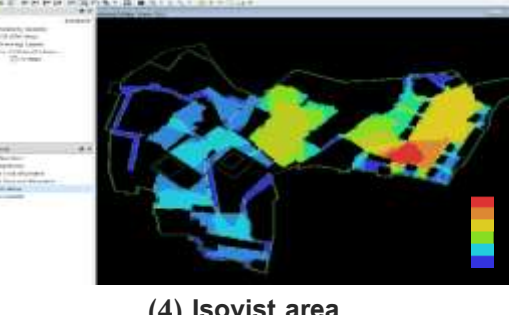# 6. Analytical study of the Citadel of Salah El-Din in Cairo using the Space Syntax Theory

6.1. Morphological analysis of the castle

	1. Spatial analysis of the castle using the Agraph program				
	(general indicators based on the presence of one door to the castle)				

CV	i	RA	MDn	TDMn	
0.	1.	**0.66**	4.	52	**0**
1.	1.	**0.44**	3.	42	**1**
1,00	2.	**0.44**	3.	34	**2**
0.	3.	**0.22**	2.	28	**3**
2.	4.	**0.22**	2.	24	**4**
0.	2.	**0.44**	3.	34	**5**
1.	2.	**0.22**	2.	32	**6**
0.	1.	**0.44**	3.	42	**7**
0.	3.	**0.22**	2.	28	**8**
1,00	2.	**0.44**	3.	34	**9**
1.	1.	**0.44**	3.	42	**10**
0.	1.	**0.66**	4.	52	**11**
0.2	1.	**0.22**	2.	24,00	Min
1,00	**2.**	**0.44**	**3.**	**37,00**	**Mean**
2.3	4.	**0.66**	4.	52,00	Max

CONTROL VALUE

INTEGRATION

DEPTH

1. From the analysis it appears that the index of control of the central part of the castle increased as a result of the possibility of entering the northern and western parts through
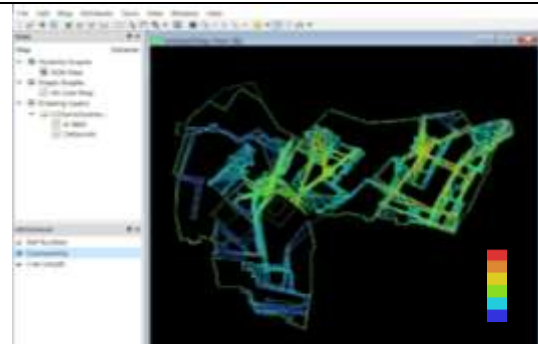
Spatial analysis of the castle The initial analysis of the castle shows the height of the total depth and its impact on the rest of the indicators	the central part of the southern sector 2. 2Increasing the average depth from the main door of the castle to the end of the northern part, where it reached 42, and the end of the western part, reaching 52, which affected the integration of the spaces of the castle as a whole. 3. The rate of integration decreased as a result of the increase in depth, and it reached the largest integration coefficient in the central part and the lowest in the western part
Table No. (2) The effect of using a single entrance on the spatial analysis of the castle	

| 1.1. **Spatial analysis of the castle using depth map program (detailed analysis)**	
(**convex map**)	
 Visual integration (HH) (1)	 **Connectivity** (2)
High visual integration of the central region and a decrease in the rest of the parts as a result of the high rate of depth	concentrated the high rates of visual communication in the squares because of the connection of the main sectors of the castle with narrow corridors that obstruct vision
 Angular mean depth (3)	 **(4) Isovist area**

The low rate of depth in the central part and the high level of its integration – the high rate of depth in the rest of the parts, which increased the proportion of isolated areas – the northern part was distinguished by a high–visibility rate due to the vastness the square of the open castle theater
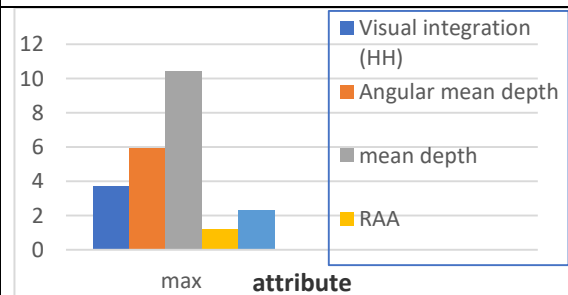
(Axial map)

attribute	min	mean	max
Connectivity	**2**	**157**	**375**
Visual integration (HH)	0.95	2.1	3.7
Angular mean depth	1.4	2.7	5.9
Entropy	2.4	2.9	3.4
mean depth	3.35	5.03	10.4
Relativised Entropy	1.8	2.5	3.8
RA	**0.004**	**0.006**	**0.016**
RAA	0.3	0.5	1.2
Control	0.2	1	2.3

axail map (5)
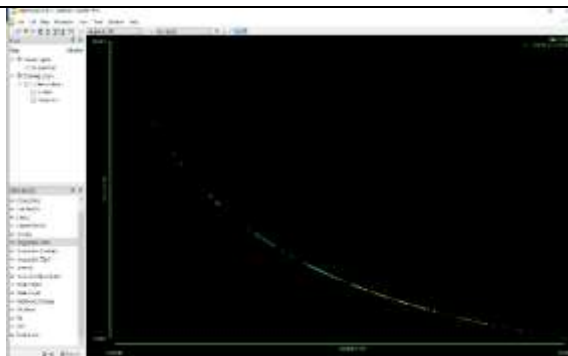
The inverse relationship between high depth and low integration
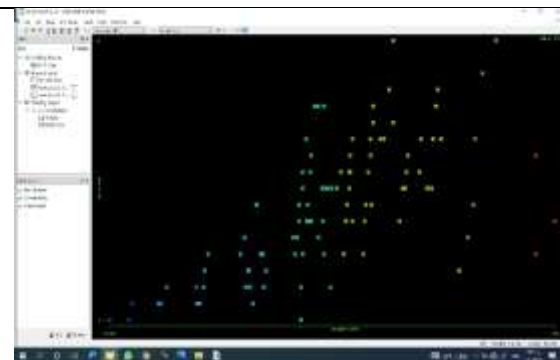

Quantitative analysis of the steric properties of Salah El–Din Citadel

The basic indicators of the spatial properties of the castle

Associative index R=0.499

The value of the correlation between local integration and holistic integration indicates the weakness of the relationship and the lack of coherence of spaces

Clarity index R=0.4114

The value of the correlation between communicativeness and integration indicates the weakness of the relationship and the lack of clarity of the Unintelligibility system.

Table (3) Total indicators for visual and axial analysis

7. Results of analyzes of optical and axial maps: (Table No. (2), table no (3)

The relations of the spatial and visual organization of the Citadel of Salah al-Din did not receive an adequate share of study, despite its importance, as the citadel contains a number of internal squares that contain a number of heritage buildings, which are linked to each other by gates that control the movement of the visit, with the presence of a single-entry door, making dealing with the site as a unit. One despite the different spatial properties, which are reflected on the nature and quality of the appropriate activities and for the purpose of achieving the objectives of the research, the current situation of the castle was first analyzed through (justified graph maps), then using the (depth map) program and analysis of the axil map and visual maps and the results were as follows

Through the analyzes of the maps, some important indicators were extracted from them
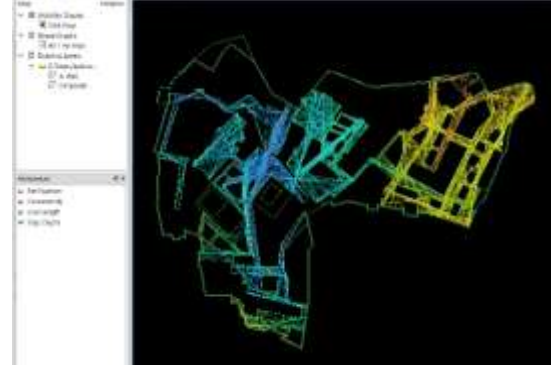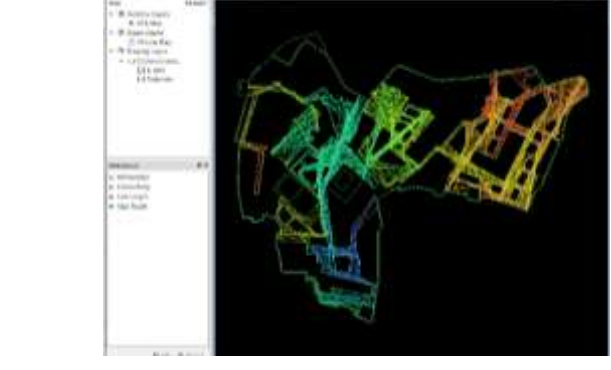
7.1. Depth indicator :

It is clear that the average depth is high during the urban spaces far from the main door, which increases the isolation of these spaces, as the average visual depth ranges between 1 and 6 for the maximum visual dimension and between 3 and 10 according to the axial maps that represent the movement of the visit, which is shown through the visual map No. (3) And the pivot map No. (5), where the blue color indicates the lowest value and red the highest value

7.2. Integration:

The high rate of the total depth reduced the total integration of the spaces, which affected the movement of visitors, which was characterized by a little clarity coefficient, except in the second part of the southern region, where it is characterized by a high integration rate since it is the connection point between the three sectors of the castle through the internal doors (Citadel Gate / Al-Bab The middle / Bab Al-Alam) in contrast to the western part, which was characterized by a large depth rate and less integration, which made this area largely isolated, especially due to the closure of Bab Al-Azab, which led to a clear deterioration of the western part.

The effect of the depth rate on the efficiency of the spatial properties of the castle as a result of treating it as one sector and not three sectors, which was shown by using one door to enter and close the remaining doors

8. Analyzing the effect of using three doors on the depth index compared to using one door

Spatial analysis of the use of three doors	Spatial analysis to use only one door
The visual analysis of the use of three doors shows a decrease in the average visual depth of 9 and an average visual depth of 4.1 compared to using only one door	The visual analysis of the depth level shows an increase in the average visual depth of 11 and an average visual depth of 5.5, which made the northern region the least tourist attraction for visitors.
The axial analysis of the use of the three doors shows a decrease in the depth of the movement axes of up to 8 and an average depth of 3.8 compared to using one door to enter, where the analysis shows a decrease in the average depth of the northern region	The axial analysis shows an increase in the depth of the movement axes of up to 11 and an average depth of 7.5, and the most depth is concentrated in the northern part, which is the most isolated part
The analyzes show the extent of the impact of dealing with the castle sectors through the use of a door for each sector, as this led to a decrease in the rate of motor depth by 28% and visual depth by 19%	
Table no (4) Analyzing the effect of using three doors on the depth index compared to using one door	

Spatial analysis of the castle using the Agraph program (general indicators based on the presence of three doors to the castle)

CV	i	RA	MDn	TDn	
1.	4.	0.22	2.	24	**0**
0.	2.	0.22	2.	30	**1**
1,00	2.	0.22	2.	30	**2**
0.	3.	0.22	2.	28	**3**
2.	5,00	0.2	2,00	22	**4**
1.	2.	0.22	2.	30	**5**
0.	1.	0.44	3.	40	**6**
1.	5,00	0.22	2,00	22	**7**
0.	3.	0.22	2.	28	**8**
1.	2.	0.22	2.	30	**9**
0.	1.	0.44	3.	40	**10**
0.	2.	0.22	2.	32	**11**
0.	1.	0.22	2,00	22,00	Min
1,00	**3.**	0.22	**2.**	**29**	**Mean**
2.	5,00	0.44	3.	40,00	Max

control value

The middle part retained the highest rate of control and Connectivity

Depth from root

integration

Increasing the value of the integral from 2 to 3	Depth rate decreased from 37 to 29

Comparative analysis between the rate of depth, integration and control as a result of using all the doors of the castle compared to using only one door	
spatial analysis of the castle using one entrance 40 20 0 maen ■TDn ■MDn ■RA ■I ■CV	spatial analysis of the castle using three entrance doors 50 0 maen ■TDn ■MDn ■RA ■I ■CV
The initial analysis of the castle shows the height of the total depth and its impact on the rest of the indicators	The initial analysis of the castle shows a decrease in the average depth and a rise in integration as a result of using the three main doors of the castle.
Table No. (5) The effect of using the main castle doors on the spatial properties	

9. Recommendations

1. Opening the closed doors of the castle allows more connection with the outside, reduces depth rates, and improves the efficiency of the visit. Table no (4),table no (5)

2. The use of Bab Al-Azab allows the use of the western part that is exposed to neglect, as it is the most isolated area, despite its presence in important squares (Sultan Hassan Mosque Square and Al-Rifai Mosque)،

3. The opening of the ELmodarg door and the Gaded door leads to an increase in the connection and integration between the northern and western parts, a gap that emerged through the analyzes conducted on the basis of the opening of the three main doors (the EL-MODARG door, the EL-GADEAD door, the EL AZAB door,)

4. The importance of morphological analysis in determining the strengths and weaknesses of historical areas and their effective role in improving sustainable tourism management plans.

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