Re-reading Historical Cairo

Ref 078

Spatial Configuration Transformation

Nabil Mohareb
United Arab Emirates University, Architectural Engineering Department, Al-Ain, United Arab Emirates
nabilmohareb@gmail.com

Keywords
spatial configuration; spatial morphology; urban growth; urban history; Cairo

Abstract
Traditionally, the analysis of historical sites depends heavily on researches that focused on the physical and social aspects of the sites. The main emphasis of such approaches was to analyze the architectural style and characters, social life and activities within the urban fabric, and to different extents, to examine other issues related to the environmental and physical conditions of buildings.

However, the traditional analysis techniques exhibited an apparent lack in the perception of the "spatial configuration–social behavior" relationship. Consequently, several researches emphasized a need to establish a scientific basis for a quantitative model that translates the way the social and spatial aspects simultaneously affect each other in historical sites.

The paper's main aim is to build a model framework that analyzes historical Cairo from the spatial configuration aspect, in order to understand the spatial and related social transformation through selected eras in history until present. This model gives a better understanding on why some activities and places are still alive until now. It comprises multilayer of analysis for the current situation (data triangulation using space syntax, field survey, and questionnaire), the research's aspects (spatial, social, and physical), and interpretation method to analyze the results (dimensions). Based on the current situation, selected experiments are used to re-read the 'Past' of historical Cairo.

1. Introduction

Conventional analysis of historical sites depends heavily on researches that focused on physical and social aspects of historical sites. The main emphasis of such approaches are to analyze the architectural style and characters, social life and activities within the urban fabric, and to different extents, to examine other issues related to the environmental and physical conditions of buildings. However, these analyzes exhibited an apparent lack in perceiving the "spatial configuration–social behavior" relationship. There have been various attempts to read the historical sites, particularly Fatimid Cairo. The conventional approaches depend heavily on written literature review. These reviews illustrate social aspects, architecture style, political and economical events. However, they show few data regarding the total urban fabric, how people move and where. In addition, the relation of spatial configuration and land uses distribution through the entire urban fabric. Furthermore, analyze the transformation of spatial configuration through time. Consequently, several researches emphasize a need to establish a scientific basis for a quantitative model. This model needs to translate the way social and spatial aspects simultaneously affect each other in both micro and macro scale relationship; moreover, to understand their transformation through time.

The paper's main aim is to build a model that analyzes historical sites from the spatial configuration aspect, to understand the routes and related social transformation through history.

The paper starts with introducing methods and tools used in spatial configuration. Space syntax and GIS (Geographic Information Systems) are used to analyze the current situation of historical Cairo as a case study. This analysis assists in understanding the historical spatial transformation from past until present. Four different eras of historical Cairo are compared using five main experiments to analyze spatial transformation.

2. Research Framework

The paper adopts the spatial configuration approach, considering the cause and effect between spatial and social activities factors, as well as their interrelation with the built environment. Hillier argued the social factor is important to understand the development of the spatial configuration, and their mutual interaction through history(Hillier and Vaughan, 2007). In this part, the research builds a model of investigation for analyzing historical Cairo. It considers the two major points: spatial and social factors. Spatial factors, for this paper, are related to the space morphology (routes configuration, cross-sections, frontages, entrances, and building blocks). Social factors are analyzed, for this paper, by activities such as land use distribution, pedestrian/ vehicles movement rather than a social standard of living (poverty, degree of learning, income, etc.). As the social standards of living are beyond the paper's scope, although they can be considered as future layers to be introduced to the model.

For current situation analysis, the research uses triangulation method (Fellows and Liu 1997); it is using more than two methods to examine the same thing. The research has adopted space syntax as a spatial configuration analysis theory and techniques, in addition to Whyte's (Whyte, 1980)and Bosselmann's (Bosselmann, 1998) approaches for the field survey. Furthermore, using a questionnaire system, and gate system to trace people /vehicle actual movement inside Fatimid Cairo to analyze the current social interaction with the historical sites.[3] Finally, it aggregates the data into a geographic information system (GIS), to improve the analysis and measure the correlation between data.

2.1 Reading Current Situation

Historical urban spaces contain multiple layers of values (Feilden, 1994). Each value needs a precise layer in the proposed model framework, considering the research's aim, and scope. The following parts will setup the conceptual framework for the model's layers, Figure 1.

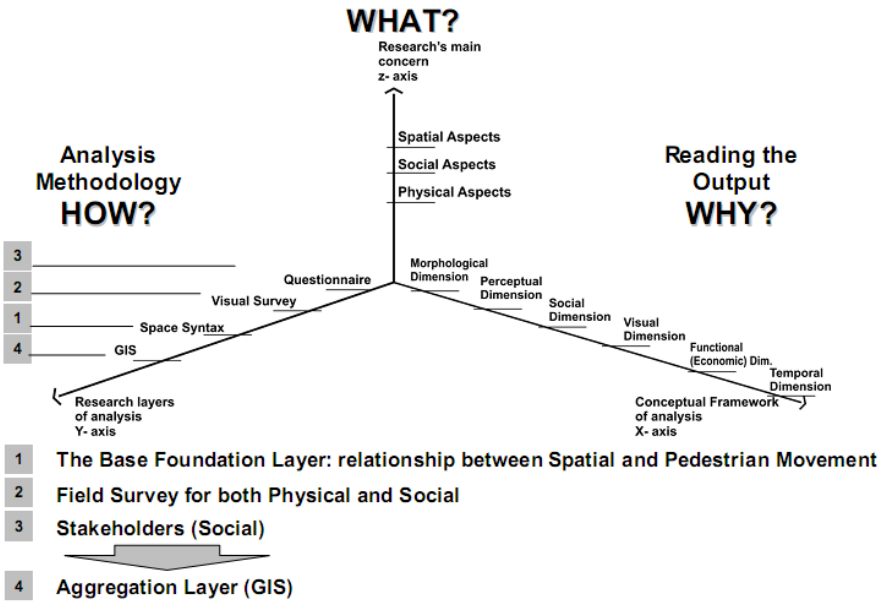

Figure 1

Model of investigation framework, illustrating the research's main concern, layers and the conceptual framework for analyzing Fatimid Cairo

The first layer is the foundation layer. It is related to the research's main concerns in understanding the spatial configuration of historical sites. It is an important layer due to its ability to understand the spatial relationship between the selected case study's micro configurations, hierarchy of spatial patterns, and its interaction with the macro spatial configuration of the surrounding context. Furthermore, the spatial layer gives a hypothetical explanation regarding the pedestrian potential movement -the second layer will verify the analytical base evidence of the pedestrian movement- concerning the relationship between the social and spatial. Space syntax theory and tools are utilized to facilitate establishing this layer. Methods to build this layer are in the following order: establish an authentic map; using space syntax tools and methods for spatial configuration analysis; highlighting the integrated and segregated parts of Fatimid Cairo and finally; test the current correlation between pedestrian real movements and spatial factors.

Second layer depends on field observation for both physical and social factors. It is related to understand the actual relationship between the social (pedestrian movement) and the spatial, how people navigate inside the historical sites, which routes are more selectable to both 'to-movement' and 'through movement' and their speed of movement in different routes, in addition to the visual analysis for physical environment within Fatimid Cairo. A gate system is used to understand the actual movement (pedestrian/ vehicle) through selected gates in order to give credibility to the first layer of hypothesis potential movement.[5] Consequently, to this step, the first two layers are used to analyze the current condition. Moreover, it can be used to trace the transformation of spatial/ social aspects for the past, and forecast the spatial transformation for number of future scenarios.

The third layer deals with the stakeholders (social), understanding their interest in the historical site, their agenda in upgrading process. This layer is fulfilled by using semi-structured interview within the historical site. It is used to test the validity of the model in relation with the stakeholders needs.

The fourth layer represents the aggregation layer. GIS software is used to store and analyze the gathered data, producing thematic maps for different types of analysis required.

These four layers represent the main framework of analysis in the proposed model framework. Moreover, the researcher adopts Carmona's six points of investigation (dimensions) to understand historical urban spaces with respect to the research's main concern about spatial configuration. Carmona's dimensions are as follow: Morphological dimension, perceptual dimension, social dimension, visual dimension, functional (economic) dimension and finally the temporal dimension (Carmona et al., 2006). See figure 1.

In Figure 1, X-Axis represents Carmona's dimensions concerning how to read urban spaces through six complementary points (Carmona et al., 2006), while Y-Axis represents the research main layers, tools and techniques. Due to the intervention between the dimensions as Carmona (2006) argued, as one analysis could be used more than once in different dimensions, consequently, the research depends on the layers as chain of analysis and the dimensions for understanding the results and conclusions. Techniques and methods used within the following order:

1) Foundation stage: establish the base map, geo-reference axial, and segment map based on space syntax techniques and methods, measuring integration[1] and choice[2] analysis to understand the spatial configuration.
    - Draw axial / segment map using a reliable map (for layers 1 & 4)
    - Integration Analysis 'To-Movement potential', for three levels Metropolitan Cairo, Historical Cairo and the case study (Fatimid Cairo) using R3, R7 and Rn for axial maps (Hillier and Hanson, 1984), in addition to restricted metric radii for R800m, R500m, R5000m and R10000m from segment maps (Turner, 2007). (layer 1)
    - Choice segment length weighted analysis[4] using different metric radii; R500m, R800m, R2000m, R5000m for the three levels of study. In addition, the analysis will compare between the local/ global highest 10% selectable routes for 'through-movement potential' (Hillier and Iida, 2005), (Turner, 2007). (layer 1)

2) Examine the relationship between social and spatial; through examining the pattern of pedestrian movement and their correlation with the spatial configuration.
    - Pedestrian Gate counting analysis is used to understand the current pedestrian (local/ tourist) and vehicles flow, In addition, correlate the result with number of physical and spatial factors to analyze their interrelation. In addition, this process enables the model to forecast potential pedestrian flow for any upgrading development inside the case study. (layers 1, 2, 3 & 4)
    - Proposed cross-section analysis (third-dimension for space syntax). (layer 2& 4)
    - Intelligibility analysis (Hillier, 1997).[6] (layer 1)
    - Local Area effect (synergy) analysis 7 (Hillier, 1997), (Hillier, 1996).[7] (layer 1)

3) Analyze the physical form of Fatimid Cairo.
    - Land use analysis for the case study. (layers 1,2 ,3 & 4)
    - Block-size / Plot-size analysis for the three levels of study, to understand their relationship with the pedestrian movement (time and speed). (layer 2)
    - Frontage analysis based on the case study area and its relationship with the pedestrian movement (Carmona et al., 2006). (layer 2)
    - Entrances analysis based on the case study area and its relationship with the pedestrian movement. (layer 2)
    - Height analysis for the case study area. (layer 2)
    - Point and step depth analysis for historical Cairo and Fatimid Cairo. (layer 1)
    - Dominate direction analysis for historical Cairo. (layer 1)

4) Analyzing the visual form of Fatimid Cairo
    - Field Survey
    - VGA (Visual Graph Analysis) analysis is based on the two-dimensional morphology of spaces for Khan El-Khalili and the total case study.[8] (layer 2)

5) Collect-interpret: Using questionnaire, semi-structured interview, to understand the stakeholders need and their relationship with the spatial configuration.

The previous data and analyses are embedded within GIS system to perform more analytical analyses and investigate the spatial and social relationship. The field survey is not a stage by itself; however, it supplies all the research's layers with data and reconfirms the output results.

The current situation results and correlation are in details in a prior research. However, the results showed that almost 67% of the spatial configuration analysis is correlated with the actual current pedestrian movement. This percentage is increased toward 75% when introducing the location of historical buildings/monuments as a weighting cause. Moreover, 83% of historical buildings are located on the highest 10% selected routes for pedestrian movement (the total buildings studied were 188, and 156 buildings were correlated with highest 10% of choice R800). In addition, land uses distribution are highly correlated with the integration values; integrated spaces attracts more socio-cultural activities (Mohareb, 2008), see figure 2.

The previous results show the ability of the model to explore the relationship between the spatial configuration and the social activities as a current situation. The next part of the research will take advantage of the current results -as it is capable to understand almost 75% (with historical/ religious building influence) of social/spatial relationship- for the investigation model to analyze the transformation of spatial configuration for historical Cairo through time. It gives the opportunity to test the spatial transformation for the micro and the macro level at the same time, figure 3.

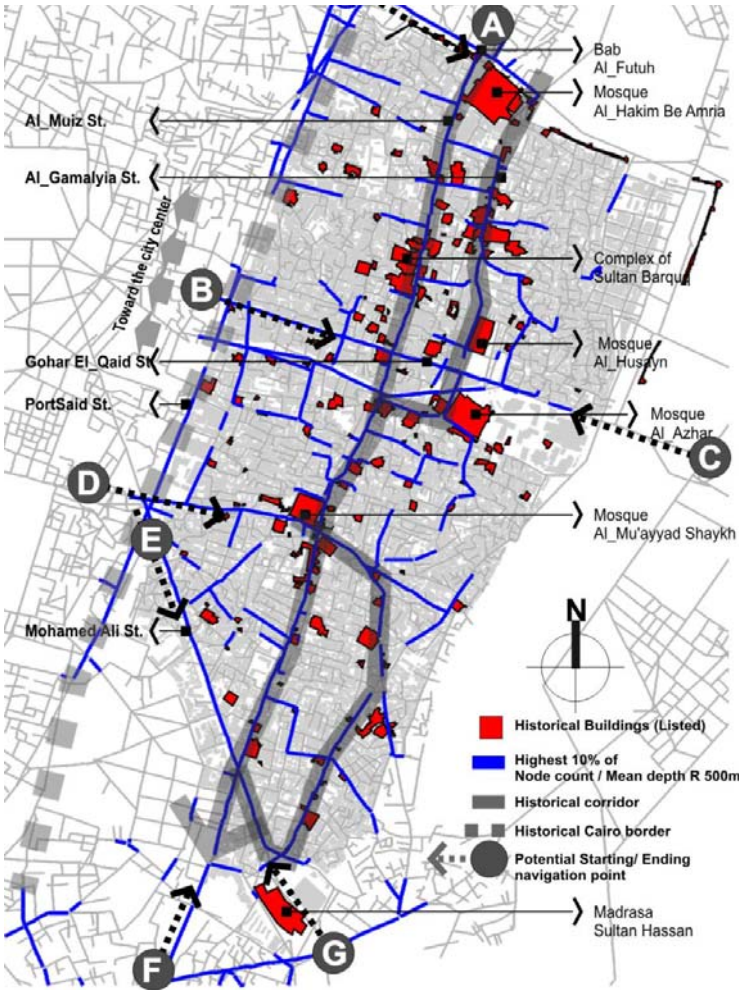

Figure 2

Segment map, for highest 10% selected routes, represents the main heritage corridor and the potential entrances (starting / ending) points for the historical Cairo from the main routes.

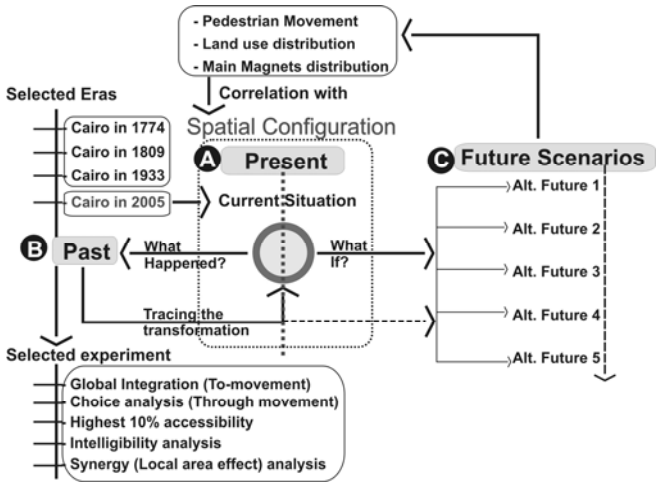

Figure 3

The research framework for re-reading history for historical Cairo, through spatial configuration approach.

2.2 Reading 'Past' situations

The research extended the model of investigation to reread historical Cairo history from the spatial configuration model. The research develops Karimi's approach (Karimi, 1997) for reading history through time using spatial configuration analysis, by introducing the model of investigation as a tool to read the current situation, confirming its output validity, and trace historical transformation. The research proposed five main experiments to compare and analyze the routes' transformation through time, see figure 3. The main experiments are:

a. Global Integration analysis (to-movement potential): It is used to understand the pattern of 'to-movement', which clarifies the degree of accessibility of Cairo's routes at that time using segment maps with global node count divided by global Mean Depth (Hillier et al., 1987).
b. Choice segment length weighted analysis: It is used to understand the main structure system or the' through movement potential' routes (Hillier and Vaughan, 2007), (Turner, 2007), (Hillier and Iida, 2005).
c. The highest 10% value of Integration (node count / mean depth). 10 % was selected as a percentage after a number of experiments done on the current 2005 map to select the most appropriate usable routes. It depends on real pedestrian and vehicle movement data that gathered in earlier stage of the research, and examined in the following parts. For consistency, it is used for all the maps in different eras,
d. Intelligibility analysis using the correlation between connectivity and the global integration (Rn) to give a clue of how the urban system is clear to its users (Syntax, 2004)
e. Synergy (Local Area effect): It is used to indicate the relationship between local parts and global parts (Syntax, 2004).

2.3 Model Limitation

The proposed model is limited to the spatial configuration and the social interaction due to the paper scope. However, several other causes, the researcher is aware of, that could be added as social, cultural, economical and political causes if the model compares number of historical sites due to the previous mentioned constrains.

The size and locations have no limit when applying only the first layer of analysis in the model, as space syntax analysis is not limited to certain size and locations. However, other layers of analysis are limited to the available data, which force the model as a total to be limited to the available data for the selected site's size and location. The model is not designed to compare architectural style or environmental aspects; however, due to the existence of GIS layer, it is simple to insert any data related to the site typology.

3. Rereading the history of Cairo transformation

Several historical maps selected for Cairo city that reflects the major key transformation of urban pattern according to major events that took place in Egypt. First, 1774 Cairo map represents the situation before the French expedition to Egypt, and depicts the fact that urban spaces were not yet affected by any 'imported' western urban development concepts. Second, 1809 Cairo map was selected as it represents the period after the French invasion and the beginning of Cairo Expansion. Third, 1933 Cairo map represents the development era and introduces new urban fabric grid, which is now the city center. Finally, 2005 Cairo map as the current situation.

3.1 Cairo in 1774

Cairo in 1774 represents an era before the French expedition to Egypt. This era is for a long time without any development or upgrading projects (Warner, 2005). The five analytic experiments are used to understand the urban pattern configuration, and how it worked at that time. Cairo axial map was drawn using 421 axial lines.

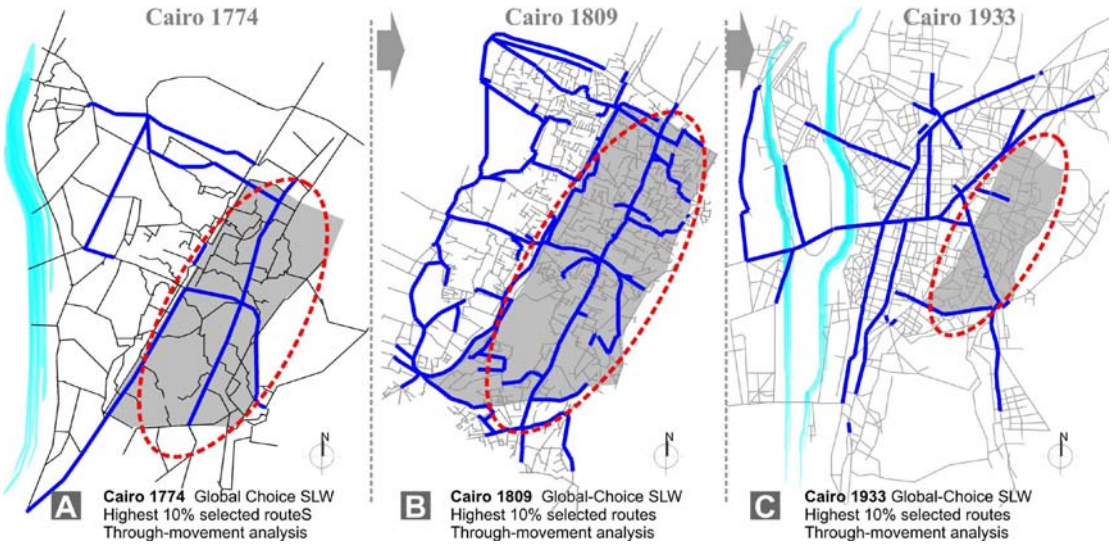

Figure 4

Comparative analyzes for 'through-movement' using Global Choice with segment length weighted for the highest 10% selectable routes to Cairo in 1774, 1809, and 1933.

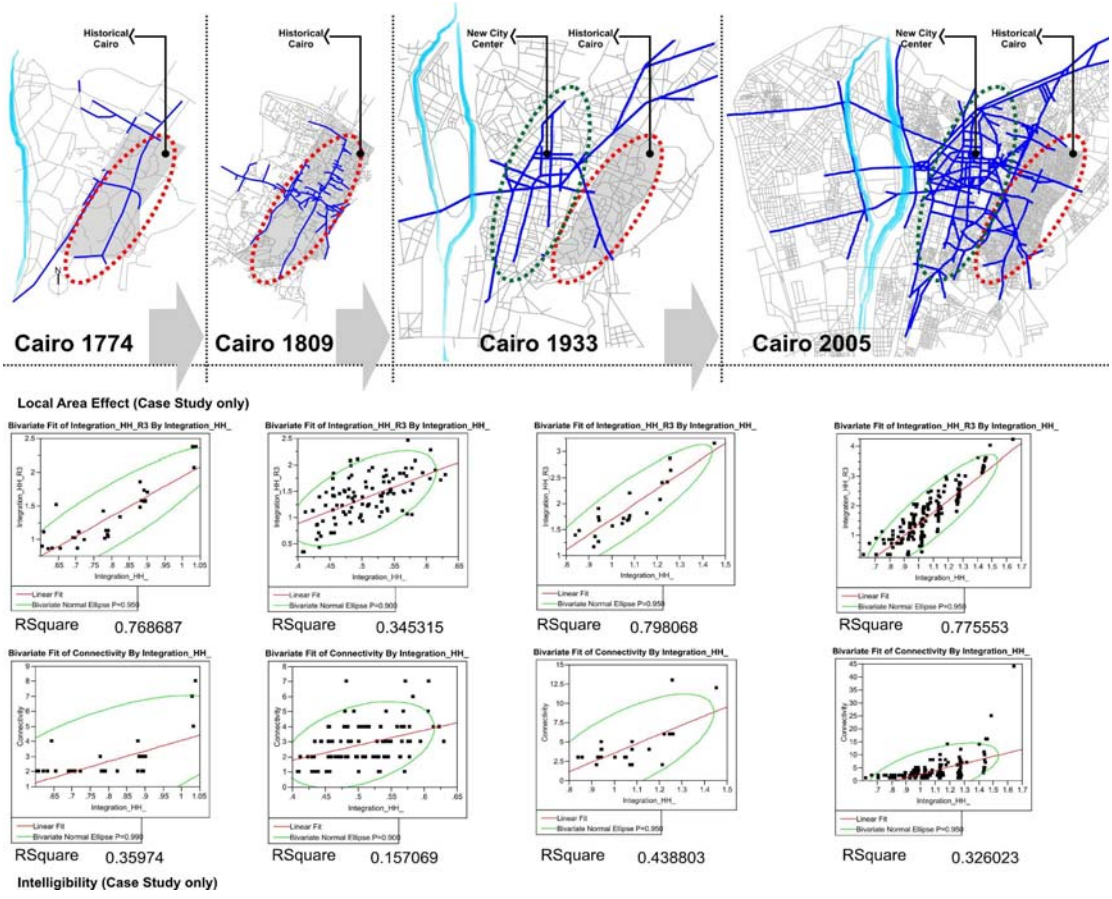

Figure 5

Comparative analyzes for Cairo 1744, 1809, 1933 and 2005 regarding integration (Highest 10% accessible routes), local area effect, and Intelligibility.

a. Global integration analysis: Figure 5 identifies the most accessible routes such as El-Muiz St. followed by what is called today Portsaid St. and Ahmed Maher St., and then El Darb El-Ahmer and El Gamaliya st. These areas represented then the city livable center.
b. Choice segment length weighted analysis: From figure 4, it shows that El-Muiz St. represents the first choice of 'through movement potential', followed by Ahmed Maher St. and El Darb El-Ahmer St.
c. The highest 10 % (Global Integration): Figure 5 (right) clarifies that the most accessible routes are correlated with the most selectable route for potential movement.
d. Intelligibility analysis: It had shown 0.1404 as Pearson's coefficient r2 which indicate the total urban system was not clear to its users. Moreover, that was true as the residential areas were segregated from the high commercial and religious area, see Figure 5.
e. Local area effect (Synergy) analysis: In figure 5 (right) r2 is 0.435, which indicates moderate connection between local and global areas.

3.2 Cairo in 1809

Cairo in 1809 represents an era after the French expedition to Egypt. It was the start of developing process held by 'Mohamed Ali the Great'. The map does not show yet the major development projects; however, it shows the great expansion toward the river Nile (to the east) (Warner, 2005). Cairo axial map was drawn using 1550 axial lines.

a. Global integration: It shows that the most accessible routes were El-Muiz St. as the main spine of the city followed by what is called today Portsaid St. and a number of perpendicular connectors to the outside of the Historical Cairo, such as: Ahmed Maher St., followed by El Darb El-Ahmer and Amir El_Guyushi street. These routes still represent the city livable center see Figure 5.
b. Choice segment: El-Muiz St. represents the first choice of 'through movement potential', followed by PortSaid st. and then, Ahmed Maher St. and finally, El Darb El-Ahmer St., see figure 4.
c. Highest 10 % (Global Integration): The most accessible routes are correlated with the most selectable route for potential movement, which are El_Mouiz St. still the main spine, followed by Ahmed Maher St. and Amir El_Guyushi St.
d. Intelligibility analysis: had shown 0.049 as Pearson's coefficient r2, which indicates the total urban system, was completely unclear to its global users, see Figure 5.
e. Local area effect (Synergy) analysis: r2 is 0.241, which indicates less moderate connection between local and global areas.

3.3 Cairo in 1933

Cairo in 1933 represents an era after the French invasion to Egypt. It emerged after the Modern Cairo built by Khedive Ismail, who has built the modern city toward the west side of the historical Cairo, river Nile, and toward the northeast (Warner, 2005). Due to this expansion, some older settlements were torn down. Many monuments were destroyed to clear the way for the Boulevard Mohammed Ali, linking the Citadel to Ataba zone. In 1865, the center of government was moved from the Citadel to the new Khedival palace and administrative offices in Abidin. Until the period of 1880-1950 (Abu-Lughod, 1971), it represents the Colonial period. The modern city was enormously developed away from the old city, hastening its deterioration. Cairo axial map was drawn using 950 axial lines.

a. Global integration analysis: The most accessible routes were shifted toward the new city center built by 'Khedive Ismail'. The major integrated part with the historical Cairo were through Mohammed Ali St. followed by El-Azhar St. and Portsaid St. and part of Ahmed Maher St.. The historical Cairo seems more segregated than ever, see Figure 5.
b. Choice segment length weighted analysis: Mohammed Ali St. represents the first choice of 'through movement potential' (from / to) the historical Cairo, followed by Gohar El_QaidSt., El_Muiz St. and Ahmed Maher St., see figure 4
c. Highest 10 % (Global Integration): Mohammed Ali Street is the only accessible route among the highest 10% from the Historical Cairo, while the major routes selected are from the city center.

d. Intelligibility analysis: has shown 0.2584 as Pearson's coefficient r2 which indicates that the total urban system was not clear to its users if we include historical Cairo with the new city center. Moreover, that was true as historical Cairo was more segregated from the new developed area. See Figure 5.
e. Local area effect (Synergy) analysis: r2 is 0.62205, which indicate high connection between local and global areas.

3.4 Cairo in 2005

Cairo in 2005 represents the current situation. Cairo expanded tremendously to cover part of Giza and Qalyubiya governorates, in addition to several new neighborhoods and new cities like 6 of October city, as they are almost attached to Cairo. The selected boundaries are: from the north, train Railway, Ramsis St. and Kobry Imbaba, from the east; Salah Salim St., Al-Nasr St. and Citadel, from the south; Ain Al_Syra St., Midan Giza Station, and finally from the east part the train railway. These boundaries represent an effective buffer zone to historical Cairo. The five analytic experiments are used to understand the urban pattern configuration, and how it worked in recent times. Cairo axial map is drawn using 7440 axial lines.

a. Global integration analysis: The most accessible routes are Mohammed Ali St., El_Azhar st., Amir El_Gushy St. and Gohar El_Qaid St. and their residential area's form segregated clusters within the historical Cairo.
b. Choice segment length weighted analysis: El-Muiz St. represents the first choice of 'through movement potential', followed by Ahmed Maher St. and El Darb El-Ahmer St.
c. Highest 10 % (Global Integration): PortSaid St. represents the border for the historical Cairo. The major connector with the city center routes are: Mohammed Ali St., El_Azhar st., Amir El_Gushy St. and Gohar El_Qaid St.
d. Intelligibility analysis: had shown 0.1130 as Pearson's coefficient r2, which indicate the total urban system was not clear to its users due to its organic fabric. Moreover, that was true as the residential areas in Historical Cairo were segregated from the high commercial and religious area inside historical Cairo and completely isolated from the city center.
e. Local area effect (Synergy) analysis: r2 is 0.429, which indicate moderate connection between local and global areas.

4. Aggregating the data outcomes

Figures 4 & 5 demonstrate the routes transformation process. They highlight how the city center shifted from the historical Cairo towards the new city center. In addition, the intelligibility and local area effects have shown the interaction between the spatial and social cause's analyses. Cairo in 1933 represented the highest period of intelligibility and local area effects and that correlate with historical data available at that time. As this period, particularly 1863, Khedive Ismail's rise to power marked a decisive stage in the evolution of Cairo. On the other hand, Cairo in 1809 (before Mohamed Ali arrival, as the French scientists illustrated this map) retained its medieval features. However, Cairo in 2005 has enormously expanded, and it is barely legible for its inhabitants.

Spatial analysis configuration records transforming important routes through history. From the analyzes, there are major routes that still play an important role in connecting the historical site with the surrounding context: El-Muiz St. Quid El_Gohar St., El_Azhar St., Mohammed Aly St. and Amir El-Quish Street, see figure 2, 4, & 5. They represented the main accessibility parts of the city as they were as closeness to everywhere else, forming the most livable places, such as Khan El_Khalili. Moreover, through time they became less important and shift to be more usable as 'through movement' to go from one destination to another, connecting the historical site to the adjacent new city center. This shift in use could be detected for each route, and their relation with each other overtime.

5. Conclusions

The paper establishes a model framework to re-read historical Cairo based on its spatial morphology. It investigates the present situation to understand the degree of correlation between spatial-social interactions. The paper uses triangulation methods to understand and analyze the

current situation. This step is a preparation stage for the main aim of the paper, which is tracing back the spatial transformation for historical Cairo.

Historical buildings, mainly religious and daily used buildings, are almost located (83 %) on the highest 10% of selected routes for pedestrian movement. This indicates that their locations were carefully selected to fulfill their user's daily needs. Moreover, highest 10 % accessible routes through the spatial transformation history of Cairo are acting as a connector between old Cairo and the modern city center. They represent the active part of historical Cairo.

We can understand and read history in different ways; in this paper, analyzing the spatial configuration reveals more data than any other verbal descriptive methods. Particularly, if the historical site has less historical documented data at a particular time in history. The method and techniques showed in this paper represents a model used to analyze the causes and effects of changes on the historical spatial configuration, using time series maps, field surveys and available documentation on the history of the site. In addition, this model enables us to understand the current situation for the pedestrian movement and the distribution of land uses. The research concluded that the presented model could be embedded into the classic traditional techniques to give a comprehensive perspective and understanding to historical sites present situation and to reread the history as a parallel methodology.

Notes

1 Integration: Refers to how many other lines are up to n steps away from each line. (Hillier et al., 1987) In another definition; it is a static global measure describing the average depth of a space to all other spaces in the system, the space of the system can be ranked from the most integrated (red axial lines) to the most segregated one(Blue axial lines) (Klarqvist, 1993). In a more recent definition, it calculate the closeness of each element to all others, and that is the accessibility for to-movement (Hillier, 2005). The formula of integration: Integration = 1/RRA

2 Choice: The degree of choice each space represents or how likely it is to be passed through on all shortest routes from all spaces to all other spaces in the system(Hillier et al., 1987), the recent explanation is the degree to which each element lies on path between elements, and that is its potential for through-movement (Hillier, 2005)

3 The field survey, tracing people's/vehicle's movement, and the questionnaire, are not fully presented in this paper, they were done in previous research (Mohareb, 2008), in addition to the researcher's PhD.

4 Segment length-weighted Choice 'Betweenness' with a metric radius restriction was introduced by Turner (Turner, 2007) to improve space syntactic measurements using road-center line model, which gives better correlation with observed traffic movements.

5 The pedestrian movement's data was obtained by using the 'Gate' method of observation. Thirty-four gates were carefully selected to represent the most important points for pedestrian movement.

6 Intelligibility is defined as the correlation between connectivity and global integration, and it is an important indicator for how clear an urban system is for its users. (Hillier, 1997).

7 Local Area Effect (synergy): It is measured by the correlation between local integration R3 and global integration Rn(Hillier, 1997), (Hillier, 1996) . It is used to indicate the relationship of local parts and global structure in a spatial pattern within urban area. In addition, the consistent relation between local and global patterns of movement allows behaving rationally in our choice of location for land uses. (Penn et al., 1998).

8 VGA examines relationships of co-visibility between all points within a spatial system, as it divides the space into a uniform grid, and examines which cells are visible to which other cells (Turner, 2001).

- All maps and figures are drawn and constructed by the researcher.

Acknowledgment

I would like to acknowledge Dr. Amr EL-Adawi and Dr. Hany Ayad for their great help to accomplish this paper.

References

Abu-Lughod, J. 1971. *Cairo 1001: years of the city victorious*. New Jersey: Princeton University Press.

Bosselmann, P. 1998. *Representation of Places: Reality and Realism in City Design.* University of California Press.

Carmona, M., Heath, T., Oc, T. & Tiesdell, S. 2006. *Public Places Urban Places: The Dimensions of Urban Design.* Oxford: Architectural Press.

Hillier, B. 1996. *Space is the machine: a configurational theory of Architecture.* Cambridge University Press.

Hillier, B. 1997. The Hidden Geometry of Deformed Grids: or, why space syntax works when it looks as though it shoudn't. *Space Syntax First International Symposium.* London.

Hillier, B. 2005. *The art of place and the science of space*. World Architecture.

Hillier, B., Burdett, R., Peponis, J. & Penn, A. 1987. Creating Life: or, Does Architecture Determine Anything? *Arch. & Comport / Arch. Behav.,* Vol. 3, 233-250.

Hillier, B. & Hanson, J. 1984. *Social Logic of Space.* Cambridge: Cambridge University Press.

Hillier, B. & Iida, S. 2005. Network effects and psychological effects: a theory of urban movement. *5th International Space Syntax Symposium.* University of Delft.

Hillier, B. & Vaughan, L. 2007. *The City as one Thing.*

Karimi, K. 1997. The Spatial Logic of Organic Cities in Iran and the United Kingdom. *Space Syntax first International Symposium*. London.

Klarqvist, B. 1993. *A space syntax glossary.*

Mohareb, N. 2008. Tourist navigation system -the Start/ End Journey-: Space Syntax approach. *Instant Cities: Emergent Trends in Architecture and Urbanism in the Arab World, CSAAR 2008*. American University in Sharjah, Sharjah.

Penn, A., Hillier, B., Banister, D. & Xu, J. 1998. Configurational modeling of Urban movement networks. *Environment and Planning B: Planning and Design*, Vol. 25, 59-84.

Syntax, S. 2004. *Fifth Framework Programme: AGORA cities for People.* London: The London Institute.

Turner, A. 2001. Depthmap: A program to perform Visibility Graph Analysis. *3rd International Symposium on Space Syntax*. Georgia Institute of Technology.

Turner, A. 2007. From axial to road-centre lines: a new representation for space syntax and a new model of route choice for transport network analysis. *Environment and Planning B: Planning and Design*, 34, 539-555.

Warner, N. 2005. *The Monuments of Historic Cairo: A map and Descriptive Catalogue.* Cairo: The American University in Cairo Press.

Whyte, W. H. 1980. *The Social Life of Small Urban Spaces.* Project for Public Spaces,