

The relationship of crime to the street network using the space syntax theory, Case study Al-khums City-Libya

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Abstract: The issue of crime increments in vast urban areas, because of the development of the residential neighborhoods and the development of the populace, and also the expansion of the economic activities, which is normally accompanied with a shortcoming in the customary social relationship concepts. In spite of that, the planning method of residential areas plays a basic and dynamic part in fortifying the social connection among inhabitants. It additionally gives them a feeling of security, and enables them to partake in decreasing the capability of criminal exercises and expanding the level of security inside their neighborhoods. The role of this paper is to determine the conditions related to urban crime occurred within the Al-khums City, Libya. Then chose Al-khums City, to reduce crime in residential areas. the study this research by space syntax theory of the streets analysis using an application UCL depthmap, knowledge the measures of spatial configuration in terms values global and local integration and Connectivity.

Keywords: Crime, Space Syntax, Al-khums City, Street Networks.

1. Introduction and background

Crime is a part of any social framework known to human social orders since its initiation. It contrasts starting with one society then onto the next, even inside one community does not occur similarly in all places and not by a similar way. and also the variety and assorted variety of its neighborhoods. As it described by a tangled and complex social relationships to a large population in a particular geographic area, connected to economic and commercial activities wide. So the progressing advancement and proceeded with development of the communities in significant urban communities emitted constantly creative types of criminal behavior. There is presumably that the urbanization in significant urban communities a considerable lot of the positive parts of the most essential are the high standard of living and income individuals.

Understanding crime, especially the factors that cause crime, has been the focus of researchers in both design and social fields for decades. In social sciences, the prevailing theory of the spatial location of crime was the theory of social chaos. There are three external factors: poverty, racial and ethnic heterogeneity, which is supposed to lead to a withdrawal in social societal control activities and an increase in delinquent and criminal activities. (Sampson & Groves, 1989). On the other hand, the theory of routine activity, the other major theory of the spatial location of crime, claims that criminal events are caused by ardent offenders, attractive targets, and the absence of competent guardianship against the indiscriminate, non-random crime of time and space. (Cohen and Felson, 1979). Urban design theory has addressed the issue of crime. Experimental research in design has focused primarily on the specific features of the site and the situation somewhere. Beginning in the 1960s, this research group emphasized the role of environmental features in crime prevention. Jacobs (1961) argued that the circulation of people and the appreciation of public space were critical elements of urban vitality and noted that informal surveillance was a good deterrent to criminal activity. In urban design, Oscar Newman (1972) conducted the most influential empirical study examining the relationship between crime and the environment. Newman explained the concept of defensible space, its most important regional components and natural observation. More recently, urban design researchers who have used space syntax techniques to analyze the geographical distribution of crime have begun to focus on other spatial and socio-demographic factors that can influence crime patterns.

2. Methodology

In this study is the street network analysis in accordance with space syntax technique, street network analysis has to follow these steps:

- a. Taking maps of the selected case studies, drawing the longest and fewest axial lines to obtain the axial map.
- b. Analyzing the maps using UCL Depthmap software, calculating the Global Integration, Local Integration R = 3 and Connectivity values.

2.1. Crime:

Criminal offenses is an action or omission which constitutes an offence and it is punishable by law an offence which goes beyond the private and into the general public sphere, breaking prohibitory guidelines or laws, to which legitimate punishments or supports are attached, and which requires the intervention of a public authority. description makes clear, what the law states in the end defines what is which is not crime. While popular definitions approach the legislation as a given, sociological definitions approach the concern in a more sociable way drawing attention not only to the take action itself but the legislation itself and whose passions it seeks to protect. It makes a differentiation between offences and general public offences that offend a broader group of social best practice rules or values. Criminologists therefore look beyond this rigid legal definition to take a look at the social and ethnical roots of crime and criminalization, including an a wondering approach as to why certain activities are classed 'crime' while some are not.

2.2. Space Syntax and Crime

A significant range of design research calculated the relationship between the occurrence of criminal events and spatial configuration as measured by the methodology of space syntax. [1]. In graph theory and the idea of urban morphology, describes the theory of space syntax and quantitatively measures the configurational characteristics of urban space. [2]. Two measures of space syntax, integration and connectivity, measure the level of access to the street within a spatial system. The theory assumes that the built environment, which is seen as a system, provides or moves movement from anywhere to Environments that are more directly related to other environments (high on integration and connectivity) tend to attract greater intensity of motion. Empirical research has supported this view widely by showing that areas with high structural accessibility have more pedestrians and car users. [3]. The theory of space syntax is also related to one of the social theories of the spatial location of crime, the theory of routine activity. [4].

Expanding on the possibility that district layouts give openings and access to perpetrate commit a crime, Shu and Huang (2003) examined the impact of spatial configuration on the distribution of thievery in residential districts. Through correlational analyses, a solid association was found between global integration and theft rates in low-wage neighborhoods. Assist discoveries demonstrated that there were correlations between local integration and global integration and burglary rates in middle-income districts. The authors proposed that globally and locally integrated middle-income districts are more secure than segregated ones. In addition, the authors found no correlation between global or local integration and burglary rates in high income districts. This is conceivably clarified by the way that "objective hardening" features are more typical within high income districts. The authors clarified that more connected streets will attract in higher pedestrian movement, and thus more eyes on the street. Because of promising discoveries utilizing Space Syntax for identifying the spatial distribution of crime, Gosnells, a city in Western Australia counseled the Space Syntax laboratory at University College London distinguish the spatial distribution of crime. The Space Syntax Lab compared pedestrians and vehicles movement to crime statistics and space syntax measures. The outcomes were consistent with previous findings and showed a strong connection between spatial configuration and theft. [5].

2.3. Spatial Configuration and Crime

The term spatial configuration is utilized to refer to the structure of potential movement and co-presence as controlled by the position of limits in space and by the associations and disengagements between areas that results from the presence of boundaries. Configuration, essentially characterized as all the while existing relations, is about the structure of the built form of the parts that are in an exceptional relationship with each other. In the previous decade, an impressive group of design research started to give to the connection between the event of criminal occasions and spatial configuration. Such studies discovered correlations between measures of Space Syntax, and crime in residential districts. In earlier Space Syntax research on crime. two parts of movement and land use with a specific end goal to prevent crime have been highlighted: the co-presence of pedestrians on the street on the one hand, and the constitutedness of a road: a road "protected" through consistent and various residential entrances. The theory provides a numerical logic which to associate spatial and social data, for example, connections between the stream of flow of pedestrian and vehicle movement and crime in urban zones. A major plan is to reveal the shrouded examples and structures inside spaces. On account of accessibility of satisfactory computational apparatuses, the advantage of space syntax method is that it allows us to ascertain the relative degree of accessibility for each street segment in respect to the entire, or to its surroundings, for a whole city street network. Most of the space syntax research has shown that crime, specifically property crime, tends to cluster in segregated areas, especially in those "unconstituted encased bunches which Newman thought to be the way to increase local reconnaissance and thus to prohibit causal interruption by non-residents". Hillier (1988) contends that if the spatial configuration makes the natural pedestrians movement more difficult, there won't be an adequate number of individuals to produce the view of a

very much appropriated and used space. Observational research has supported this idea by demonstrating that places with higher accessibility tend to have lower crime rates, while places with low accessibility, segregated places, have higher crime rates. [6].

3. Data Gathering and Analysis

3.1. Site Description

Al-Khums City is located in the northwestern part of Libya on the coast of the Mediterranean Sea to the east of the Tripoli city (capital of Libya) 120 kilometers. The city is characterized by the presence of the city of Lebda archaeological (Liptes magna) located in the north-east of the city as well as the presence of sandy beaches, which gave it great tourist importance, in addition to its beautiful location. [7].

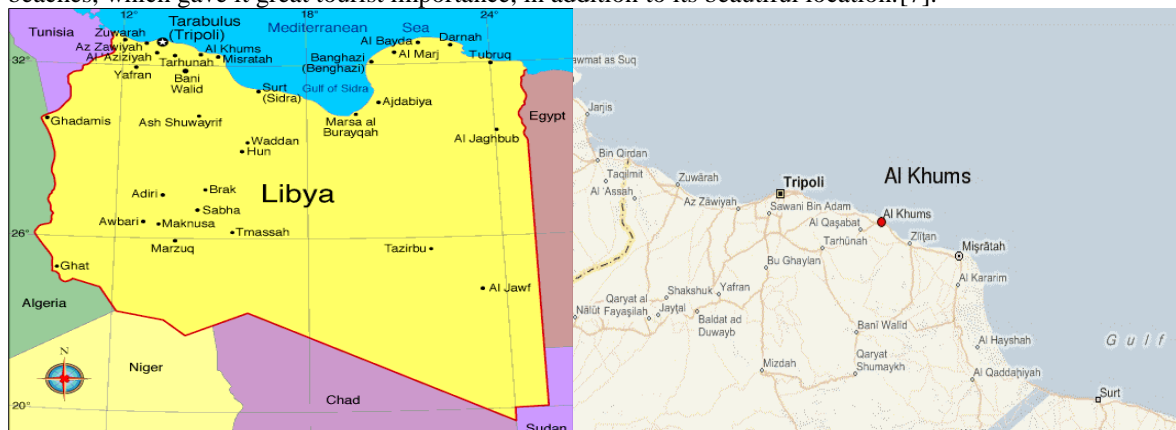


Figure 1: Location of Al-khums city

3.2. Historical background

The city of Great Lebda (Liptes magna) was founded since the first century AD on a commercial basis as a natural port on the Mediterranean coast resorted by sailors and traders Phoenicians during their commercial flights, This city soon became a Mediterranean basin and flourished in the until Roman era it was called the city of the Great Lebda (Great Liptes), It was at period the capital of the Roman state, under the reign of Emperor Septimus Severus, Leptis Magna is of major historical cities and the greatness of their monuments and the richness of its history and cultural impact in addition to being characterized by a variety of characteristics make it unique among the ancient cities. Leptis Magna was among the largest cities and urban expansion. In the era of the Libyan Punic and Phoenician and Roman. In particular, during the reign of Emperors of Al Severus they belong to an old family from the city of the same leptis. Phoenicians may be able to establish their commercial centers along the North African coast. Leptis was in the commercial center. the Phoenicians used in their way from the coast of the Mediterranean Sea for trade with Spain and that about the second century BC, Leptis Magna designed in planning such as Roman cities, The city was famous during the reign of the emperor Septimius Severus, the son of Leptis and his birth it. There are many city landmarks remaining to date. The most prominent of which are Roman theater, Arc de Triomphe, amphitheater, Hadrianus baths and others. [8].

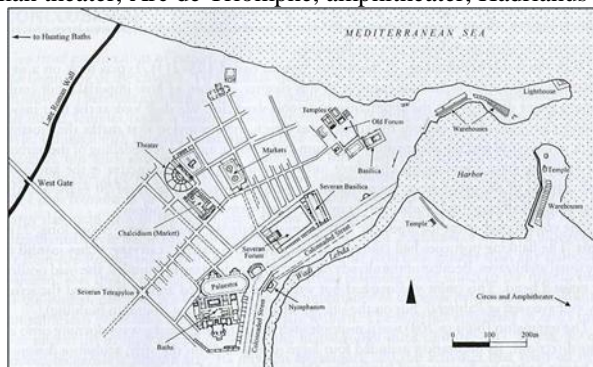


Figure 7: Location of liptes magna



Figure 2: Septimius Severus Arch and Roman theater

3.3. Street networks

Based on the assumption that criminals always choose places that require the least amount of time and energy to commit their crimes, chose a sample Al khmus City. relationships between crime and space across the areas are unlikely to be due to . The selected district : which includes districts attract and generate criminals at the same time, it was difficult to identify whether criminals are insiders or outsiders, especially that most of these district. (Al khmus City represents , There are many shops, cafes, restaurants andetc.) located within the downtown which attracts people, visitors from different areas, whether criminals or not. To identify the relationship between street networks and crime rates, space syntax analysis has been used.

3.4. Processing The Axial Maps

The three most popular ways of analyzing a street network are Global Integration, Local Integration (R3) and Connectivity values. As shown figure (3) illustrates of case study.

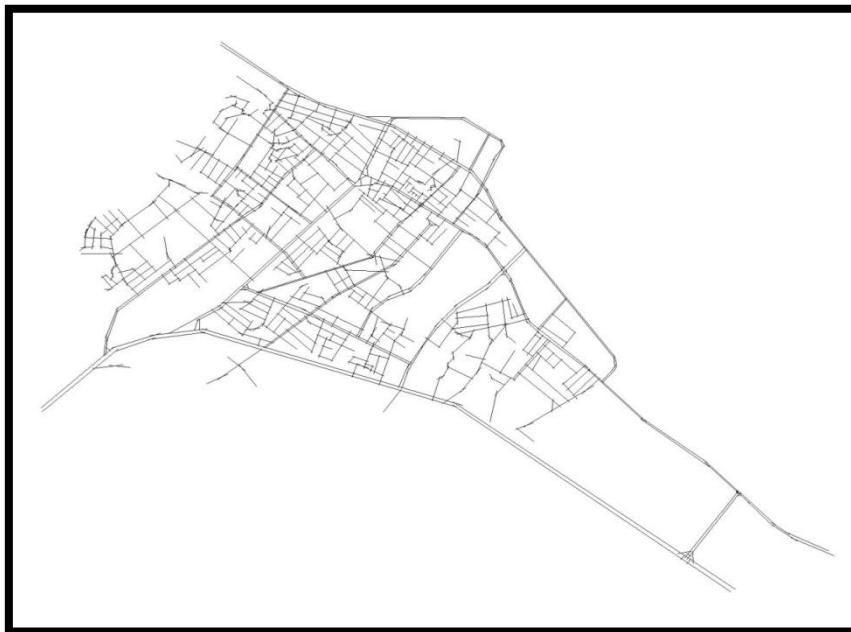


Figure 3: Axial Maps of Al-Kums City

Integration

Measures what number of turns utilizing a street to reach all other street in the network, using shortest paths. In case the amount of turns required for reaching all in the graph is analyzed, the measure integration is said to quantify at radius 'n'. The primary crossing requires just a single turn, the second two turns et cetera. The road that require the least swings to achieve every other road are called "most integrated" and are typically represented with hotter colors for example, red or yellow. Mix can likewise be Integration can also be analyzed in local scale instead of the scale of the whole network. In the case of radius 3 for instance.[2].

Global integration

The global integration demonstrates to the general conductivity and connectedness of each and every space in the whole spatial system. The higher integration value a space has, the more accessible it is from different spaces. It by and large implies that a space with high integration value has a good opportunity to a place for collecting and interaction between individuals. Global integration appears to have a fundamental impact in influencing those local solidarities open to each other and along these lines in the generation of new data and solidarities. Axial global integration is described as the integration values of axial lines at the perpetual sweep which can be used to show up a photograph of integration style at the biggest scale.[9].

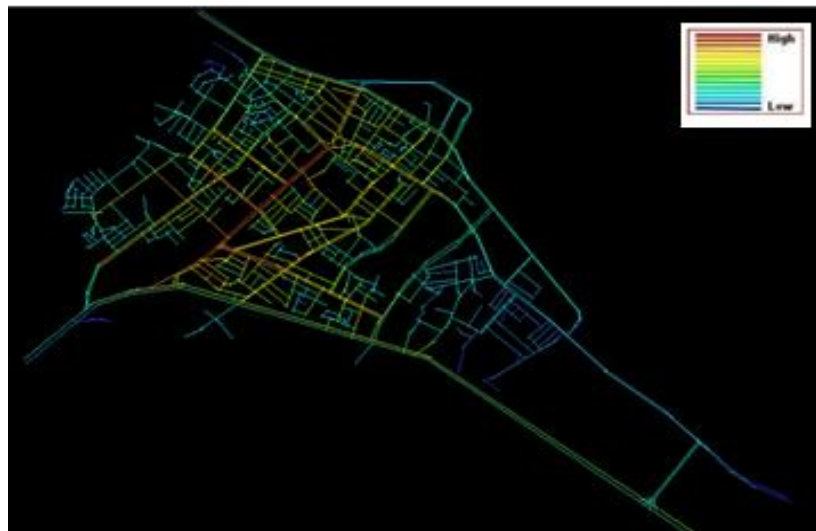


Figure 4: Global integration of Al-khums City

Local integration

The local integration represents an accessibility and connectedness inside a part of the entire spatial framework. This value is figured just a several shape a specific space, as a during three in depth. Past inquires about demonstrate that the local integration joining can be translated by the hierarchy of accessibility and local movement of pedestrians. Axial local integration is portrayed as blend estimations of axial lines at the radius 3 (root notwithstanding two topological steps from the root), which can be used to show up a concentrate picture of integration.[9]. Results bolster the nearness of a more number of individuals appear to give high discovery and arrest of criminals and potential dangers. Generally connected with a higher integration with higher activity levels at various levels of pedestrian and vehicle values. Accordingly, more individuals and the eyes are available, which thusly make potential issues for those attempting carry out any criminal act. The red color represents the highest values and then the orange, yellow and green after that blue color represent the least values.

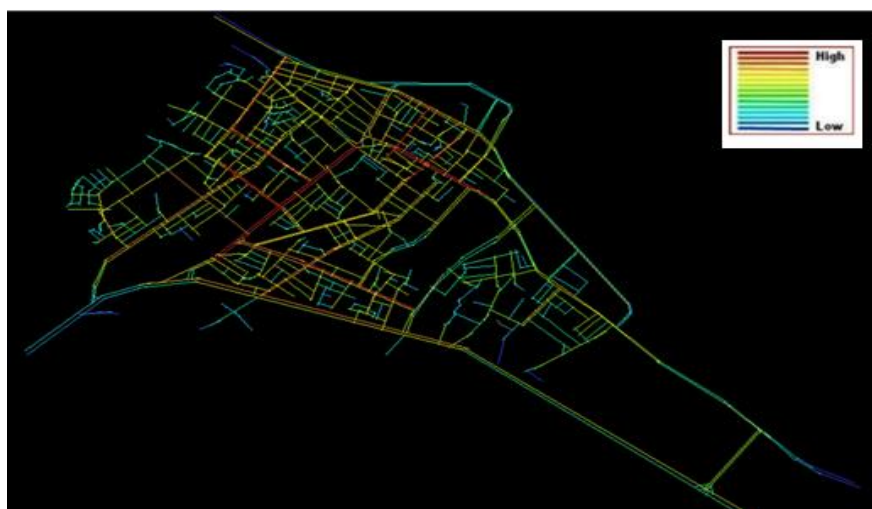


Figure 5: Local integration of Al-khums City

Connectivity

Connectivity is a simple and useful measure for axial map in space syntax. It refers to the number of the lines directly connected with the given line. In a general way, lines with high connectivity values are believed to be more popular than other lines and suppose to attract more traffic. Based on this thinking, human movement patterns can be predicted to a certain degree.[10].



Figure 6: Connectivity of Al-khums City

4. Results and Discussion

This paper discusses the study of the street network by the space syntax theory to analysis global and local integration and connectivity. The red streets in the Al-khums city are more integrated and less separated. Which indicates to people and vehicles movement are heavy. (especially at peak hours, more congestion in these hours). As shown in Fig (4). The red colored streets are more active than vehicles and pedestrians, and more integrated as in Tripoli Street, as shown Fig (5). Also this street represents the red color, where there are many different shops, government offices, security services, offices Travel, tourism and other activities. It is a street of importance of the city. The city street which branches from the street of Tripoli, and this street is represented in shops carpet, furniture and government offices, including the movement of people and vehicles. Street 17 February is also the red color, as shown Fig (5). It is of the most important streets in the city, is a lively street, it includes diverse shops, administrative centers, government offices, offices and engineering companies and banks. Note vehicles and pedestrians movement are dense. These streets are located in a more integrated and less separated area. They encourage criminals to commit theft, crimes of quarrels and skirmishes, and streets that represent green and blue are less integrated streets and more secession and some streets have closed ends. It observe these streets in the Lebda neighborhood, Al-Suqawtari neighborhood and the college district. Where these streets encourage and provide opportunities for criminals to commit major crimes. Because these kinds of crimes need a less integrated environment and more separation, and these places note the people movement a few where this type of crime requires little movement, whether vehicles or pedestrians, and also need less watchful of the eyes of passers-by.

Representing the connectivity values in the Al-khums city, Tripoli Street, 17 February Street and JameaAljadid Street are red color representing the highest connectivity values in the city. These streets are crowded into people. They are also one of the most important streets in the city. As mentioned previously, Tripoli Street and 17 February Street are one of the streets that have many crimes of theft and quarrels, making it easy about criminals to escape from other streets. The streets that represent the green and the blue color are the streets that represent the lowest connectivity values and more privacy, as these streets represent the residential areas. As in the Islamic cities require urban planning to take into account privacy within the residential neighborhood. Where in some neighborhoods the movement towards people is low, which helps criminals are easy opportunities to commit major crimes.

5. Conclusion

Space syntax techniques procedures have recently been utilized to help foresee how space will be. they have just been drawn after to help portray the flow of crime in metropolitan areas. Exactly like the reasonable structure of Jacobs, Hillier as the originator of this hypothesis, declares that "intelligible deformed grid " and constituted outward confronting piece are the key highlights of spatial configurations that design away crime from urban zones. From the situation of Newman's territoriality based faultless space framework, Hillier takes a gander at passing outsiders regularly made by the intelligible through the street framework as useful components that can as a effect protect the streets from crime incidences while strong inter-visibility of moment surroundings of each houses inside those constituted outer confronting pieces enables occupants to secure the outsiders. In reality, Jacobs' system of "outsiders secure the streets and inhabitants watch the outsiders" is which echoes the capacity of normal reconnaissance.

There is a positive relationship between the space syntax and a crime in the Al-khums city , where global and local integration is positively associated with each crime type's occurrence on the streets Al-khums city , As it increases the impact of some land use on the crime , as use the commercial land is the most common streets where the crimes of quarrel and theft as in the streets of 17 February and Tripoli Street , as mentioned above. The high-income neighborhoods in Al-khums city, Do not have crime rates. That low-income neighborhoods, crime rates are increasing , especially major crimes, this is a type of crime in the area with low connectivity and integration values is located in separated area . low people and vehicles movement, where crime rates are increasing. As in the Lebda and Al-Suqawtari neighborhoods.

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