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The Planning Unit of Residential Districts through the Islamic Conception: A computer program to implement the basic criteria

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- Abstract

This research aims at defining the size of a planning unit through the Islamic conception to be used as a forming unit for the residential districts, in order to give a unique style for our cities in the Islamic world. The criteria of this planning unit emerge from fixed bases of the Islamic beliefs, which establish unchangeable criteria, unlike the western criteria that are based on material needs of society with changeable needs.

The research objective is to introduce a computer program, and implement the basic criteria of this planning unit that reflects the main extracted values including neighboring and mosque role, as an alternative for the Western thoughts of Planning.

The computer program reflects the criteria that emerge from fixed bases against changes of time and location, having the flexibility to correspond with changeable needs of societies in our world.

The program helps planners draw and implement basic data of the planning unit, which corresponds with the interpretation of Islamic verses on the value and importance of neighboring and mosque role.

1. Introduction

The architecture and planning in our Islamic world that have western style, is not compatible with the needs of our society, and does not correspond with the urban, social, and religious values of the society Maintaining this status of architecture and planning may result in changing the society needs to conform to the existing style. Consequently, the society values also are vulnerable to be changed, which badly affect the unique character and urban values of the society. The needs to architecture and planning criteria that emerge from our society values have become a first priority.

Implementing the society values and demonstrating them into the physical environment conserve the unique character of our cities. In the same time, these values will have a stable reference that does not change through decades according to the changeable material needs of the society. And in case of changing these needs, the stable criteria and bases will be the evaluation references for alternates and solutions, as the objec is not to have modular for planning the residential district or neighborhood.

Here and before going further, we have to shed the light on that describing the values and bases with Islamic, not Arabic, as our Eastern society (both Muslims and Christians) has unique values and customs that differ from the Western's. It is the admission to and gratitude for Islam on us (as Arabs) because it is the complete and complement religion that organizes the entire life of individual and society.

2. The Need for Extracting the Planning Bases of Residential Districts

Many of our cities do not provide the social requirements and needs of the society, and features of the problem appear in the following planning defects:

- There is no clear planning of the residential district whereas the streets are planned intersectiona (mostly perpendicular). The residential units lie on both sides of the streets without defining a certain area fo residential district, which should have open areas that are not crossed by traffic. This current status does no provide: safe and calm, and familiarity between inhabitants to perform activities in open residential areas.

- The mosque does not play its important role as a religious and social center in the residential district which ties it with educational, cultural, medical, and commercial activities.

- High buildings and towers (from 10 to 30 floors) without essential need in most cases lead to lack i the social familiarity between inhabitants of these towers.

- Lacking of open and green areas inside the residential district.

- Unclear separation between vehicles and pedestrians traffic.

- The interference between various uses of administration, commerce, and manual industry with the residential districts suffering of:

- bad distribution of services,
- crowd of users of various services,

- and disturbance generated from the manual industry that are widely spread in the economic and poor areas of housing.

From the foregoing investigation, the needs for extracting the planning bases of residential districts appear as an important priority. These bases not only correspond with the religious, social, and urban values of the society, but also have a stable reference from our beliefs, which have the flexibility to enable them to correspond with changeable needs of the societies in our world.

3. Western Planning Thought

The planning bases of neighborhood (Ibrahim, Abul-Baqi, 1993) in western thought1 can be summarized in:

- Defining a certain number of inhabitants based on the educational service (the ideal number for an elementary school or a preparatory school). This number of inhabitants defines the size of other services daily basis (commercial, cultural, etc.).

- Implementing the human scale in the outdoor spaces between buildings, especially in pedestrian routes. The walk distance from the residential area to both the school and the commercial center is implemented based on the ability of walking of various ages, and according to the nature of the location and weather.

- The neighborhood is divided into two or three sections; each has an elementary school. These sections are divided into smaller areas; each one has a kindergarten.

- The speed vehicle traffic is planned to be on the neighborhood borders whereas the slow vehicle traffic is planned on the inner routes of residential sections or commercial centers, which are separated from pedestrian routes.

These planning bases of neighborhood were based on fulfilling the material needs of the society without any fixed or belief reference. Consequently, when these material needs have changed, the thought become inapplicable. This is evidence to what happened in some cities planned in England at the beginning of the last century, where neighborhoods were planned according to the previous bases. When the ratio of car possession has largely increased and the new patterns of giant mulls have appeared outside the border of neighborhoods and districts, the daily movements of inhabitants were oriented outside the residential areas. This results in emerging a new planning thought that was implemented in the more recent cities in England, for example Melton Kenz, where the planning was based on providing the freedom of cars movement between different parts of the city. The human scale was not taken in consideration to reach the administrational and commercial services in the neighborhood center. In other words, and human scale was replaced by car movement. Small commercial centers were provided beside the main center in the neighborhood center.

4. The Planning Unit through Islamic Thought

The Islamic thought fundamentally extracted from fixed values of the Islamic legislation sources that are alterable according to society needs that are changeable. This part of research is concerned with extracting fixed values and criteria from Islamic conception, which form a basis of a planning unit.

4.1 Values Demonstrated in the Planning Unit

The following investigated criteria form the planning unit in order to demonstrate important social values of Islam in our districts and cities.

4.1.1 Neighboring

Neighboring is not only the most important Islamic value that is objectively demonstrated and desirably revived in planning, but also the concept of the planning process, since the faith in Allah was linked with the generosity to neighbors as it is narrated in the Noble Hadith of the Prophet Muhammad (peace be upon him).

The residential district encompasses from a number of neighborhoods, which are divided into a number of planning units depending on the size and shape of the neighborhood.

a- Size of the planning unit

The Prophet (pbuh) said: "Verily, forty houses are neighbors. Whomever his neighbor fears his bad deeds will not enter the paradise" and "Neighboring right to forty houses (and he aimed at the four directions)", (Albukhary, Muhammad). Through trying to interpret the Prophet's saying to define the planning unit to encompass forty houses in the four directions, we have the following interpretations:

- Either each direction has 40 houses so that the four directions have 160 houses, or the four directions have 40 houses so that each direction has 10 houses.
- Defining the number of neighbor houses of a house A, through the interpretation of 160 neighbor houses in four directions, Figure 1. This house has 39 neighbor houses in one direction and 40 neighbor houses for each direction of the other three. Another house B, Figure 1, has 31 neighbor houses in a direction and 48 neighbor houses in the opposite direction, where both directions have 79 neighbor houses. The other two directions have 80 neighbor houses

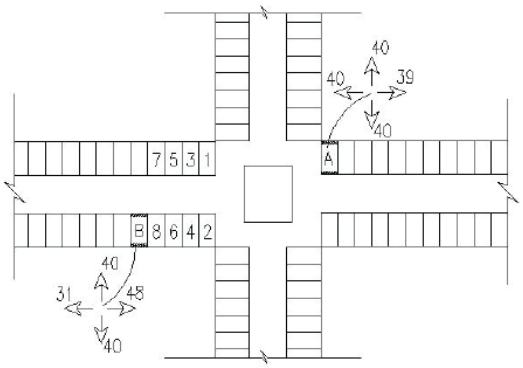

Figure 1 Trying to Interpret the Prophet's Saying of Neighboring

The foregoing interpretation highlights that it is hard to define equal numbers of neighbor houses in the four directions. Therefore, what can be understood from the Prophet's saying is that the objective is to define the number of houses that implement neighboring concept, not how to distribute this number of houses.

Another result is that the total number of houses in the planning unit should be either 161 or 41 house, in order for a house to have 160 or 40 neighbor houses.

Consequently, to encompass all the previous interpretations, the planning unit that has the maximum number of 161 houses may be divided into four small planning units where each small unit has the maximum number of 41 houses.

b- Population in the planning unit

The number of inhabitants in the planning unit depends on the average number of family individuals. It may be assumed that the average number of family is 6 individual (mother, father, 2 daughters, and 2 sons). A compound family has the original family and two families of sons, which represent 16 individuals (6+5+5=16). Each house has either a simple family or a compound family (Ibrahim, Abul-Baqi, 1982), where a simple family represents a residential unit and a compound family represents three residential units.

Consequently, the planning unit has:

- 2576 individuals (161 houses * 16 individuals), in case of 483 (161* 3 families) residential units or one house per a compound family, or
- 966 individuals (161 houses * 6 individuals), in case of 161 (161* 1 family) residential units or one house per a simple family.

c- Relationship of inhabitants in the planning unit

The relationship of inhabitants in the planning unit should not be based on any material reference or standard because this contradicts with the equality value of Islam, and it may badly affect the social relationships of inhabitants. The relationship of inhabitants may be classified according to relativeness in order to implement the Islamic values of relativeness closeness. Other relationships, such as work, mutual benefits, etc, have the same priority.

4.1.2 Mosque role

- The mosque2 is the cities heart of the Islamic world, and has an important role3 in the society. It had been linked with other functions since the beginning of Islam; the separation between the mosque and the other functions badly affected the relation between the society and the mosque. This has leaded to separate the society from the original role of the mosque, the religious function.

- The mosque and the linked services are in the center of both the planning unit and the neighborhood. If there is more than one center, the number of mosques defines based on the number of these centers. The services in this case may be divided according to the number of mosques and centers.

4.1.3 The Distance between Mosques

The Prophet (pbuh) said: “If people know what praying in the first raw of prayers has, they should compete on it” (Albukhary, Muhammad, the first part). The prayer can be performed in any pure place; however, the group prayer in the mosque is better than the individual prayer. The location of mosque may be a basis of planning; the distance between mosques and the area that mosque covers depend on the walking distance in the time period from the Azan and Iqamah (Call to prayer and Wording of Azan to perform the prayer).

a- The maximum area that mosque serves

- The time period from the Azan and Iqamah: the minimum time period is in the Maghrib prayer, where it lasts for a two Rak’ah prayer, about 7 minutes (this is what is implemented in the Sacred Mosque in Makkah.)

- The maximum total distance of walking to the mosque = 3000 meter/hour4 * 7/60 = 350 m. Fifty meters is subtracted for the vertical distance of five floors (the maximum height economically), where the walking

distance for one floor is about 10 m, Figure 2. Therefore, **the maximum horizontal distance of walking = 300 m**, and the mosque covers a maximum area of 282857.1 m^2 (22/7 * $(300)^2$), which equal about 0.09 Kilometer ^{2}, Figure 3.

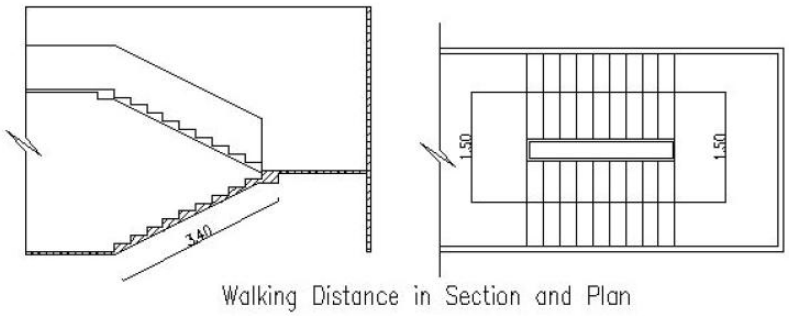

Figure 2: The Walking Distance for one Floor = (3.4*2 + 1.5*2) = 10 M

- This area may be decreased in case of the mosque covers a neighborhood which its area is less than 0.09 Kilometer ^{2}, or in case of other criteria (like location) impose a linear shape on the neighborhood where the horizontal distance between the two mosques is 600 m (300*2), Figure 3.

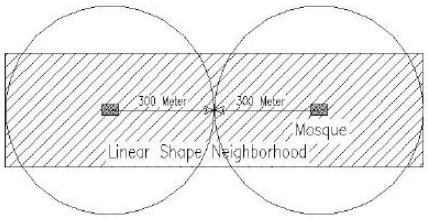

Figure 3: The Max. Area that a Mosque Serves and the Max. Distance between Two Mosques

b- The minimum area that mosque serves

- The Prophet (pbuh) said: "If there are thirty houses, an Imam must be specified for performing the Friday prayer" (Albukhary, Muhammad, the second part). Through interpretation of this saying, it can be extracted that the minimum area that mosque covers has thirty house. And this area can be decreased where the scholars encourage the long distance between the mosques (Alakabi, Abul-Haq, and Muhammad, Ibrahim, 1991).

- If the planning unit has four small units; each small unit has a mosque. The minimum area that the mosque and the linked services cover is the area of the small planning unit.

- From Figure 4, **the minimum horizontal distance of walking is approximately 170 m**. 30 meters is added for the vertical distance of three floors (the minimum height economically), where the walking distance for one floor is about 10 m, Figure 2. The minimum total distance of walking to the mosque = 200 meters.

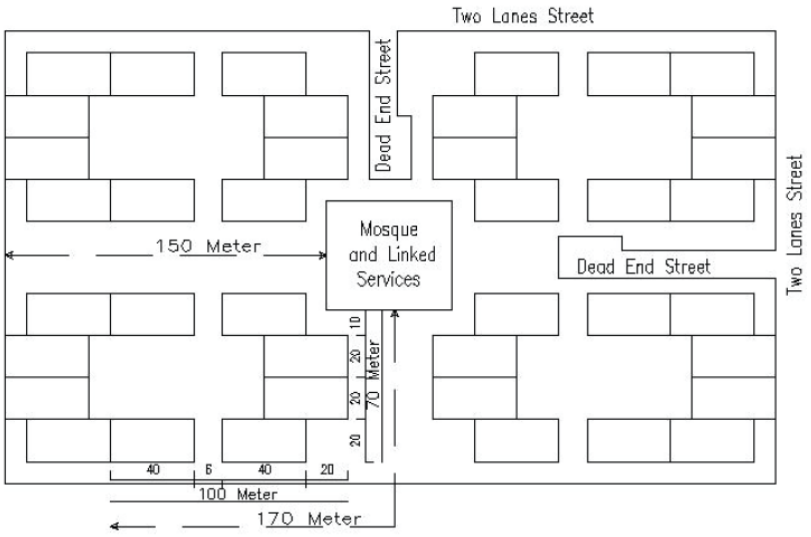

Figure 4 : The Minimum Area that a Mosque Serves and the Approximately Minimum Walking Distance to a Mosque (170 Meter). An Example of a Small Planning Unit (40 House) that Has Four Parts (Each Part Has 10 House).

c- Size and area of the mosque

- The number of prayers depends on the population, the ratio of Muslims, and the ratio of males over 7 years, and this may differ from area to another.

- The minimum number of inhabitants is that is in thirty houses from 180 to 480 individuals (the house has either a simple family, 180 individuals, or a compound family, 480 individuals). This is for the Prayer Place or the Local Mosque.

- The maximum number of inhabitants is that is in an area of 0.09 Kilometer 2 or in the neighborhood which may have an area less than 0.09 Kilometer 2. This is for the Gathering Mosque.

- The needed area of a prayer is 0.6 m2 (1.2 * 0.5 = 0.6) where the width needed for a standing prayer is 0.5 m and the length needed in front of a prayer is 1.2 m (Abdelhameed, Wael, 1995). The area of the mosque = number of the prayers * 0.6 m2 + area of the services (bathrooms and Imam's room) + the mosque square.

4.2 Public Possession

- Islam has approved the general possession and urged to safely keep it, which has the benefit of the individual and the society. Also, Islam organizes the use of public possession through keeping its maintenance.

- In order for the general possession to perfectly perform its function, the functional quality has to be considered during planning through the required service area for the individual.

- The public possession is classified into streets and services.

4.2.1 Streets

They are planned according to the following criteria:

a- Width of streets

- Inside the planning unit, streets that have dead end or cul-de-sac have two lanes, and other streets have more than two lanes depending on the car possession ratio.

- Between the planning units and the neighborhoods, the streets widths depend on the car possession ratio and the traffic density, which differ from area to another, with considering the future growth.

b- Area of parking

- During planning the streets, parking areas have to be calculated and distributed according to the car possession ratio, with considering the future growth.

c- Safeness

Safeness can be achieved through:

- - Preventing the crossing traffic inside the residential areas.
- - Separating the pedestrian traffic from the vehicle traffic that is preferred to be at the borders of residential areas.
- - Specifying pedestrian routs.

d- Urban values

- Streets level and ranking, and their gathering.

- Dividing the inner streets into visual sections, and streets appearance from distance.

- Reserving each street style and function as the same.

4.2.2 Services

Islam encourage what has benefits for the individual and society; this is evidence in public service building that appear in the old Islamic cities, like Sabeel (a public place for drinking water), Kotab (a place for teaching the children). Islamic values urge to justice and equality between people, through the context here the meaning of justice is through the good distribution of services in the neighborhood and district, so that all individuals spend approximately the same time to reach different services.

4.3 Distributing the houses and services in the planning unit

- The interpretation of the house can be as the following:

- A separate house, which contains a simple family or a compound family. This house consists of one floor to three floors (each family in the compound family has a separate floor). The number of inhabitants in the planning unit that has this kind of housing is from 966 to 2576 individuals.
- A residential building, which consists of five floors (the more economic level of the planning unit the higher number of the floors). From the total number of the inhabitants in the planning unit, which is 2567 individuals with assumption of a family has 6 individuals, the number of the residential buildings in the planning unit can be specified.

- The neighborhood has more than one interpretation of the house, where it can be classified into a number of the planning units that depends on the size and shape of the neighborhood. The planning unit that has a total number of 161 houses or 2576 individuals is classified into four small planning units; each one of them has a number does not exceed 41 houses or 656 individuals, Figure 5.

- The small planning unit has only one interpretation of housing, in order for houses heights to be equivalent.

- The mosque and the linked service buildings (cultural unit, social unit, etc.) in the neighborhood center at the middle of the main traffic route and around the main center square; the schools are located at the center sides perpendicularly on the main traffic route. The services that are not in the center of the neighborhood are distributed on the main routes of vehicle traffic.

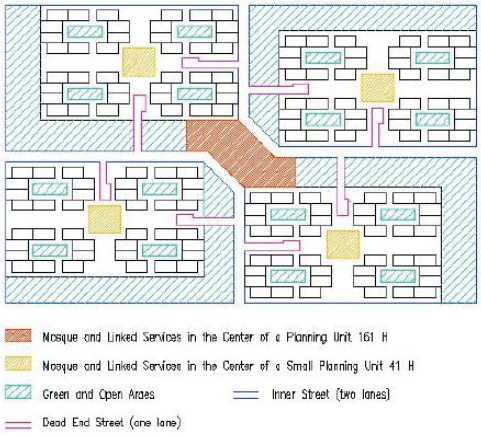

Figure 5: **An Example of A Planning Unit that Are Divided into Four Small Units, Each One Has a Mosque and the Linked Services in Its Center**

- The higher heights are on the main traffic routes and decrease into outside. The neighborhood has the higher heights (five floors) where the residential use can be combined with other uses (commercial and administrational) on the main traffic routes. The inner traffic routes have the lower heights (three floors).

5. A computer program to implement the basic criteria of the planning unit

We can summarize the previous criteria in: Neighboring, Mosque Role, Public Possession, and Distributing the Houses and Services in the Planning Unit. The first two criteria are considered the basic criteria that represent the Islamic conception in planning thought.

The research introduces a computer program that implements these two criteria, Figure 6. The program has two main functions: draw the plan, and calculate the Residential units number and population, in order to specify areas of planning units and areas of mosque coverage. Also, there are functions of saving and loading the drawing in dxf (for famous CAD programs) and native (for the java program only) formats.

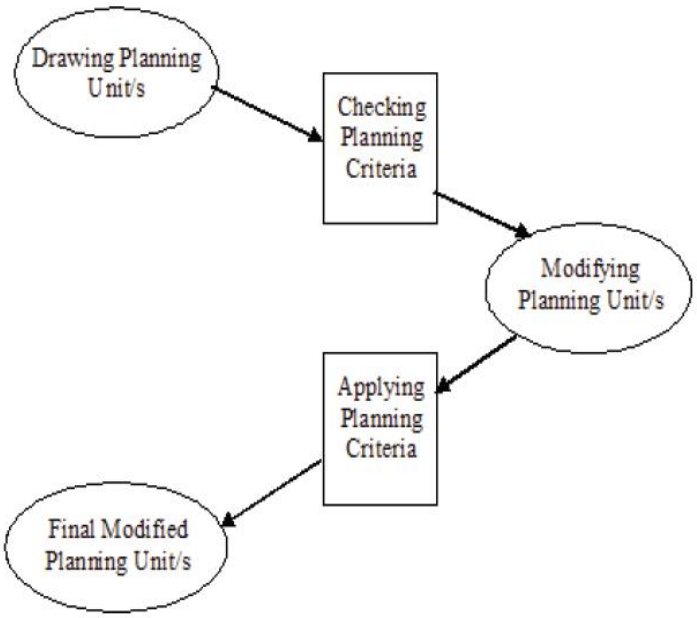

Figure 6 : A Process Model of the Introduced Computer Program

Figure 7: illustrates the program flowchart, including the user role in the process. The functions offered by algorithms are divided into two main categories: Drawing (by the user) and Calculation functions (according to the input data).

- Drawing Functions:

The drawing functions have four pull down menus, namely: 1) Select, to select Segment, Shape, or Group. A user has to select among the three options according to the next action. The first two options allow to draw or transform, while the third option allows to transform any selected shapes or to calculate area or population of the selected planning unit/s. 2) Draw Shape, to select and draw a shape among different offered shapes, such as: Circle, Triangle, Rectangle, Pentagon, Hexagon, Heptagon, Octagon, etc. 3) Draw Segment, to select and draw a segment among offered segments: Point, Line, and Arc. 4) Transform, to select and transform the previously selected segment, shape, or group from the offered function: Move, Rotate, and Scale, Figure 8. User has to select first and then apply transformational functions.

Moreover, there are functions of Save and Load through other two pull down menus. Both functions have the options of: 1) dxf format that enables the user to reopen the drawing in a different CAD program (for example AutoCAD), and 2) native format that enables the user to reopen the drawing in the Java program used.

Also, there is a Delete button to delete any selected segment, shape, or group to modify the drawn planning.

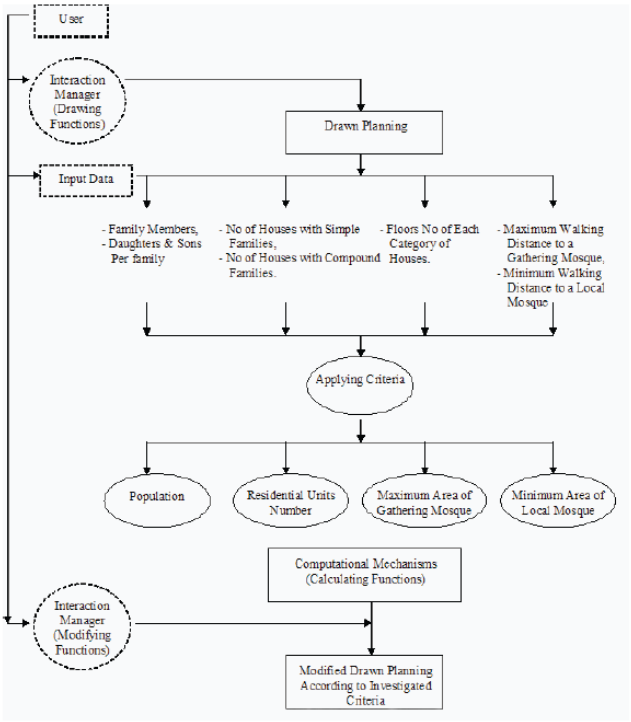

Figure 7: **The Program Flowchart**

- Calculation Functions:

The program asks the user to enter the assumed data previously investigated, through a popup window at the beginning of program, which collects information, namely: number of family members, number of daughters and sons per family, number of houses that have simple family and floors number of this category, number of houses that have compound family and floors number of this category, walking distance in the area, maximum walking distance to a gathering mosque (masjed gami'a), and minimum walking distance to a local mosque (masjed mahali). In other words, all data that can be vary from one unit planning to another or from one area to another would be inputted in the program.

The algorithms calculate the residential units number, population, maximum area that a gathering mosque (masjed gami'a) covers, and the minimum area that a local mosque (masjed mahali) covers, in any selected area by the user, which is drawn in the main panel.

By clicking the Ho. no. (houses number) button or the Popu. (population) button, the results of calculations appear in a popup window to specify the differences between what is drawn and the basic criteria. The program has the potential to enable the user to modify the drawn planning through various transformation and deleting options, Figure 8.

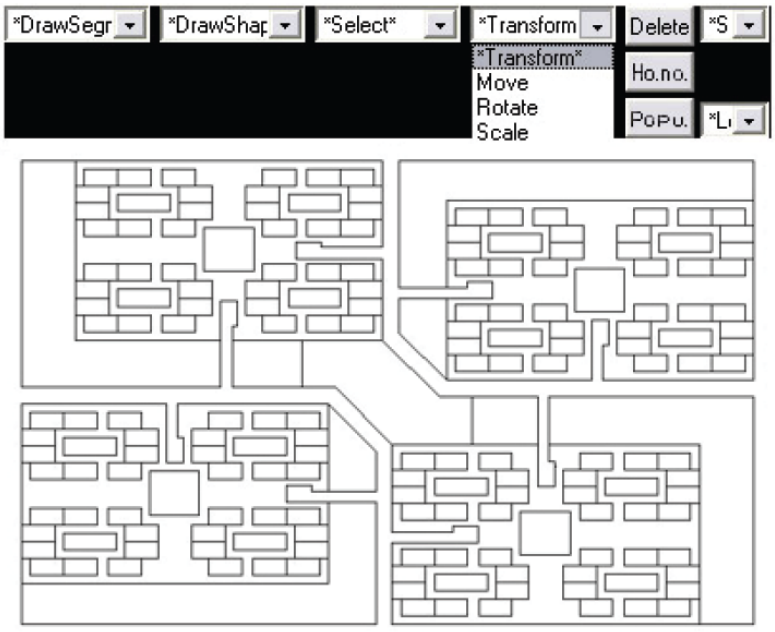

Figure 8 The Introduced Computer Program (a Planning Unit Drawn in the Main Panel), and the Components of the Transformation Pulldown Menu.

6. Conclusion

The research highlights the need for planning criteria that emerge from our society thoughts and beliefs. The western thought of planning has been reviewed, in order not to make the same planning disadvantages.

The values that are generated from the Islamic conception have led to define the criteria that can be summarized in: Neighboring, Mosque Role, Public Possession, and Distributing the Houses and Services in the Planning Unit. These criteria give cities planning of the Islamic world a unique style that corresponds with society needs and beliefs.

The research introduces a computer program, as an implementation tool, to help architects and planners draw the planning and apply the two main investigated criteria. The algorithms are based on creating an environment for the user to draw planning, to implement the basic criteria (through computational mechanism), and to modify the drawn planning.

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(Endnotes)

1 In 1938, a book of the American philosopher "Louis Mimford" was published, which affected the planning thought especially with his theory of the residential neighborhood, where he established its basis and criteria based upon the walking movement of the child between the home and the school and upon separating this movement from the vehicle traffic with is noisiness and danger. Mimford planned the school with its cultural activities in the center of the neighborhood instead of the place that the church has in the middle era. Through this thought and implementation, the church had removed from the center of the social life to be in aside place in the society, (Ibrahim, Abdulbaqi, 1993, pp 15).

2 The mosques are classified into (Alakabi, Abul-Haq, and Muhammad, Ibrahim, 1991):

- Prayer Place (Mosala): where the group prayers are permanently performed in work places, mulls, etc.
- Local Mosque (Masjed Mahali): It locates in the planning unit and the neighborhood to perform the five prayers.
- Gathering Mosque (Masjed Gami'a): It locates in the neighborhood and the residential district to perform the Friday prayer, as the Friday prayer is not performed in every Local Mosque.

3 The mosque had been linked with functions since the beginning of Islam, which can be summarized in (Abdul-Raof, Essam El-deen, 1968):

- Religious center, for praying and studying the religion commands.
- Governmental authority, for political and justice administration.
- Cultural and educational center, for studying science and debates between scholars.
- Medical and pharmacy center.
- Social center, because of the mosque yard in which prayers gather five times daily.

4 The walking ratio differs from a region to another based on the nature of location and climate. We may assume that the walking ratio is 3 kilometers/hour for the moderate climate and location.

الوحدة التخطيطية للأحياء السكنية من خلال المفهوم الإسلامي

Wael Abdelhafeez M. Abdelhameed

- الملخص

تهدف هذه الورقة البحثية إلي تحديد حجم لوحدة تخطيطية تستخدم كوحدة لتكوين الأحياء السكنية و ذلك من خلال مفهوم إسلامي، لكي نعطي طابعا مميزا لمدن عالمنا الإسلامي. و في نفس الوقت تكون الأسس التي تقوم عليها هذه الوحدة التخطيطية أسسا ثابتة و نابعة من عقيدتنا الإسلامية، و ليست كالأسس التي اتبعها الغرب و التي تغيرت بتغيير الاحتياجات المادية للسكان.

و يمكن تلخيص أسس الفكر التخطيطي الإسلامي في تحديد حجما لوحدة الجوار (الوحدة التخطيطية) علي أن تكون مأخوذة من تفسير أحاديث رسولنا الكريم عليه أفضل الصلاة و السلام في قيمة و أهمية الجوار والتي تعتبر المدخل إلى الفكر التخطيطي الإسلامي للأحياء السكنية، وعلي أن تكون نابعة من تعاليم الدين الثابتة التي لا تتغير مع الزمان أو المكان. وفي نفس الوقت يكون لها من المرونة ما يجعلها متوافقة مع متطلبات السكان والتي تتغير بتغير الزمان والمكان (طبيعة الأرض والمناخ ..... الخ).

و تهدف هذه الدراسة إلي تقديم أداة تطبيقية، عبر برنامج حاسب آلي، لهذه الوحدة التخطيطية لتكوين الحي السكني و التي تجمع الأسس المستخلصة آخذة في الاعتبار المساحة التي يغطيها المسجد و الذي يمثل نواة هذه الوحدة. يعمل هذا البرنامج علي مساعدة المعماريين و المخططين في: رسم المخطط، و تطبيق و حساب المعايير التخطيطية الأساسية التي تم بحثها، و أخيرا تعديل المخطط المرسوم ليتوافق مع هذه المعايير.