Developing and establishing a geospatial database of the religious endowments in Hilla, Iraq

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Abstract. The religious endowments (according to religious and legal contracts) are one of the important sources that acquire historical, cultural and economic importance in all countries of the world. For optimal management of real estate (non-transferable assets) of religious endowments, the proposed study introduces a new technical method for management, and under this method, a geospatial database is constructed: (satellite images, digital maps, and field survey data enhanced with GPS coordinates). Real estate that belongs to a religious institution in Iraq (Shiite endowment in Hilla city) will be investigated as a case study for the proposed research. In this proposed study, methods of statistical and spatial analysis are employed on the spatial database provided by Geographic Information Systems, in order to better manage and invest these properties.

1. INTRODUCTION

Islamic endowments or so-called (Wakf) can be defined as the permanent dedication of moveable or immovable properties that is religious, pious, or charitable. Charity is the major feature of the wakf concept. It means the endowment of immovable or moveable properties by the Muslims for the welfare of the poor and needy and for maintaining properties dedicated to tombs, mosques, shrines orphanages, madrasas, and the likes [1]. Islamic endowments is playing a dominant role in the Iraqi's religious activities. Islamic endowments can be classified into two types, first, shrines, mosques, and other religious locations. Second, real estates, lands, and properties [2]. Shrines and mosques and are major nodes of gatherings, granting those in charge of them stages to disseminate their ideas and confirm themselves in the religious fields. They have facilities that can be utilized for commercial operations or as real estates, and they achieve donations and charities from philanthropists and pilgrims.

Before 2003, the government-controlled most of the important Islamic endowments in Iraq through the Ministry of Endowments and Religious Affairs (MERA) [3], the post-2003 official policy adopted a new model that recognized the autonomy of religious institutions and their right to operate independently in the public sphere. Real estates that belong to a religious institution in Iraq such as the Shiite endowment include several assets like buildings, lands, commercial locations. Recently, the management of these real estates is faced with several challenges such as the complexity of the documents archiving, counterfeiting, and manipulation in the real estate registry. In addition, the decision-makers didn't have the efficient tools to monitor and control the performance of Islamic endowments. Therefore, the proposed study looks forward to the shift in the method of real estate
management from the paper style to the digital method because the latter method has important advantages in terms of shortening the effort time, in addition to greatly reducing counterfeiting and manipulation in the real estate registry, because the new records of real estate are digital and have high technical specifications from Where the accuracy of authentication and security of access and update.

2. RELATED WORKS

There are several studies were conducted for land management operations based on different techniques. Recently, the establishing of Databases for lands, owners, condition, and tenants have attracted experts in the field of land management. Jiyuan et. al, 2002 [4] developed a database for land cover-land use at national scale, in order to save geographical and environmental information related to china. On the other hand, Poursaeed et. al, 2018 [5] they developed a method for predicting the luxury level of real estates based on database system that created using photos and data. An Islamic endowments database is considered one of the most important databases due to the importance of endowments in the economy growth in many countries like Iraq. Many studies conducted to manage and control real estates that belong to the Islamic endowments, Pioppi et. al 2004 [6] evaluated the real estates that belongs to (WAQF) in Egypt and analyzed the relationship between endowments and the Egyptian economy. They used statistical analysis. In a separate study, Sanusi et. al,2015 [7] proposed a method to evaluate endowments in Malaysia by examining the applicability of cash WAQF in Muslim countries. One the other hand, Ahmad et. al 2012 [8] proposed a database to manage and control (WAQF) real estates in Bangladesh by using computers systems. Hasan et. al,2019 [9] evaluated the Islamic endowments in Iraq based on the databases and management systems. SINGH et. al,2012 [1] proposed a study to evaluate the impact of Islamic endowments in Iraq on the political operation based on specific databases for endowments. The main drawbacks of studies above, they time consuming, they don’t have the ability to manage locations or creating spatial analysis. Nowadays, spatial technologies became wide-spread in different applications [10-13]. There is a lack of spatial methods for managing the Islamic endowments. Therefore, we conducted a study based on GIS modeling.

3. METHODOLOGY AND DATA

3.1 STUDY AREA

This work was conducted in Hillah, Iraq. The Governorate of Babylon is located in the middle of Iraq, south of Baghdad at the intersection of longitude 44° 22’ 12.4” – 44° 22’ 12.5” E and latitude 32° 24’ 23.54” – 32° 31’ 57.47” N. The city of Hillah is the administrative center of the province of Babylon, and is 89 km to the south of Baghdad. The total area is 5,119 km², equivalent to 1264930.495 acres and has a population of about 2,065,042 people in 2018. This area is unique by several land use locations such as commercial, industrial, residential areas and several human activities and infrastructures that recently increased. Moreover, there are many historical locations such as old Babylon city distributed near the city making this area attraction location for tourism. On the other hand, agricultural fields covered large areas in Babylon province [14]. On the other hand, the weather in this area considered cold in winter and hot-dry in summer.
3.2 THE OVERALL METHODOLOGY

The proposed methodology includes the integration between Geomatic techniques such as global position system (GPS) and Geographic Information System in order to establish an efficient geodatabase for monitoring and controlling Islamic endowments in Hillah city located within Babylon province, Iraq. The geodatabase (GDB) is the normal data management structure for ArcGIS. It is easily to put in a container for attributes and spatial data. A geodatabase is a store of geographic data implemented with the relational database. First, Feature data set, is some of the structural elements of a geodatabase that can be develop any geographic data it contains spatially related feature class together with the topology and network objects that bind them. Feature class is a table with a shape field containing point, line, or polygon geometries for geographic features and for topology; it is the set of integrity rules that defines behavior of integrated features. Second, the survey data set is also one of the structural elements of a geodatabase, which contains survey measurements that are used to calculate coordinates of the features. Third, table is also one of the structural elements of a geodatabase which can be define as a collection of rows and columns. Tables represent nongeographic objects. Finally, raster data set is the other elements of the geodatabase structural.

Figure 2 represent the structural of any geodatabase. Field survey is first step in our methodology, which conducted based on two types of forms as well as collecting the UTM coordinates (Easting, Northing) position of each real estate belonged to Islamic endowments (Shiite endowment in Hillah city), by using GPS equipment. The second step includes GIS works composed of the building of geo-database of Shiite endowment by using ArcGIS software. GIS is an integration of software and computer hardware for gathering, storing, manipulate, and analyze a geographic data base that referenced to the earth in order to produce a geodatabase or maps and tabular data. GIS deal with two data (spatial, and non-spatial).

Then this geo-database was joined to the proposed forms based on the relationship class method by using ArcGIS software. The final step includes the extraction of data from the proposed Geo-database and creates specific reports based on stakeholders' demands. Figure 3 is representing the proposed methodology.
Figure 2. Inside the geodatabase

Figure 3. The proposed methodology
3.3 The Field Survey
The field survey was performed during September to November 2020, which is covered all real estates that belong to Shiite endowment in Babylon province, Iraq. The process of surveying implemented based on several steps, the first step is the observing of geographic position (UTM or Geographic coordinate) for each real estate belongs to Shiite endowment by using Global Navigation Satellite System that represented by Global Position System equipment, model (Garmin - eTrex® 10) with horizontal accuracy +/- 5 m, vertical accuracy +/- 10 m. The observation process required several minutes to connect with at least 5 satellites in order to obtain the optimal accuracy of coordinates. The second step was the data collection by using two forms, the first form includes general information related to the real estate such as building ID, name of real estate, number of real estate, the condition of the real estate, area, construction year, number of units, number of floors. On the other hand, form two includes specific information for each unit within single real estate such as (the name of contractors, number of contract, the date of contract, contract duration, the amount of rental, etc.). The last step is the data entry by converting hard-copy data to digital information by using Microsoft office software in order to prepare the required database that will be the input data for the Geo-database.

3.4 GIS Works
In order to create an integrated Geo-database, we applied the relationship class technique using ArcGIS software to connect real estates that belong to the Shiite endowment in Babylon province and their existing tenants either persons or companies. Theoretically, relationship techniques show how the non-spatial and spatial objects are connected. In a geospatial database, all relationships are stored in a specific class, which called (relationship class). According to a relationship class, where related objects can exist independently. Generally, relationship class has three types of cardinality concept (i.e. one-to-one, one-to-many, or many-to-many cardinality). Technically, each object in the origin relates to each object in the destination based on a unique value that located at key fields in both objects. For example as in figure 4, the parcel 789 connects permits 2 and 3 because all those records have the same parcel ID.

![Figure 4. The objects relationship process](image)

In the connecting process, a key field located in the origin object is usually called the primary key. While the key field in the destination object is called a foreign key. The key fields may be named with different names but they must include the same type of data and the same information. Therefore, we must define the field keys during creating a relationship class. On the other hand, a relationship’s cardinality defines the count of objects within an origin class, which can connect to the count of objects within the destination class, there are three relationship’s cardinality in geospatial databases such as one-to-one relationship where each object in the origin class can connect to only a single object in the destination class, one-to-many relationships define the relationship when one object in the origin class relate to many objects in the destination class, and many-to-many relationship defines the relationship when a single object within the origin class can connect to several objects within the destination class. Figure 5 shows the cardinality types.
In this work, we were created a geo-database for real estates that belong to the Shiite endowment in Babylon province as a feature class (polygon) by using ArcGIS software (Arc catalog), after that, we were drawing each real estate based on the available coordinates. Furthermore, we created a field for the join process, which has the same values that input in the survey form. This field is called (join code). Then, we created a relationship class between parcels that created in ArcGIS and the table that contains surveying information. We relate GIS parcels with form 1 that represented by table 1 based on (one-to-one relationship) after that we related parcel with form 2 that represented by table 2 (using one-to-many cardinality) in order to produce a geo-database includes both (spatial and non-spatial) information for real estates that belong to the Shiite endowment in Babil province. Figure 6 represent the relation one to many in the geodatabase for one feature.

Figure 5. Represent the relation one to many in the geodatabase for one feature.

4. RESULTS AND DISCUSSION

In general speaking, the resulted geo-database is considered as a unique geo-database related to an Islamic endowment in Iraq that included both locations and detailed information for each real estate that belongs to the endowments. In other words, this geo-database is the first geo-database for the office of the endowment in Iraq created using Geomatic techniques. Besides, the resulted geo-database has several capabilities such as query, search, and statistical calculation. Moreover, users have the ability to easily deal with data both spatially and statistically. For example, we can preview all details related to each real estate, these information include (land use, name of tenants, area, contract duration, rental amount, … etc.). The proposed Geo-database have related each real estates with the several tenant information, if we want to identify any tenant information, we can easily use ArcGIS software (Arc Map) to preview these information. For example, Real estate can contain several units. Relationship class process can relate all units with one real estate. Figure 7 shows the
digital thematic map for religious endowment in Hillah while in Figure 8 there is a relationship between one real estate and different units that existing in the same real estate.

According to the resulted geo-database, geographically, the real estates of the Shiite endowment in Babylon province included 40 real estate distributed along Hillah city. Thus, we can extract several statistical information related to spatial locations, for example; the highest amount of annual rental was recorded of 46000000 that related to the investment of a group of markets in Al-Mahawil city. On the other hand, the longest contract term was recorded as 20 years for the investment of a group of markets related to husseiniya al-Rasool in Al-Mahawil city. While the shortest contract term was recorded for other real estates. According to the geo-database, we can create several thematic maps related to the Shiite endowments condition. Moreover, we can update these maps. For example, we created a thematic map of the structural condition of the real estates that belong to Shiite endowments in Hillah city. The created maps shows spatial distribution of endowments real estates located within Hillah city. In general, most of these endowments were concentrated in the city center. Regarding the structural condition of each real estate, we extracted the condition based on mapping techniques, where there are 17 real estate in good condition, 6 real estates in bad condition, 7 real estates in a moderate condition.

Figure 6. Thematic map for religious endowment in Hillah
5. CONCLUSION

The religious endowment is one of the important sources that acquire historical, cultural and economic importance in all countries of the world. For optimal management of real estate (non-transferable assets) of religious endowments, a geo-database has been proposed in order to optimize the data management and documentation in real estates that belong to the Shiite endowment in Babylon province. A relationship class technique was applied to relate GIS data and field data that input in two types of forms, by using one-to-many cardinality, the proposed method obtained an integrated geo-database for real estates and buildings related to Shiite endowment office. In general
speaking, the resulted geo-database is considered as a unique geo-database related to an Islamic endowment in Iraq that included both locations and detailed information for each real estate that belongs to the endowments. In other words, this geo-database is the first geo-database for the office of the endowment in Iraq created using Geomatic techniques. Besides, the resulted geo-database has several capabilities such as query, search, and statistical calculation. Moreover, users have the ability to easily deal with data both spatially and statistically. Therefore, we recommended spatial data bases as a major systems in the managing and controlling real estates for Islamic endowment in Iraq.

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