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Article

Drawing University of Kirkuk Map Using (GIS)

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Abstract: A geographic information system (GIS) is a computerized system of capture, storage, verification and representation of data relating to places on the surface of the earth. A GIS will be able to combine numerous forms of information on one map such as the streets, buildings, and vegetation. This incorporation enables users to understand, analyze, as well as visualizing the spatial patterns and associations effectively. In addition, GIS is able to absorb any dataset that has locational attributes. Location can be given in various forms like latitude and longitude, postal addresses or ZIP codes .And because problem of this research is that the University of Kirkuk does not have a digital map, so by using the ArcGIS program, we will draw a digital map for kirkuk University Work method in brief was where we collected all the required information about ArcGISProgram aw we got (Arial image of kirkuk university ,AutoCad map of kirkuk university) and georeferencing them and drawing points, polygons and line.

Keywords: Map, Information, System, Geographic, University

1. Introduction

It AGIS is an abbreviation of a geographic information system. A computer program that maintains the data is referred to as an information system. A GIS is a system of information that deals specifically with geographic, or spatially based information[1]. GIS is one of the fast growing technologies that combine graphical capabilities and tabular data to evaluate the issues that affect the real world.

The problem of the research is that the University of Kirkuk does not have a digital map with accurate global coordinates. The objective of this research to draw digital map for University of Kirkuk by ArcGis Software With accurate global coordinates (X,Y) that Connected with Latitude And Longitude[2]. After Diagnosis the problem of research e started by studying the theories and collecting as much information as possible about the GIS program and learning[3] how to use it in drawing maps ,we started by bringing an aerial image of Kirkuk city into the program and locating the University of Kirkuk After that We were could to get the map of the University of Kirkuk from the Presidency of the University of Kirkuk, which was in an autocad form We start by georeferencing together with the arial image in GIS program ,and after that we begin drawing lines on it to locating the roads of cars and pedestrians paths and drawing points to identify electricity poles, trees and drawing polygons to draw building ,And merge all these layers, that we draw it we got a digital map of University of Kirkuk[4].

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2. Materials and Methods

This section will be the one that tries to familiarize the reader with the basics or the main elements of a GIS. All these components will be individually taken into consideration in the following. GIS elements: a working GIS is made up of 5 core elements which are: hardware, software, data, people and methods/applications as shown in Fig 1.

Figure 1. GIS Components

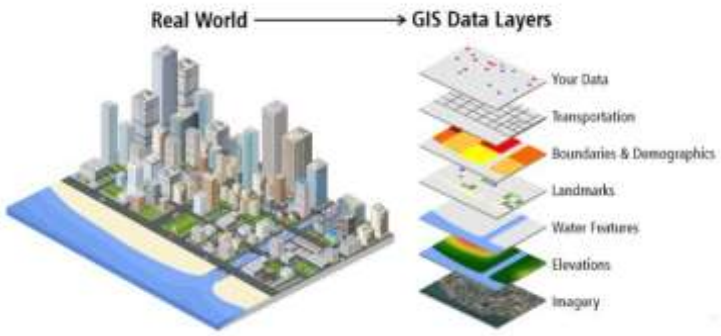
The computer hardware plays a central role in the same field; it does the actual execution of the software, holding the data gathered and is the main interface through which the staff interacts with data in the system. Nevertheless, hardware is not completely definite, and the right customizations vary with the purposes of the project. To illustrate, when a research requires that the record of all the landslides in Mayor in a specific duration is needed, then scuba equipments will not be needed; however, they will be required in an activity like a coral check-up.

With this respect, some of the hardware requirements might differ, but they are still indispensable to the process. There are four major categories of devices:

1-GPS, cameras, probes: data acquisition.
2-scanners, digitizers as data input
3- Data output printers, computer monitors, plotters
4-Data analysis and storage: computer, hard drives.

The GIS software provides the functionality and tools needed to store, analyze and display the geographic spatial information. The basic software elements comprise: a database management system; tools used to input and manipulate geographic information; tools used to support geographic query, analysis, and visualization; and graphical user interface (GUI) to provide easy, convenient access to the tools.

A GIS is driven by data and is, therefore, the most crucial aspect of a GIS. Geographic information and related tabular or attribute information, as illustrated in (Fig-2) could be



acquired internally or obtained by a commercial data vendor.Majorities of GISs create and maintain a database to facilitate the arrangement and management of data.

Figure 2. Layered GIS Data

GIS applications are designed, marketed and put to use by people. GIS would not exist without people. The technology can be of low worth in the absence of staff that manages the system and comes up with strategies on how to apply the technology. The users of GIS can be technicians and experts who create and maintain the system, end users who use it to facilitate their daily professional activities and decision-making.

Methods are well considered schemes and/or rules of an organization detailing the application of the technology or the way it is to be used.

- Guidelines. – Specification. - Standards and selects what to be included and what is to be omitted.

3. Results

Topography, commonly referred to as entities, has been a common representation of topography in scaled maps and plans[5]. These maps or plans gave lists of scaled or generalized features that are found in a given geographic area. Along with the emergence of large databases, compiled mainly to map, the focus was on novel methods of analyzing and querying the data stored in computers, which later led to the emergence of geographic information system[6]. GIS data can either be assembled out of existing databases, digitized or scanned out of existing plans and maps, or can be gathered by the use of traditional surveying methods or the global positioning system (GPS).A geographic information system is a system which makes use of geo-referenced data to respond to questions[7]. A computer-aided cartographic system is a collection of graphics elements to view and print maps in general, only, and, consequently, not a GIS. A drafting with the assistance of a computer (Table 1.)

Table 1. Correlations of conventional fields to GIS.

	Functions of GIS								
Discipline	Data Acquisition	Mapping	Pre-Processing	Data Structure	Database	Spatial Analysis	Modeling	Display	Application
Geography		x				x			x
Cartography	x	x						x	x
Remote sensing	x	x				x		x	x
Photogrammetry	x	x						x	x
Surveying	x	x							
Geodesy		x							
Statistics			x		x	x			
Operational research						x	x		
Computer science			x	x	x	x	x		
Mathematics				x		x	x		
Civil engineering	x	x				x	x		
Urban planning	x					x	x		x

Both GIS and CAD are generally computer based, but CAD is normally used in high-precision engineering and surveying applications, and GIS is usually used in lower levels of precision that are normally needed during mapping and planning.Since Figure 3, which, in fact, displays the affiliation of GIS to other major systems, demonstrates the resemblance of CAD to mapping, CAD can be likened to mapping since it is in essence a catalogue of documented and calculated data that can respond to the following questions: What is it? Where is it located? However, CAD does not have analytical tools to implement spatial analysis[8]. Comparatively, besides providing the responses to the questions of where and what, GIS can model data and give the answers to the spatial and other questions; the topology offers GIS the abilities that are not possessed by other programs.

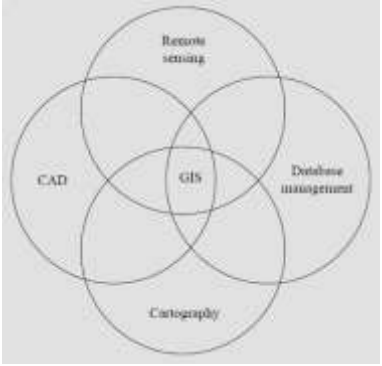


Figure 3. The correlation between GIS and other primary systems.

GIS A GIS can be viewed as a collection of subsystems in the already established framework of a bigger main system[9]. As such, a GIS is a system of four major functional subsystems (Figure 4).

1. Data input (ingest through maps, aerial photographs, satellite image data)
2. Storage, retrieval and querying (data storage and retrieval).
3. Transforming, analyzing and modelling of data (manipulation and analysis)
4. Display of data (reports in maps, reports, plans, etc.)

There are five main components of a GIS, which include the data acquisition, data preprocessing, data management, data manipulation and analysis, and product generation (output). These components are involved in a working process of the GIS system (Figure 5).

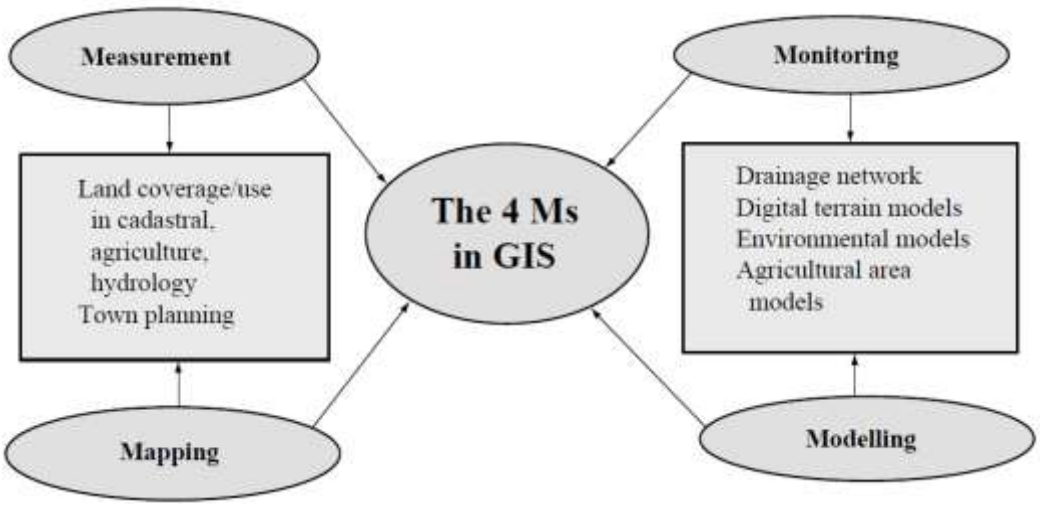


Figure 5. Part of the schematic illustration of the four Ms in a GIS.

Basic GIS Operations. A GIS has the following components in its basic operations:

1. The overlay operation, which uses two or more maps collecting key on the basis of Boolean conditions and produces the definition of new, explicit boundaries[10].
2. Operations to reclassify the attribute data of one of the map coverages in a controlled and systematic way.
3. Distance and connectivity measures, which encompass simple inter-point distance measures as well as more complicated tasks like defining zones of rising cost of transport away in particular locations[11].
4. Neighborhood characterization: which gives values to a location based on a summary and mean measures of a variable, and includes smoothing and enhancement filters[12]. Patterns of such manipulation processes are called cartographic modeling.

The geographic information system can be applied in three major levels namely data management, analysis, and prediction. This is the lowest level of application that is involved with the entry and storing of data, retrieval of that data by spatial and conditional queries and the presentation of the outputs of the retrieved data. In the case of data-management applications, the GIS is primarily an inventory system the role of which is to store and portray data about spatial features. These characteristics usually involve the width, the number of lanes used and the number of people using a given highway.

The second use of GIS application is analytical. This mode uses the space analysis powers of the system by the user. Such instances are finding the shortest line between two points or making parcels of land larger based on certain characteristics and so on.

The uppermost level of application of a GIS is in the category of the prediction (What if?). In this case, the information handling and processing of a GIS can be merged in a modelling process[13]. Examples are the modeling of the impact of traffic on a given region at a given time, modeling the impact of flooding and modeling the probable impact of an earthquake. These three levels in totality represent common GIS practice in the modern world.

The key goal of a GIS is to reduce the time that would be spent on expensive activities of processing, storing, studying, and controlling a significant amount of information and distilling and determining their correlations to the geographic location or the terrain characteristics.The falling prices of computer hardware and software at a very high rate will allow a GIS to take more tasks, which will make it available to a broader range of users. Likewise, the cost of Computer memory has greatly increased over the past years with computers moving out of kilobytes to gigabytes but data storage devices in computers have been depleting.

The main objective of GIS is to receive raw data and convert it by using overlay and by using other types of analytical calculations into new data that can help in the quick and timely making of decisions[14]. A GIS is not devised to serve a particular purpose; this is a general purpose problem solver in reality. A GIS provides an organization with the potential to utilize geographic analytical techniques to specific geographic regions to address different issues The following are some of the reasons why a GIS is necessary: The following are the reasons why a GIS is needed:

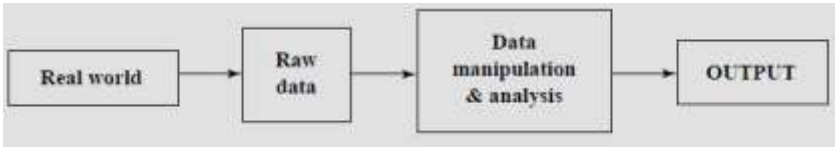
1. There is a poor maintenance of geospatial data.
2. Statistical maps and statistics are old.
3. There is inaccurate data and information.
4. It has no data retrieval service.

5. There is no data sharing. Results of implementing a GIS are expected to be the following:

After the implementation of a GIS, it is expected to have the following benefits:
1. Geospatial data are more conveniently stored in the standard form.
2. It is easier to revise and update.
3. Geospatial data and information are more readily searched, analyzed and represented.
4. Value-added products are gained in more.
5. There is the ability to share and exchange geospatial data.
6. The productivity of the staff is enhanced in an efficient manner.
7. Time and money are saved.
8. More effective decisions can be arrived at in a brief time.

The real world data, together with their geographic positions are inputted in the GIS software to be manipulated and the necessary analyses done and results are delivered upon processing by the application software. This is the theoretical model of a GIS

Accuracy of a GIS is always given intense emphasis by engineers and surveyors. To other users like the planners, rescue squads, and firefighters as well as security personnel,



it is not much about accuracy. In order to create the correct GIS, the geo-references that are required should be surveyed and identified professionally, and then coded properly in computers.

Figure 6. The transformation-based view of a GIS operatioz

Data exploration can be said to be data-driven querying and analysis. It can either be practiced as a self-contained GIS operation or as a proceeding to the formal analytical processes as suitable to the situation. Data queries allow users to study high-level trends of the data, view specific subsets in detail, and focus on the connection between datasets. Data exploration is meant to get the whole picture of the data so as to develop research questions and hypothesis[15]. The other vital aspect of effective exploration is the use of interactive dynamically connected visual tools such as maps, graphs, and tables. A GIS user can perform a data query using a map or a table. A GIS user can see both the spatial and the attribute aspects of the data subset that he has chosen after querying the data

A GIS is a computerized system that is employed in the storage, management and manipulation of data concerning geographical features and phenomena. Since real-world objects are very complex they ought to be placed in appropriate object classes which have similarities in the form of thematic data. They can be referred to as thematic or non-spatial data, associated with spatial or geometrical data layers.

Even data may influence the utility of datasets. In GIS, measurement framework is well established in practice of any type of data, even geographic data. Field or level gives the best representation of most natural phenomena or characteristics especially those that are continuous.

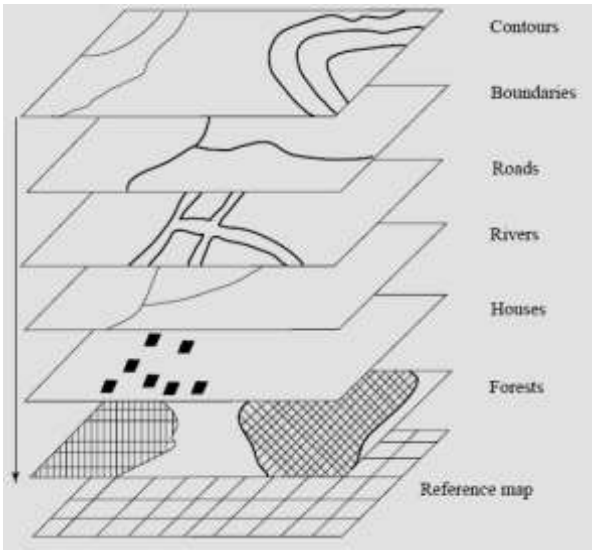


Figure 7. Thematic layering of the items needed for a planimetric GIS map

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Nominal: specific qualitative values, which are not ordered (land cover). Ordinal: are ordered, but not directly comparable (categories of landslide risks) Interval/ratio: traditional measurements which are real-valued (elevation).

Table 2. Levels of measurement in a GIS

	Point	Line	Area
Interval/Ratio	Each dot represents 20 objects 100 > 50 – 99 0 – 49	Contours 10 20 30 Flowlines	Population density 125 100 75 50 Elevation density 500 300 100
Ordinal	Large Mediun Small	Interstate highway State highway	Business districts Primary Secondary
Nominal	Town Mine BMx Bench mark	Road Boundary River	Swamp Forest

In GIS, where georeferenced objects are described by x and y, then it is said to be a two-dimensional system. When a two-dimensional x, y geometry is extended by adding a third dimension the z-coordinate, which is the height parameter, as is the case with a digital terrain model (DTM), this geometry becomes a 2.5-dimensional GIS.Moreover, the two-dimensional x, y geometry can be set with any other pre-defined functional relationship of a given attribute, that is, soil type, expressed as z = f(x, y), and the resulting representation will be also termed as 2.5-dimensional GIS.

A GIS is described as a computer system which assembles, stores, administrates, and presents information with geographical references.Geographic data are categorized

into two major types; both the spatial and feature attribute data.Raster data and vector data are the most popular types of spatial data. Whereas raster data denote space via a grid of cells (or pixels), a series of coordinates denoting location denote space in a vector data representation.

Environmental disciplines have long used GIS in a wide variety of activities including simple inventories and queries, map analysis and overlay, and in some cases, very complex spatial decision-support systems. Forest modeling, air/water quality modeling and monitoring, environmentally sensitive zone mapping, and analyses of economic, meteorological, hydrological and geological change/interactions are all examples. Common data that is used to create an environmental GIS consists of elevation, forest cover, soil quality, and hydro geology coverages. The application of environmental GIS in most settings is such that environmental factors can be better incorporated into the socioeconomic development that allows to create a balance between the two

The application of GIS applications in environmental studies has grown exponentially in the past decade or so. Originally aimed at examining forestry, these instruments have found their use in a broad array of environmental projects, including research activities and the forest-fire prevention planning, as well as the protection of endangered species

It has experienced a significant progressive increase in the computing capacity accessible to hydrologists per se over the last twenty years, and this has spurred significant changes in the way hydrological studies and operational activities are pursued. GIS finds application in water-resource to deal with hydrologic cycle and processes in various areas of research. The following applications are multifaceted per se since

GIS is critical in military operations which are physical spatial. Access to accurate information is very crucial in command, control, communication, and coordination so that operational orders can be made within a short period of time. GIS finds uses in a wide range of applications by the military forces, such as cartography, intelligence, battlefield management, terrain analysis, remote sensing, installation management and monitoring of possible terrorist movement, on a wide range of scales and time intervals across the theaters and services, all contributing to an overall improvement in the state of operational preparedness. The use of GIS in the The management of the public health needs to be informed on many issues including the prevalence of the disease and facility availability to make decisions on how to establish infrastructure or take action in addressing arising circumstances. Such decisions have to be arrived at based on perceived states and the information at hand, and in a timely manner to be well-informed.

The other area where geographic information system can be useful is in geology. Geological interpretation of a particular region whether in the exploration of minerals and oil or engineering geological works is essentially an amalgamation process of multifarious datasets of multifarious data sources

GIS in business has had significant efficiency improvement in many parts of business with a notable market and geographic marketing research and other related analytics. Examples of its use include finding the potential competitors, mapping market limits of retailers, computerized hazard-information classification and risk-management decision making in insurance companies and businesses.

GIS technologies have found extensive use in planning and management of utility. GIS is seen by organizations involved in infrastructure and utility services as an effective tool of managing planning, decision making, customer service, regulation requests, standardization of methods and graphics display and good visualization.

Geodesy is the science involved with the study of the shape and size of the earth in a geometrical sense, with the study of some physical phenomena, e.g. of gravity, with the

object of trying to explain the tiny disruptions in the figure of the planet. The field relates well with surveying and mapping. A large part of the information regarding the shape and size of the earth is made by surveys. The Earth as a whole

Maps are created in an extensive scale. Many users use maps; geographers, military personnel, economists, planners, civil engineers, architects, air and marine navigators, and a host of others.The surface features on earth are many and thus it is. they could not possibly be put in one map at a time.

Fields are which have boundaries given on cadastral maps (planimetric maps). and buildings, and to have registered the ownerships of landed properties. Cadastral maps depict the places of property-ownership lines.They are ready and are made up by government bodies and are utilized in revenue and taxation

Topographic maps represent the profile and the height of the ground. Topographic maps are used in the design of gardens and parks and similar landscapes.

Figure 8. A cadastral map

Figure 9. A topographic map

The thematic map depicts a base map overlaid with information on a particular subject. Thematic maps can be of geologic, forestry, soil, land-use, etc. and historical themes. These maps can be used to convey information in a number of ways.Techniques that are commonly used in the thematic cartography that are utilized in mapping include the following.

a-Single Symbol Each feature on a map is represented with the same. colors and symbols. b-Graduated Color Features, are shown in the same type of symbol, but the colors signify the evolution. of values of a given data attribute.

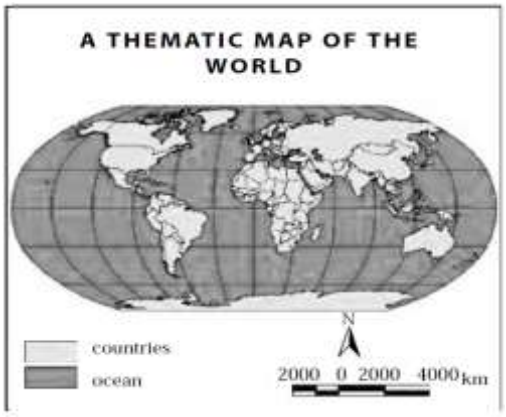


Figure 10. A thematic map

c-Dot Density The characteristics of theme are shown by a number a of dots representing. a value. This process is good in demonstrating the showing distribution of specific things in a region. A dot map of population e.g. population will most likely have.

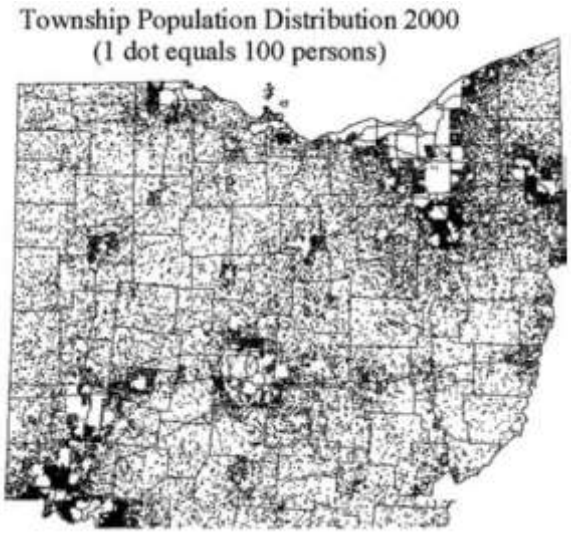
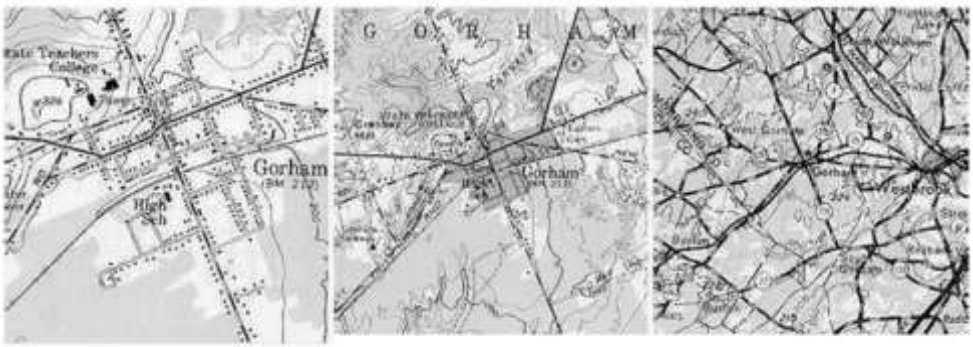
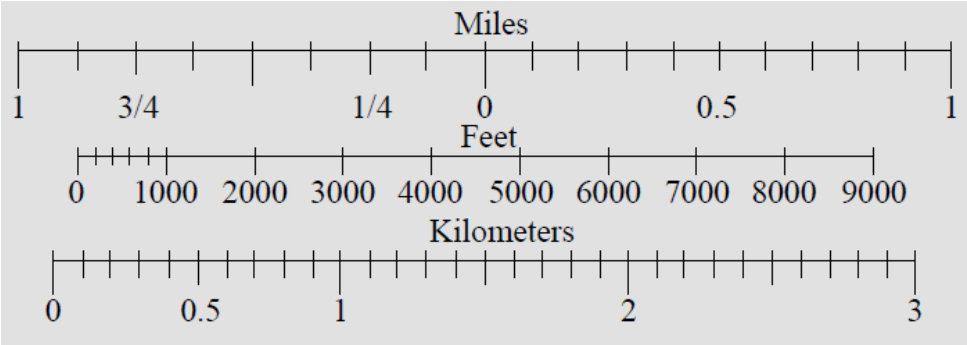


Figure 11. A thematic map with dot density

A scale of a map gives the map reader a ratio of the size of the features in the map against the size of these features on the ground. The orientation of a map shows the location of the map in reference to the surface of the earth. Maps are traditionally designed with the north direction which is usually the true north at the top. The distinction between Northing, Southing, Easting, and Westing should be understood and one should be able to locate these orientations on a map. The maps are classified as small-scale and large-scale maps on the basis of scale.

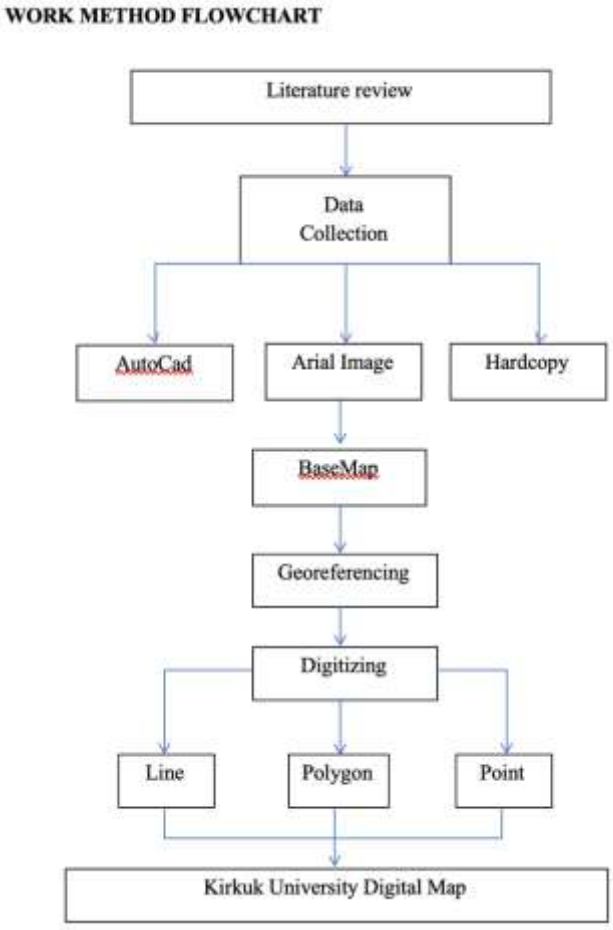




Position (Location) A map represents the position or the place of places or features. Jobs are usually described in terms of the coordinates of a location on the ground

Spatial Relationships A map expresses the spatial relationship of the features. Indicatively, what district is adjacent to another district? What is the position of the river on the side of the road? Is there a dam on the farm? What is the nearest railway station, etc? Distance, Direction, Area Numerous details may be obtained out of a map, and covering multiple distances, direction, and regions. In calculating distances and areas, scale of the map should be considered in order to be accurate.

Types of Maps A map is a depiction of the real world on a small piece of paper and is limited in the number of things that can be represented. The cartographer carefully



Data Collection: Collecting all data that we gained AutoCad rial Image Hardcopy
-AutoCad: AutoCad map of kirkuk University
-Arial Image: Arial image of Kirkuk City
-Hardcopy: Hard copy of all data that we collected
BaseMap: By Inputting arial image of Kirkuk City we get base map on GIS

Georeferencing: is a process of Merging arial image with AutoCad map
-Line: Drawing lines is to indicate of main roads and secondary of it
-Polygon: Drawing Polygon is to indicate buildings
-Point : Drawing points is to indicate trees and Electricity Column
After Georeferencing and locating and drawing and getting coordinates (X,Y) we get Kirkuk University Digital Map
1st- reconnaissancing University in general shape ,building and roads and paths,Etc….
2nd- gaining enough information about GIS and practice on it
3rd-inputting kirkuk city arial image in to GIS

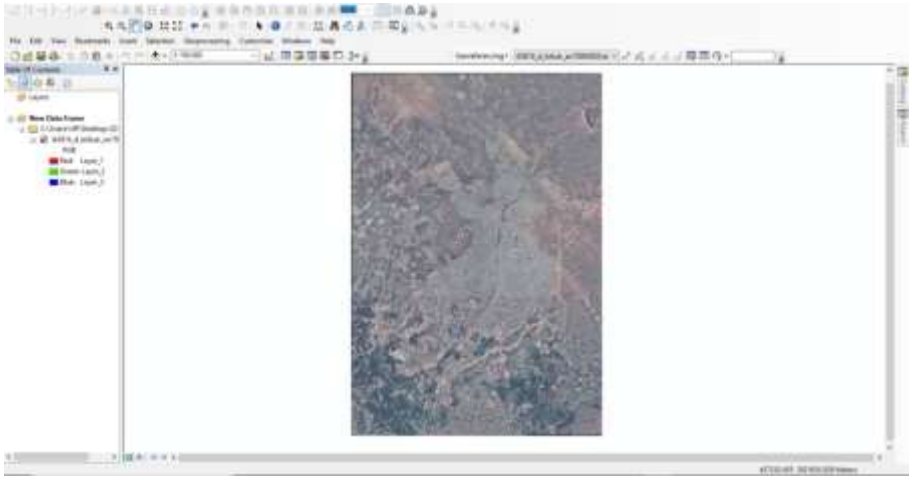


Figure 14. Kirkuk Arial image in ArcGIS

4th-locating University of Kirkuk Location on kirkuk city arial image

Figure 15. University of Kirkuk Satellite image

5th-Drawing roads and pathways , buildings , green areas every layers

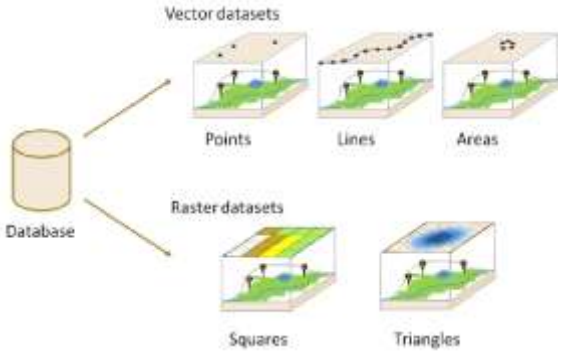


Figure 16. Symbols of Drawed layers

6th-Merging

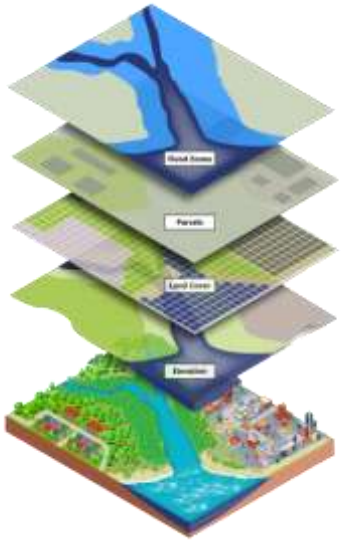


Figure 17. Merged layers

FINAL RESULT - KIRKUK UNIVERSITY DIGITAL MAP

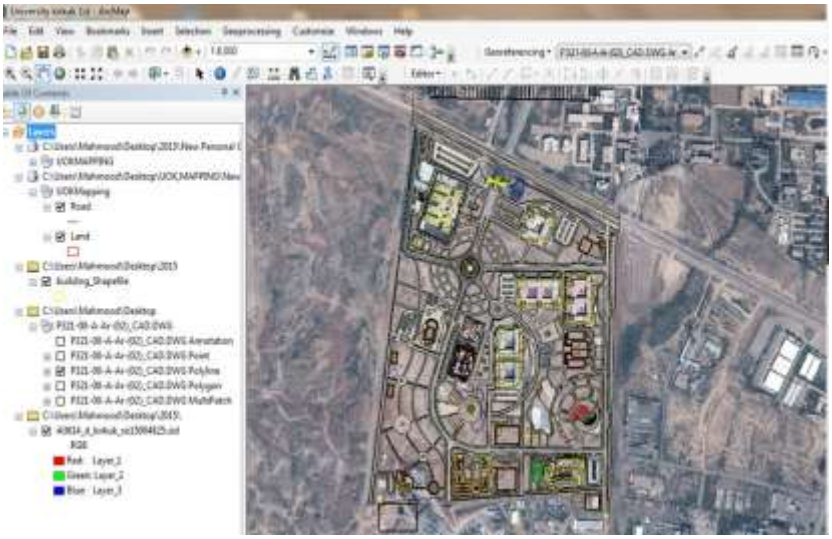


Figure. 18.U.O.K Digital Map

Figure. 18. Closer look Digital Map of U.O.K

SYMBOLS USED ON THE MAP

Red lines is a main roads that cars gets through it
Gray lines is a pedestrian paths
Yalow lines is a perimeters of buildings
Green lines georeferencing is a border of university

4. Conclusion

Throughout this project We concluded that the GIS Software is a wide-ranging program as it is widely used in many fields like maping ,health-wire, emergency, police data, hydrology, etc. , and we learn how to used maping

But the most important point, which is the reason for this project We concluded that the university does not have a digital map ,So for that we draw for University of Kirkuk a digital map ,by learning an and practice on GIS software and we gain such a useful and enough information for draw a map step by step on GIS Program.

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