have been around for a long time, and during most of that time, people have drawn and painted them by hand. Hand-drawn maps became more accurate as people made new discoveries in math and geography. In the 17th and 18th centuries, advances in clock-making made it possible for travelers to determine their longitude accurately, making it easier to get accurate measurements for maps. Even as advances in technology made it easier to get accurate map data, creating a good map still required the skill of an artist. A mapmaker had to be able to draw or paint all of the map's features so that they were accurate, legible and attractive. The same is true today. Computers and geographic information systems (GIS) have automated many mapmaking tasks, but the best maps still come from skilled cartographers(1).

The recent technological developments, including new high-resolution sensors, global positioning systems (GPS), geographical information systems (GIS), are revolutionizing cartography, surveying and mapping in fundamental ways: geographic data is easily collected and combined with a variety of other data in order to create relevant information for spatial analysis and decision making. Geographic data, in its digital form, is designed to efficiently capture, store, update, manipulate, analyze, and display all forms of geographically referenced information GIS relies on the integration of three areas of computer technology : A relational database management system to store graphic and nongraphic data; cartographic capabilities to depict, graph, and plot geographic information; and spatial analytical capabilities to facilitate manipulation and spatial analysis.

Updating of future map series is an essential task. Future updating will include more accurate topographic data collected with advanced technologies, information on the changing land cover, the improving transportation network, the expanding built-up areas and other land uses. A complete and renewed process of updating databases is computerised, faster, more efficient, modern, and will take all map series into consideration.

1.2 MAPPING TECHNIQUES

Improved instruments, including GPS receivers and collected field data, have made such field research increasingly accurate. Researcher determined the correct place names for maps of previously unmapped areas. In this map that we will produce, the researcher depends on a trend

that continues with today's derivative maps, which use other maps as sources, as shown in figure (6 & c7).

Today's technology also makes it possible for cartographers to make detailed maps of places they have never been. The field of remote sensing, or aerial and satellite photography, has given cartographers a vast amount of new information about the Earth. Remote sensing isn't particularly new, the first use of aerial photography for mapmaking took place in 1858.

However, its use in mapmaking wasn't widespread until after World War II, when cartographers started using reconnaissance photographs as map data(2) .

In this research, converting satellite and aerial images to maps requires a skill for making it. Researcher has used two methods are known as raster and vector encoding. She has measured the features of engineering college image, and traced entire outlines, by using computer programs which help with the mapmaking, through recognizing the differences in old and new photographs. This may eventually automate the process of updating map data.

1.3 KEY MAP ELEMENTS

Maps are graphic representations of places that use point, line, and area symbols, as well as color, to show how selected human and physical features are located, arranged, distributed, and related to one another. No single map can show everything, so the features portrayed on each map are selected to fit a particular purpose. It is impossible to accurately depict the spherical Earth on a flat surface without distorting shape, area, distance, or direction, so cartographers use different projections to preserve selected properties (shape, size, distance, direction), while others get distorted(3) .

A good map should tell you what it is about (title), which direction north is (orientation), when the map was made or updated (date), who made the map (author), what the symbols mean (legend or key), how distances on the map relate to distances on the ground (scale), where to find selected places on the map (index), how to find places on the map (grid), and where the map's information comes from (sources or credits), as shown in figure (9). However, not every map will identify all of this information. The more information provided, the better possibility to evaluate its content, credibility, and appropriateness for a given purpose or audience(4) . So the map elements in order of importance are :

Title: Text explaining what the map is supposed to portray, like " The College of Engineering Map" .

Orientation: In most cases, the direction "north" is assumed to be at the top of a map. north arrow is a symbol indicating the direction in which north lies; a compass rose is a symbol indicating the cardinal directions (N, S, E, W) and sometimes intermediate directions (NE, NW, SE, SW), as in figure (1).

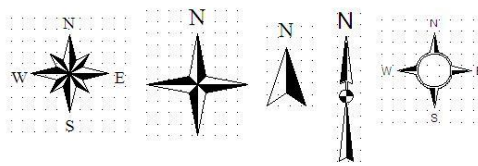


Fig. (1) : Types of North symbols.

Date: Text identifying when the map was made and/or updated.

Author: Text identifying the cartographer or organization responsible for making the map.

Legend or Key: A guide identifying what the map's symbols and colors represent.

Scale: The relationship between distance on a map and actual distance on the earth. Scale may be represented by words (e.g., "one inch equals one mile"), a ratio or fraction (e.g., 1:63,360), or a divided bar. Bar scale is best to use when enlarging or reducing the size of a map, since the scale size will change with the map size. A map showing a small area in detail (such as a street map of a neighborhood) is a "large scale" map, while a map showing a large area without much detail (such as the world or a continent) is a "small scale" map.

Index: A listing of the places on the map and where to find them using grid coordinates either latitude-longitude (44˚63´E, 37˚37´N) or letter-number (I-38-O-NE) of map index of the Iraqi maps.

Grid: Intersecting lines (called a "coordinate system") drawn on a map to pinpoint location. The grid can be a simple set of intersecting perpendicular lines identifying rows and columns with letters and numbers (often used on a street map) or a set of intersecting lines identifying selected latitudes and longitudes (often used on topographic or world maps).

Latitude lines (also called "parallels") run east-west, parallel to the Equator and measure distance north and south, from 0 degrees at the Equator to 90 degrees at the North and South Poles.

Longitude lines: (also called "meridians") run north-south and meet at the poles, measuring distance east and west of the Prime Meridian, from 0 degrees at the Prime Meridian running through Greenwich, England, to 180 degrees at the International Date Line (mostly in the Pacific Ocean).

Sources: Text identifying where the map's information comes from (like a base map for the engineering college), figure (5).

2. BASIC ISSUES IN MAP DESIGN

1. Considering the purpose of and audience for the map: One of a cartographer's first steps is to identify the purpose and audience of the map. The purpose and audience determine how data are displayed, what map elements are included, and the general layout and format of the entire map. A map designed to be a teaching tool for third graders will obviously look different than a map designed to be included in a report for senators.

2. Choosing a map type: Once cartographers know what they want to show on a map, they must decide which map type (reference or thematic) will be most effective in communicating the map's purpose to its readers. The type of data, audience, and geographic area represented are some of the factors that affect this decision.

3. Selecting a title that represents what is shown: Choosing a title for a map is an important part of the cartographic process. The title of the map should tell map readers, in a few words, what is important about the map. Some map titles simply state the information portrayed (e.g., "Percentages of Global Indigenous Languages"), while other titles engage map readers with a broader, catchier phrase (e.g., "Voices of the World").

4. Selecting and placing text: Placing text on a map is a particularly difficult challenge to the cartographer. Text must be placed so that it is readable and easily located but also must not interfere with the map's data or design. Different font types, styles, sizes, and colors can be used to establish clear association between text and map features.

5. Designing an overall layout for easy understanding: As in any form of graphic art, cartographers have to consider the layout of all map elements to create a final product that is informative, accurate, and aesthetically pleasing. Visual balance is always an important consideration for design(5).

3. TYPES OF MAPS

There are two main types of maps, based on their design purpose. Reference (or general purpose) maps depict selected details of the physical and human-made environment as accurately as possible. Thematic (or special purpose) maps depict the general spatial pattern of selected features or data. Thus the produced map in this research is a map of thematic type, specialized in representations of engineering college and others features which are currently constructed will be offset on it in the future by using GIS technique.

3.1 GIS DATA SOURCES AND DIGITAL MAP

Traditionally, GIS geospatial data have been obtained from conventional surveying techniques. Therefore the data components of a GIS can be organized into two groups: (1) where and (2) what. The position and graphical representation as a point, line, or area constitutes “where”, and the characteristics, or attributes, at the position constitute “what”. Access to each of these “side” of the data is enforced while relational joins permit GIS functions are bidirectional(6).

GIS usage has grown significantly in recent years, which has placed demands on gathering field information, most of which is hard (or even impossible) to discern using aerial photographs. For example, bench mark (B.M.) and taps locations within engineering college site are small and usually not seen on aerial photographs. Their location and the location of other small spatial objects are better determined using global positioning system (GPS) technique.

These data are electronically gathered (often with attributes) and stored in the field using a receiver memory bank. Once collected, these data can be electronically downloaded to a computer and differentially corrected, translated to a desired datum, then graphically plotted for later import as part of the GIS database.

Another way geospatial data can be procured for GIS use is by electronically digitizing or scanning existing paper products, such as engineering college plans. Scanning produces bit-mapped raster images. If a digitizer is used and is calibrated to the coordinate system of the GIS, the paper product can be directly added to the GIS. However, scanned imagery must be registered and rectified or the image coordinated are manually matched to known ground

coordinate values. The procedure of work and the stages which are followed in this research to collect the data and to produce digital map is illustrated in figure (2) :

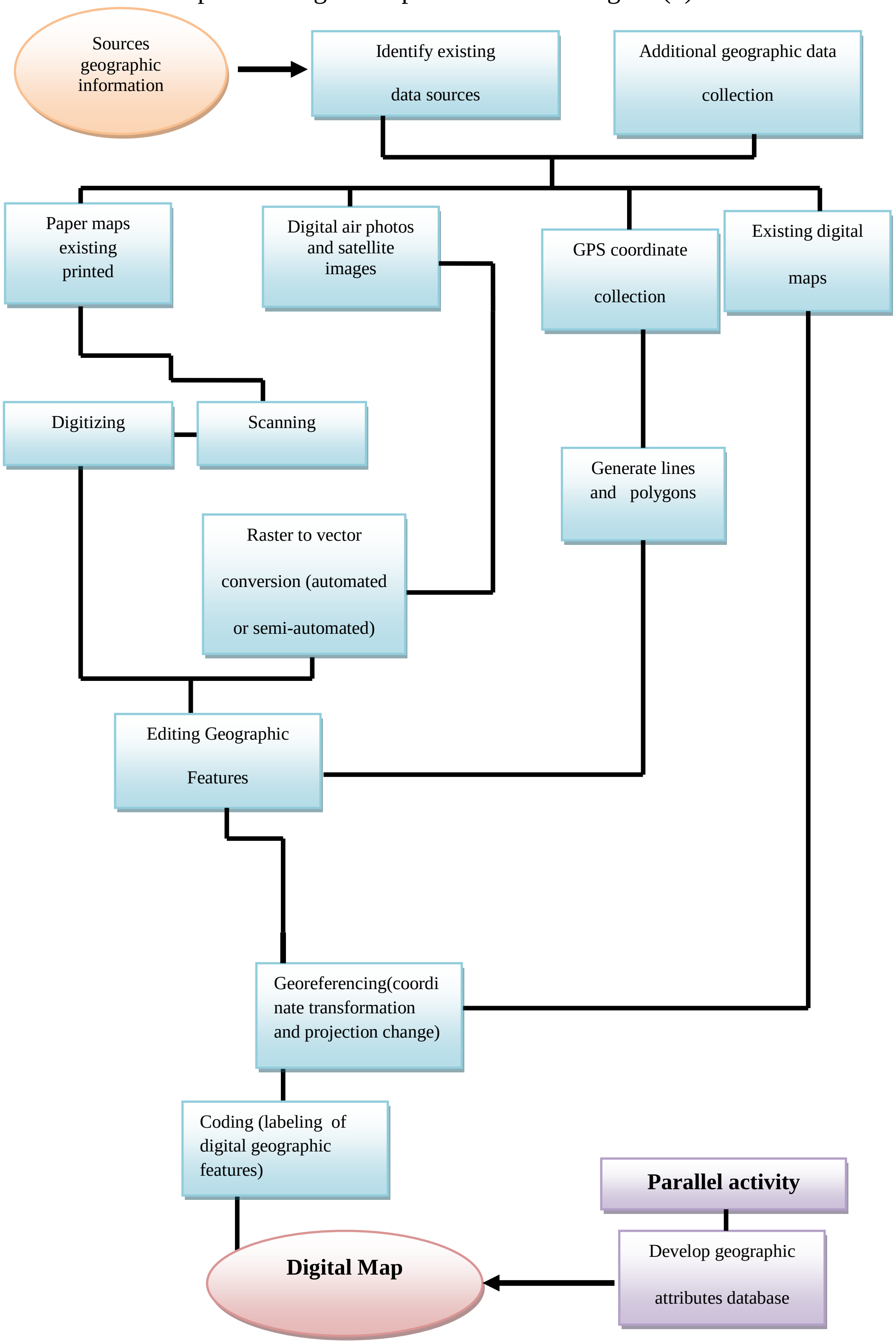


Fig. (2): Stages of map production in GIS .

In the last decade, GIS development has played an increasingly important role in modern mapping, particularly at data gathering and survey stages. GIS provides data in a structured digital format, enabling such data to be easily stored, analyzed and manipulated.

Increased use of GIS has extended the need frequent updating of mapping data and the amount of resources allocated to this. Aligning GIS to cartography permits up-to-data mapping availability as well as the opportunity to have more sophisticated digital maps to improve accuracy and user comprehension.

The development of the digital database will be based on two data sources: the conversion and integration of existing map products, which may be in hard-copy or digital form, and the collection of additional data, using fieldwork, air photos or satellite images. Collectively, the term data conversion is used to refer to these stages[7], in figure (2). The college map is accomplished by digitizing tracing the features with a mouse-like cursor and this map is converted to vector conversion by scanning. Figure (3) illustrates a view of a " study area " where five themes are activated: buildings, roads, borders, irrigation ditches, and laboratories.

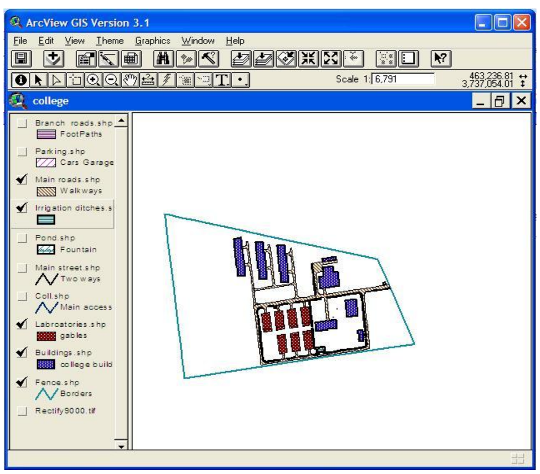


Fig. (3): GIS graphical user interface, some layers of engineering map in ArcView.

Attribute data consisting of descriptive information linked to geometric and spatial data defined by nodes, lines, and areas by some unique feature identification allow us to explore both spatial and attributed data simultaneously.

3.2 UPDATING DIGITAL DATABASES

Today, in the digital and computerised era, updating of digital databases, in theory and in practice, is evolving for a wide range of applications, in addition to mapping purposes. Several methods are in use: establishing a new GIS database, by re-mapping rather than digitizing existing maps; producing huge, unique and unified databases in large scale; working on large-scale updating and maintenance. The main approach lately, involves automatic change detection and incremental updating and versioning. This means automatically detecting, identifying and updating only these changes, which have occurred on the earth surface(8) .

The requirement for maintaining up-to-date spatial data originates both from the end-user and from the information provider, since inability to do so may result in user reluctance to utilize the data. It involves the ability to optimize the integration of updated data into existing data sets, while upgrading it, preserving the uniform inner structure of the database(9) .

4. IMAGE RECTIFICATION

In present, newly produced maps are rarely made by hand without digital processing. But most of present maps are created by other programs from non-georeferenced data. Spatial GIS data are used rather for data storage and spatial analysis than for cartographic visualization. The reason is weak cartographic capabilities of output tools of GIS packages. If maps are produced from GIS data then maps are completed from these data but outside from GIS. In this case any georeferenced relations of data are lost. Then digitally produced maps differ from manually made maps only in processing but not in accuracy, map design or legend.

Image and paper maps which are scanning rectification is the process of transforming a digital image from pixel (column, row) coordinates into your GIS coordinate system. It is a relatively simple process with satellite imagery that has little relief displacement. Typically a transformation called the affine transformation is used. This transformation is the same transformation that is used in GIS work when registering tics before digitizing new theme features.

The affine transformation is a model of two equations that describe or fit a flat plane as follows :

$$Xmap = a + b1(image\ col) + b2(image\ row) \quad \ldots\ldots(1)$$

$$Ymap = a + c1(image\ row) + c2(image\ col) \quad \ldots\ldots(2)$$

Or

$Xmap = a + b1(pixel\ X) + b2(pixel\ Y)$ ………………………………..(1)

$Ymap = a + c1(pixel\ Y) + c2(pixel\ X)$ ………………………………..(2)

Where x, y are the position coordinates in the ground (map); X, Y are the coordinates on the image; and $a, b1, c1, b2, c2$ are polynomial coefficients(11). In this research have been identified four locations on your image and estimate their map coordinates in the field using a GPS receiver. As a check, it have been plugged in any of the original image (column, row) coordinates and get college map coordinates for that ground control location. And by the affine transformation has been done rotate image (scanning college map), as in figure (6). GIS computes the best linear rectification model from these control point information and once GIS computes the X error and Y error for each ground control location, it can compute the total error for each GCP link as follows in figure (4).

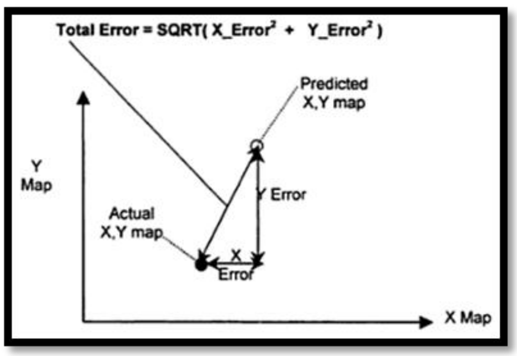


Fig. (4): Show the relationship between predicted and actual coordinates on the map.

5. BASIC MAPPING TECHNIQUES IN ARCVIEW

A Geographic Information System (GIS) is a computer-based tool for mapping and analyzing things that exist and events that happen on earth. GIS technology integrates common database operations such as query and statistical analysis with the unique visualization and geographic analysis benefits offered by maps. These abilities distinguish GIS from other information systems and make it valuable to a wide range of public and private enterprises for explaining events, predicting outcomes, and planning strategies.

In short, a GIS is an instrument for :

1. collection,
2. storage,
3. visualization,
4. analysis,
5. presentation, and
6. management of spatial data.

It is a database that links information to location. A GIS stores information about any region; for example college of engineering site, as a collection of thematic layers that can be linked together by geography. This simple but extremely powerful and versatile concept has proven invaluable for solving many real-world problems.

Spatial data is organized thematically into different layers, or themes. There is one theme for each set of geographic features or phenomena for which information will be recorded. For example, trees, elevation, and college buildings will each be stored as a separate spatial data sources, rather than trying to store them all together in one. This makes it easier to manage and manipulate the data, especially as much of the power of working geographically comes from being able to analyze the spatial relationships between different geographic themes[(10)].

5.1 MOST IMPORTANT CHARACTERISTICS OF A GIS

1. Abstraction of reality

Unlike photography, GIS is a generalized, simplified representation of the real world. The level of abstraction depends on the demand of the user and the type of collection of data (e.g. satellite images, digitizing, etc.)

2. Relation to space

All data are related to space if they can be localized geographically in any way (e.g. roads, rivers, properties, population density, measurements of precipitation, etc…). However, data must have a uniform reference system (coordinates of the country, in the appropriate projection), if not they cannot be combined. The international coordinate system for college map which we will be using is Universe Transverse Mercator (UTM), zone 38, with the spheroid and date: WGS84.

3. Combination of data layers

As presented in figure (3), different data layers can be combined as a collection of thematic layers. This possibility of combination requires a coordinate system that is inherent to all layers. Every layer is a data set that contains points, lines or polygons. The combination of the layers is for visualization only, however, the single layers are not merged to one data layer.

4. Linking with tabular information

All features represented by points, lines and polygons can contain a multitude of information, generally stored in a tabular form. For a data layers representing features of engineering college this can for example be the name of the features, its x- and y-coordinate, its inhabitants nowadays, or 20 years ago, etc. The amount of information linked with the features can be almost unlimited.

5. Digital availability

All GIS data is stored in a database. It is therefore easy to complete, actualize or update the data. A big advantage is furthermore the comparison of different time stands of data.

6. Use of different scales

Data is collected in a certain scale (e.g. digitizing from thematic sheets 1:500). However, it can be represented and used in any given scale, irrespective of the scale of collection. The scale of representation depends on the level of generalization, i.e. it can be useless to represent data in a very big scale, which was collected in a very small scale and vice versa.

5.2 USING ARCVIEW FOR MAPMAKING ENGINEERING COLLEGE

ArcView is a desktop Geographic Information System provided by ESRI. ArcView organizes the data in a project file identified by an .apr extension. These are ASCII text files that contain pointers to the physical locations of associated documents as well as user preferences (colors, GUI, window sizes & positions), but not the data itself. A project is a collection of associated windows, or documents, that are displayed during an ArcView session. Projects store and organize information in five kinds of documents: Views, Tables, Charts, Layouts, and Script Editors (whose icon label is simply "Scripts")[10] .

Thus the college's map has been completed as a project format (the *.prj file containing the projection information). ArcView's native vector data format is the Shapefile. Like most other spatial data format, shapefiles are structured in multiple files. The three basic 'parts' making a shapefile are the main file with the *.shp extension, the index file with the *.shx file extension, and the dBASE table containing the attributes with the extension *.dbf. These three files are essential for ArcView to display the shapefile. Many layers have been completed for the college's features and making tables of data and measurements (attributes) which represent the data base of the college where it consider the database of whole college. So the new data which can be insert in wherever new constrictions have done. This new map has been achieved by the process of georeference. Then it is possible to determine the coordinates of any location in it easily. At the end we can layout these features, themes and data as map and tables which help to make the decision.

6. THE UPDATED MAP AND RESULTS OF OUTPUT

As a result of what has mentioned in the research above the following figures show the update of the college map and construction of the database of whole the features of the college. So figure (5) is shows the base map of the college which has been scanned by the scanner and the same map is shown in figure (6) how map has been corrected geographical and it has become easy to read correctly with accurate coordinates obtain by connecting them locally with coordinates which are taken from GPS. Figures (a7) and (b7) shows digitizing and construction layers of the digital map, figure (c7) shows all the layers which have been drawn for producing the same digital map, figures (a8) and (b8) illustrate the tables and the base map of the updated map. Figure (9) represent the final map which is ready to be printed and figure (10) represent the photomap of the college location which is produced from the satellite data (image) of the IKONOS which has the sensor with resolution (1m).

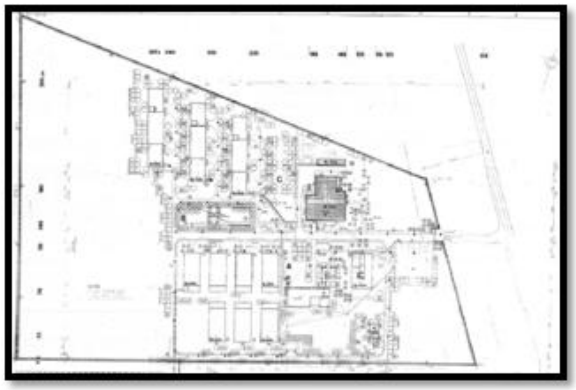
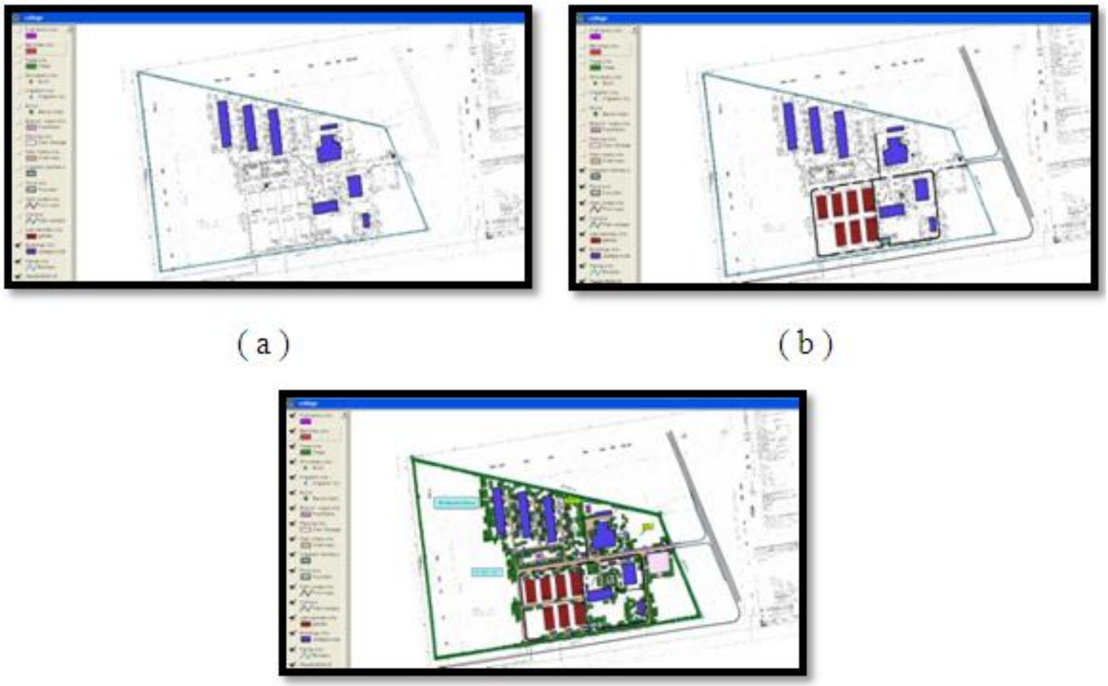


Fig. (5): The base map of the engineering college.

Fig. (6): The georeference of the engineering college site.



(a) (b)

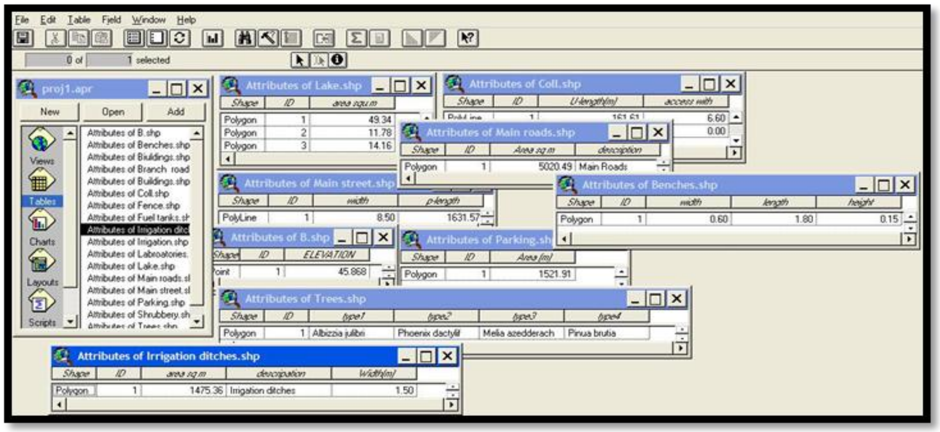
(c)

Fig. (7):a,b and c, digitizing and create layers of the map.

Attributes of Building.shp

Shape	ID	heihgt (m)	area of building (m^2)	no. of students	no. of hole	areaof hole(m^2)	type of building	no. of lab
Polygon	1	6.34	3012.9	--	--		truss	--
Polygon	2	5.	207	--	--		truss	--
Polygon	3	6.553	676.847	--	--		pre cast	--
Polygon	4	8.234	876.22	civil=223 , computer =138	civil=4 , comp.=3	68.6	pre cast	civil=1, comp.=1 +interne
Polygon	5	3.31		--	--		pre cast	--
Polygon	6	5.425	789.95	--	--		truss	4
Polygon	7	5.425	789.95	--	--		truss	10
Polygon	8	5.425	789.95	--	--		truss	4
Polygon	9	5.425	789.95	--	--		truss	3
Polygon	10	5.425	789.95	--	--		truss	4
Polygon	11	5.425	789.95	--	--		truss	--
Polygon	12	5.425	789.95	--	--		truss	--
Polygon	13	6.261	1429.52	elect.=146 , comn.=172	elect =4, comn.=2	56.84	pre cast	--
Polygon	14	6.261	1429.52	mech.=30 , power=152	mech.=2 ,power=6	56.84	pre cast	mech.=1, power=1
Polygon	15	6.261	1429.52	--	--	56.84	pre cast	--

(a)



(b)

Fig. (8): (a) and (b) tables and database of the new map by using GIS.

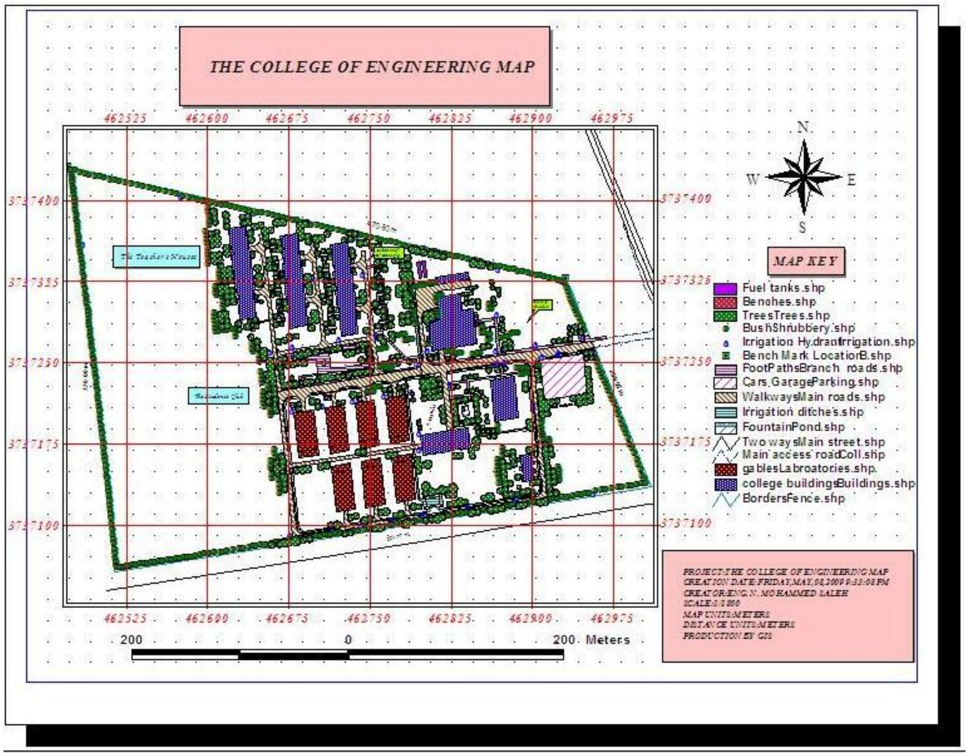


Fig. (9): The final map production in GIS-ArcView environment .

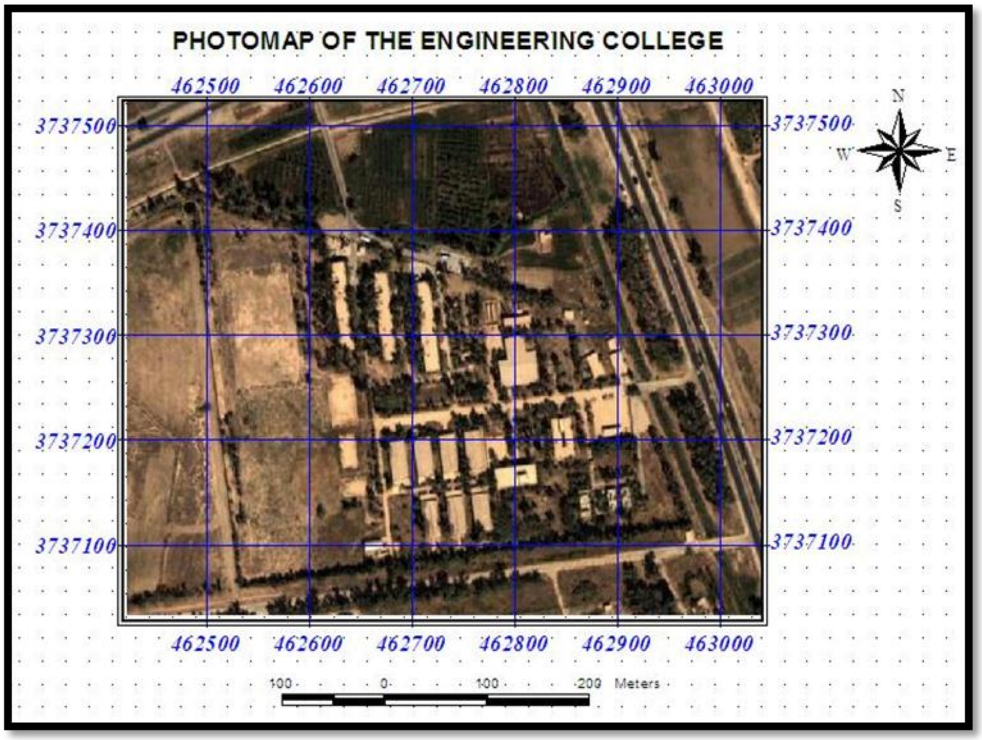


Fig. (10): The photomap of the engineering college site.

7. CONCLUSION

The only effective way to produce, care and easily update maps is to complete them from spatial GIS databases. Updating of reality presentation is preferable to process by geoinformatic technologies, mainly by remote sensing and GPS. Trends in GIS software development go into improving of cartographical capabilities of GIS packages. Final object representation by symbols on maps differs from their position records in spatial GIS databases due to principles of cartographical generalization. Any changes are preferable to make in spatial databases and then correct object position in other softwares packages because Spatial GIS databases are the only precise representation of reality and many various kinds of maps are produced from their data.

So instead of repeating the drawing of the map as a whole to set out a new feature on it, it is possible and easy to insert the new drawn constructed feature only on the map which is stored in GIS, to product and print it again, this processes, reduce the time, effort and cost .

ACKNOWLEDGEMENT

This study is partially supported by Elec. Engineer Ali M. and Arc. Engineer Nabeel , and researcher would like to express her thanks for their kind support.

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تطور الأساليب التقنية لتحديث ولإعادة خزن وحفظ الخرائط

كتطبيق: الخارطة الأساس لكلية الهندسة- جامعة ديالى

ندى محمد صالح

مدرس مساعد

كلية الهندسة– جامعة ديالى

الخلاصة

يهدف هذا البحث إلى إبراز أهمية تحديث خرائط الأساس كلية الهندسة لجامعة ديالى ذات المقياس ١: ٥٠٠ باستخدام أساليب فنية وتقنية متطورة لإنتاج الخرائط الرقمية ، وذلك لما تشهده الكلية من إنشاء بنايات حديثه ممكن إدراجها في الخارطة المستحدثة مستقبلا، حيث تم التحديث وفقا لأحدث التقنيات و بأقل التكاليف مع قدره كبيره في الانجاز والإنتاج الأسرع .

التحديث لواقع العرض (خرائط كانت آم قواعد بيانات) هو تطور لمدى واسع من التطبيقات ، بما في ذلك إغراض رسم الخرائط . حيث هناك عدة طرق في الاستخدام ، ولكن في الاونه الاخيره ، فأن النهج الرئيسي ينطوي على تغيرات تلقائية للكشف عن أضافه التحديث وتعديل الإصدار. المنتج المثالي لرسم الخرائط هي تلك التي يمكن أن تنتج في الوقت الحقيقي ، وبصورة مباشرة من قاعدة بيانات مكاني محدثة. ونتيجة لذلك ، فمن الأفضل التركيز على مواصلة استكمال قاعدة بيانات المكانية ، مع تحديد المواصفات (للتعرف على أكبر مقياس والمعتمد عليه) .

استخدم في انجاز هذا البحث تقنيتين مساحيتين وهما : (١) نظام التموضع العالمي : لتوقيع نقاط التحكم الارضيه بدقه وبسرعة عاليه. (٢) أنظمة المعلومات الجغرافية : وهي ذات أهمية بالغه في التحديث المتتالي حيث تكمن قدرة هذه الانظمه في سرعة الإنتاج وقلة التكلفة .