

# Preparation of topographic map using applications of GPS and GIS Techniques Permanent complex of School of Engineering Technology (SET) Modibbo Adamawa University of Technology, Yola Adamawa State, Nigeria)

Bashir Gambo Adamu<sup>1</sup>, Bankole Abdul malik Lateef<sup>2</sup>,  
Gidado Bakari<sup>3</sup> Mohammed Umar<sup>4</sup>

<sup>1</sup>(Department of Surveying and Geo-informatics, Adamawa State Polytechnic, Yola-Nigeria) <sup>2</sup>(Department of Surveying and Geo-informatics, Federal Polytechnic, Mubi-Nigeria)

<sup>3</sup>(Department of Surveying and Geo-informatics, Adamawa State Polytechnic, Yola-Nigeria)

<sup>4</sup>(Department of Surveying and Geo-informatics, Adamawa State Polytechnic, Yola-Nigeria)

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**ABSTRACT:** Topographic maps have proved to be effective, legitimate, and convincing media to demonstrate to external agencies how the community value, understands interacts with its traditional lands and immediate space. From cave/wall paintings, ancient maps of Babylon and Greek philosophers, through the Age of Exploration, and on into the 21st century, people have created and used maps as the essential tools to help them define, explain and navigate their way through the world. Topographic maps represent features on the earth's surface through symbols and labels; separate colors distinguish the main classes of map features. But at the SET MAUTECH Yola, the main problem; there is no clear topographic map prepared to explain land features and slopes of up and down of land. So, this makes that information gap on a topographic map scale, the purpose of the map. The main objective of this study was to describe the preparation of a topographic map using the application of GIS and GPS techniques. This study specifically focuses on the preparation of a topographic map; identify the information of contour and the triangulation irregular network of the enclosed area. The method used for this study was to collect field data of each feature of SES MAUTECH Yola using GPS instrument and downloading in the office the collected data. Some of the surveying instruments

and software used to prepare this topographic map was GPSProamx 3 instrument (Trimble R8 receiver), GPS, GIS, and AutoCAD. The researcher was given a scientific name for each feature and digitizes the futures using GIS software.

The result of this study where including a prepared topographic map of SES MAU Yola, the slope analyzed by surfer 32 software, by GIS software. The prepared topographic map of SES MAUTECH Yola shows both the natural and manmade features. Such as; buildingsblock, roads, fences, buildings, and vehicle parks. Finally, prepared a topographic map of SES MAU Yola,

**Keywords:** Topographic Map, Digital Terrain Model, Heights, Leveling

## I. INTRODUCTION

Background the map is described as documents showing a structure on the world or another celestial body, which is made with abstract characteristics, with a particular scale on a flat surface in a graphical and photogrammetric way. These strategic information sources have usually been preserved in palaces and military bases because of the value of the information they contain. Maps are one of the oldest written information resources. Maps are usually seen as being used in military operations and wars. For this reason, when the map is named, firstly wars come

to mind. However, maps are used in many fields except this field and they can be prepared differently according to these fields. This shows that it is necessary to control the maps, produce them according to particular rules and apply different rules in access and organization of them. Cartography, which is known as mapping or surveying map, had not seen as a science and application field at first. Considering the historical process, it is known that the first maps were drawn in the shape of plans and included narrower lands. These map drawings have been seen in Mesopotamia, where the civilization occurred, for the first time. However, the first remnant resembling a map (in fact a city plan) was found in the excavations of Çatalhöyük and this is dated 6200 B.C. This plan is in the Museum of Anatolian Civilizations in Ankara (Bagrow, 1964:2-3; Brock, 2001). Another important map is the first world map drawn on a clay tablet by the Babylonians (Bagrow, 1964:31; Bricker, 1968:11; Brown, 1949:33, 37). Maps are now everywhere, from the Web to smartphones, and are no longer limited to paper maps for hiking or routing. Whether they are static or dynamic (i.e. pan and zoom allowed), on paper or screens of variable sizes, good maps are maps where every feature is legible, and where the user can easily understand the geography behind the map and the message of the map. Topographic mapping to describe any features found on the earth's surface by its symbol. For this project, it is possible to identify (describe) the objects on a map or topographic mapping. The feature that found in MAUTECH Yola campus such as building, different of road, pole, different types of trees, a reservoir of water electric pole and describes the parking of the road on the map. To prepare the topographic mapping of the MAUTECH Yola by using different types of surveying instruments such as global position system (GPS), total station and using surveying software geographical information system (GIS), softdesk8, and other software, for this study Promax 3 DGPS was used for the production of topo- map of the campus.

### Statement of the Problem

Topographic map is essential in all spheres of our day-to-day activities. It provides fast and accurate method of solving geo-spatial problems, hence, the need to have one. In the past, topographical maps are mainly produced by the analogue methods of surveying. This result to situations where most of the details supplied for such maps hardly appears in the correct positions and made difficult to update when the need arises.

Also, the methods adopted in the past are tedious and rigorous because it involves a lot of computations. Furthermore, these processes take a longer time before such maps are produced. The instruments used for acquisition of these data are analogue i.e. (theodolite, leveling instrument, chain etc.) there by making the process to be very cumbersome. The way and manner in which maps are kept expose it to damage and lost, thereby rendering planning and development difficult because of non-availability of such maps. These have contributed to inability of MAUTECH authority to secure various maps such as topo map that would have been used for setting out the location of permanent site of engineering complex.

### Aim and Objectives

The aim of the project is to produce topographic maps of Permanent Complex of School of Engineering Technology (SET) Modibbo Adama University of Technology (MAUTECH) Yola using GIS and Global Positioning Station (GPS) Instruments. This was accomplished through the following objectives:

1. Field and office reconnaissance survey of the study area.
2. Observation of spatial location of both natural and artificial feature within the project area using GPS Instruments
3. To produce topographic map of the area from the Processed field observed data.
4. Make recommendation based on the results obtained for further studies.

### Scope of the Project

The study was saddled with responsibility of producing digital topographic map for the specified area. It involves the use Promark 3 GPS to pick height and other details and features. The data collected was inputted, managed, manipulated and analyzed using SURFER 7 and Auto CAD 2007 etc. The area of the project is limited to Permanent Complex of School of Engineering MAUTECH, Yola, Adamawa State.

## II THE STUDY AREA

The study area of the project is located at Modibbo Adama University of Technology, Yola, Girei Local Government area of Adamawa state, Nigeria. The institution is located geographically between latitude  $9^{\circ} 21' 18''$  N and  $9^{\circ} 21' 35''$  N and longitude  $12^{\circ} 30' 30''$  E and  $12^{\circ} 30' 36''$ , as show in the figures below.



Fig 1.1 Map of Nigeria Showing Adamawa State.  
 Source: Ministry of Land and Survey, Yola. (2012)



Fig 1.2 Map of Adamawa State Showing Girei L.G.A.  
 Source: Ministry of Land & Survey Yola. (2012)

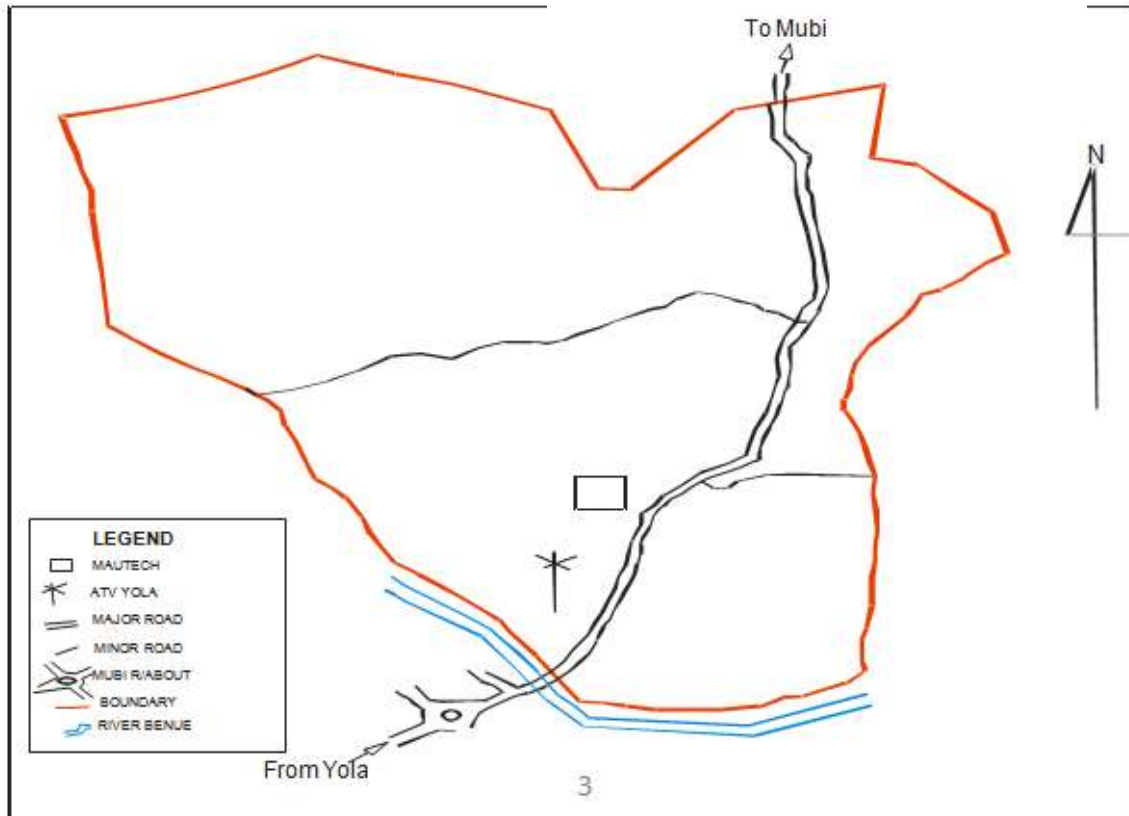
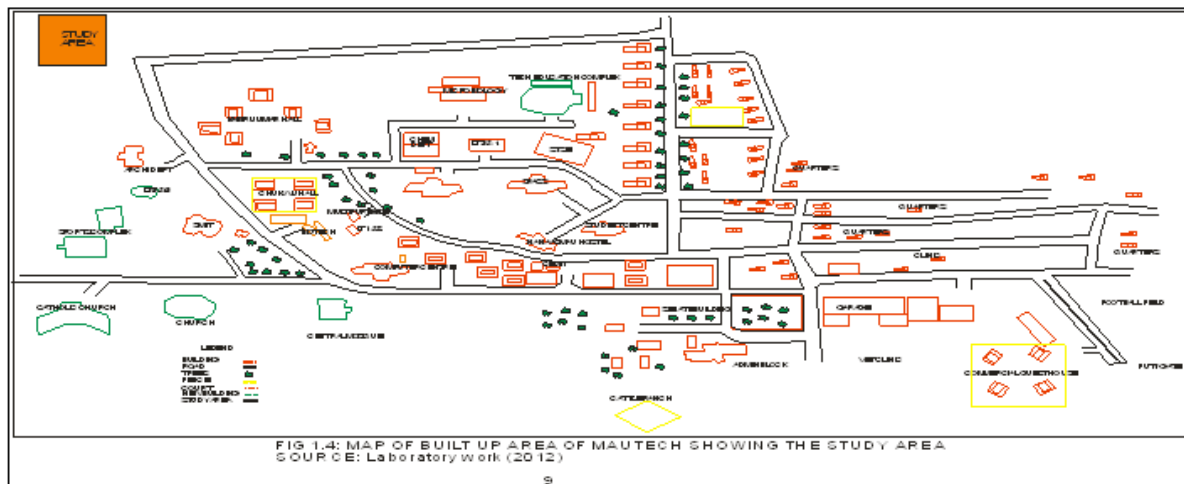


FIG 1.3: MAP OF GIREI L.G.A SHOWING MAUTECH  
 SOURCE: Laboratory work (2012)



According to Scherer (1997), topographic maps are based on topographical surveys. Performed at large scales, these surveys are called topographical in the old sense of topography, showing a variety of landmark and landscape information. This is in contrast to older cadastral surveys, which primarily show property and governmental boundaries. The first multi-sheet topographic map series of an entire country. Topographic surveys were prepared by the military to assist in planning for battle and for defensive emplacements. As such, elevation information was of vital importance. As they evolved, topographic map series became a national resource in modern nations in planning infrastructure and resource exploitation. In the United States, the national map-making function which had been shared by both the Army corps of engineers and the department of interior migrated to the newly created United States Geological surveys in 1879, where it has remained since.

Topographic maps produced by the Canadian National Topographic System (NTS) are generally available in two different scales: 1:50,000 and 1:250,000. Maps with a scale of 1:50,000 are relatively large-scale covering an area approximately 100 square kilometers. At this scale, features as small as a single home can be shown. The smaller scale 1:250,000 topographic maps are more of a general purpose reconnaissance-type map. A map of this scale covers the same area of land as sixteen 1:50,000 scale maps.

It has been described by Heinz (1997), that the basic type of map used to represent land areas is the topographic map. Such maps show the natural features of the area covered as well as certain artificial features, known as cultural features. Political boundaries, such as the limits of

towns, countries, and state, are also shown. Elevations on topographic maps are shown chiefly by use of superimposed contour lines, connecting points of equal evaluation, to give a readable picture of the terrain.

Banister and Raymond (1984) concluded that “from the general shape of ground represented on plan may be easily read or interpreted based on the contour lines.

According to Donald (1996), and Regis (1996), topographic surveys are three-dimensional; they employ the techniques of plane surveying and other special techniques to establish both horizontal and vertical control. The relief or configuration of the terrain and the natural or artificial features are located by measurement and depicted on a flat sheet to form a topographic map. Contour lines, connecting points of the same elevation, are used to portray elevations at any one of various intervals measured in meters or feet.

According to Husby (2009), digital mapping is the process by which a collection of spatial data from a location is compiled and formatted into a virtual image. Primary function of this technology is to produce maps that give accurate representations of a particular area and detailing all features of interest that would be valuable to a user.

Ndukwe (2001) The Global positioning system (GPS) was developed to replace the Transit System to overcome the problem inherent in the Transit System. GPS (in its full stage) can provide 24 hours a day instantaneously Global Navigation to positioning occurrences of a few meters. The GPS has been adopted for surveying application (High accuracy GPS surveying). The GPS satellite system is also called NAVSTAR satellite system

Michael (2000) produced the Digital Topographic map of the city of Lakewood. The map showed some infrastructure layers developed and maintained by Lakewood's GIS. Some layers such as waterlines, sewage lines, manholes, and curbs were digitized using a variety of sources that included as builds and substructure maps, individual feature layers such as fire hydrants and water valves were captured in the field by water department staff using GPS equipment. Building foot prints, transmission towers, and transmission lines were digitized using four inch colour aerials and parcel data. Annotation layers such as addresses and street names were created using address point and street center-line layers.

The concept of contour lines to show different elevations on a map was developed by the French engineer Dupain-Triel (1791). Although this method allowed the accurate depiction of land contours and elevations on a flat, two-dimensional map, it was not widely used until the mid-1800s. Several methods are used to show accurately the configuration of the land surface on topographical plans or maps, the method of showing relief are however inadequate because they do not tell the reader of the elevation above the sea level of all points on the map or how the shape are but topographical contour gives theses information and makes useful types of topographical maps.

### Justification for the Project

The needs for topographic map in taking informed decision for developmental purposes cannot be overemphasized. Topographic maps are needed for a number of purposes; this is because the maps give information on the nature of a place or an area. The maps are also used for the planning and developmental purposes. Developments in MAUTECH, like in other places are done in segments. These segments are usually Faculties (Schools) or Departments. As a result of this, there is need to have a pictorial representation of these segments (Faculties/Schools) of the University that can be referred to whenever these developments are to be carried out. This is to ensure that the right development is done at the right place for sustainability.

In MAUTECH Yola, topographic maps of schools are not readily available and this can be a hindrance in taking developmental decisions whenever that need arise. This work is therefore timely and has justified the purpose and aim of this project. At the end of the project, the map can be referred to whenever the need arises.

### III METHODOLOGY

The basic concept of this project is to collect sufficient survey data that would be used to produce a topographic map of the area in view in a digital form. ie Promark3 GPS a topographic data is available in different scales which reflect the level of accuracy and best scale for use. The smaller the scale the more information it carries and the less its accuracy e.g. a scale of 1:250,00 is a smaller scale than 1:100,000 and vice versa. Topographic maps are produced in a number of stages which includes data acquisition, processing and the presentation of the output as a map.

Data was acquired by direct field observation with the Promark3 GPS instruments, these data are the coordinates of points (Northing, Easting, and Height). Data processing involves plotting the data obtained from the field. The boundary coordinates and details were plotted using the Auto CAD software and the contour lines were produced with surfer 7 software. This section also discusses the general procedure and approach to the project. It discusses data types and sources, instruments used for data acquisition, data processing and data presentation.

The data used for this project work was obtained from two different sources: The primary data source and Secondary data source

This set of data was obtained from the site by means of direct field observation using the Promark 3 GPS receivers to obtain the spatial data of all the natural and artificial features on the topography of the project area.

Secondary source of data includes existing maps and plans of the area of concern; coordinate of existing controls.

Reconnaissance involve two aspects, field and office recce. Field recce: this is one of the most important aspects of survey and must be undertaken before work commences on site. The aim of the reconnaissance is for the surveyor to locate suitable positions for traverse station. When carrying out recce, the surveyor should walk around the site keeping in mind the Purpose and requirements of the surveyor. Office recce this refer to the process of obtaining plan map of the area, from the office or authority concerned to enable one know the position and the area to be survey.

### Instrumentation

The various instruments that were involved in the execution of this project are here under listed:

- 1 Promark 3 GPS
2. Two External low Cost Antenna
3. Computer System (HP Pavilion dv5)
4. Software: Surfer 7 and Auto CAD 2007

### Test and Adjustment of Instruments

It is a requirement in every aspect of surveying, that any instrument to be used should be tested for error. Care should be taken and ensure that all the instruments are in good working condition. In case of any fault or error in the instruments, adjustment was carried out immediately when possible.

### In-Situ Check

Before any control is to be used in survey work it has to be checked to ensure that they are in their proper and accurate position in terms of angular measures and distances from the time of establishment to present day. The processes involved in achieving this task are called in-situ check. In-situ check was carried out on the following stations.

### Procedure for surveying with promark3

1. Press red bottom to open the promark3
2. Highlight surveying and press enter
3. If initial setting was not done press menu and set the parameter and units receiver mode than after pressing menu go to setup and click enter set the setup menu

### Parameters

1. Storage
2. Antenna
3. Coordinate system
4. Map datum
5. Time format
6. North reference.

### Observation and setting

Set the master on a known station  
Open the promark3 press survey and enter

1. Press log
2. Input the ID
3. Survey mode (static)
4. Site description
5. Antenna height/type
6. Unit
7. Raw data interval
8. Check control point
9. Press enter or OK.

Then on the rover or slave set the mode to be stop and go as the above procedure for master. In addition you set the initialize point and time on site for rover or slave. After the survey observation you remove the SD card from both master and slave and download the data in the GNSS solution software.

**Note:** you open the master first then the slave, when closing close the slave before the master. The Promark 3 dual frequencies are set initially.

### Preliminary Settings

From the ProMark3 workspace, do the following: Double-tap the Surveying icon if you want to perform a real-time (ProMark3 RTK only) or post-processing survey.

Access to Preliminary Settings: Now that ProMark3 displays a navigation screen, press the MENU key and tap SetupAs a general rule, tap an option to open the corresponding setting window. Then tap the desired value. This will enable the value and take you back to the Setup menu. You can also return to the Setup menu by pressing the ESC button.

Choosing the Storage Medium ProMark3 can store your jobs either in its internal memory or on the SD card you have inserted in the unit. Tap the desired option.

### Entering the Receiver ID

(From within Surveying function only)

The Receiver ID screen provides you with the ability to enter the 4-character receiver ID which is used in naming the raw data files. Each raw data file from this receiver will include this 4-character receiver ID. Specifying the Antenna Used You select this option to define the type of external antenna used, its height and the unit used to express this height.

Three different types of antennas are listed (Promark Antenna 110454, NAP100 or Other). If you choose "Other", you will have to define the following parameters for your antenna: antenna radius, phase center offset and SHMP offset (slant height measurement point offset). Antenna Radius SHMP Offset Phase Center Offset

The choices made through the External Antenna option become the default antenna settings for all the ProMark3 surveying and mobile mapping functions.

### Choosing the Units

You select this option to set the units of measurement you want to use. Units are presented this order: long distances, short distances, speed and area. You can set these units to "Kilometers, meters, kph and hectares" or "miles, feet, mph, acres" if you like, or to three other standard sets of units. You can also create a custom mix of units by selecting the advanced option that contains a wide variety of units for distance, speed, elevation, bearing and area.

Checking that ProMark3 Receives Satellites Press NAV repeatedly until the Satellite Status screen is displayed. This screen shows which satellites the receiver is tracking and where they are located in the sky. If you are not tracking 3 or more satellites you may have to move to a more open area.

### **Boundary Demarcation**

The control points defining the boundary of the main traverse were determined by measuring the distances between the stations and the angles measured at the various stations. For the purpose of this project, Total Station and Promark3 GPS were used to determine coordinates.

### **Beaconing and Numbering**

Beacon are referred to as permanent survey mark of any kind made of concrete, iron spike or stone and as pillar is mostly used to defines area of interest, they are also classified as bench mark with description which serve as a record monument. Each type of benchmark is suitable for a particular job depending on the nature and accuracy of the job. For the purpose of this project, beaconing was carried out simultaneously with demarcation haven temporarily mark the points during reconnaissance.

### **Detailing**

Detailing is the process of picking features both natural and man-made feature such as spot heights, trees, electric poles, roads, building etc. during the detailing, Promark3 GPS instruments on a suitable point were used. The coordinates of various details were picked by shooting rays to each detail with respect to its direction and

obtaining direct coordinates to be used in plotting the various positions of features.

The Data obtained from the field using Promark 3 GPS Instrument are shown in Tables 3.9, below. Table 3.5 is the observed angles and distances using Total station. It has the stations number in column one, observed angles in column two and the measured distances in column three. The sketch of the study area is presented on fig 3.2. The sketch has ten (10) observed angles and nine (9) observed distances. The sketch of the study area is connected to existing controls E01, E02 and E03 as shown in fig 3.2. The observed boundary stations by Total station instrument are shown in table 3.6. Column one of table 3.6 has station number, columns two, three and four has the X-coordinates, Y-coordinates and the Z-coordinates of the stations respectively. Table 3.7 is the observed coordinates of the details by Total station instrument. Table 3.7 is the observed coordinates by Total station instrument. Column one of table 3.7 is the serial number, column two, three, four and five are the X-coordinates, Y-coordinates, Z-coordinates and remarks respectively while column five is the remark column. On the remark column B1, B2, etc are the coordinates of building edges and SP1, SP2 etc are the spot heights. Also tables 3.8 and 3.9 are the boundary coordinates and coordinates of details measured by GPS instrument respectively. Table 3.8 has in columns one, two, three and four, the serial number, X-coordinates, Y-coordinates and Z-coordinates respectively while tables 3.9 has in column one, two, three, four and five, the serial number, X-coordinates, Y-coordinates, Z-coordinates and the remarks respectively. On the remark column B1, B2, etc. are the coordinates of building edges and SP1, SP2 etc. are the spot heights.

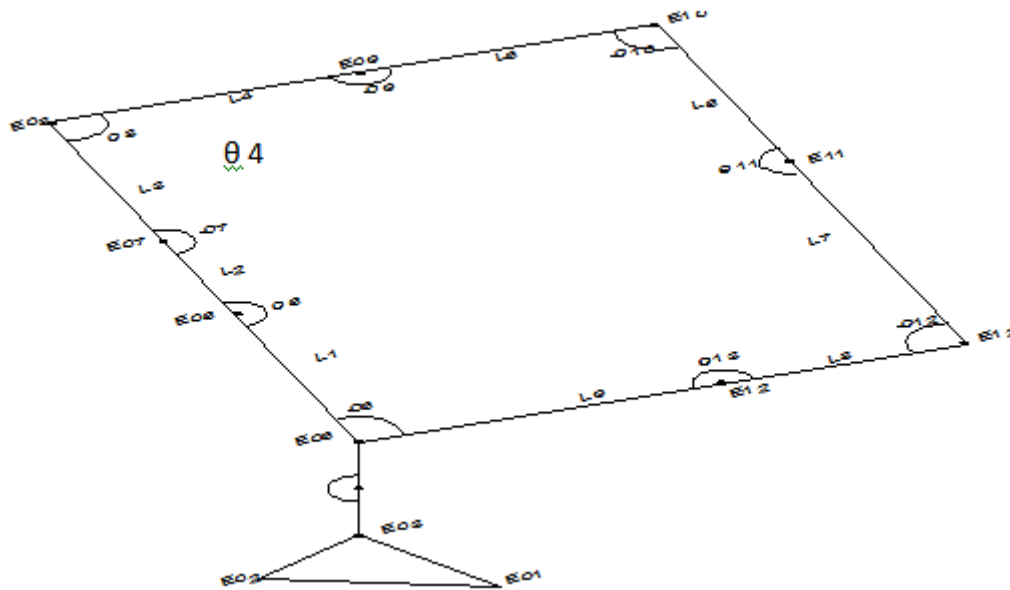


Fig 3.2 Diagram showing the sketch of the boundary.

#### IV RESULTS PRESENTATION

The result of the study is presented in graphical forms and Tables as presented in Appendixes I, II and III :

Quality of data used for any experiment can be determined by the validity and reliability of such data based on the assumption that the observers of such data are trust worthy and experienced (Idowu 2005). The validity of the data is measured by the precision of the instrument used while the reliability of data is determined by the accuracy of such data. The instruments used were tested and found to be fit for use. The test was done by repeated measurements of coordinated points around MAUTECH Yola. The result obtained showed a high degree of closeness of the data which proves its validity. Subsequently the result was also compared with values of the coordinated points. It was discovered that the one measured with the instruments used in this project was satisfactorily close to the known values. This shows that the two results agreed with each other proving its reliability. Base on these facts it can be said that the data used are valid and reliable, and therefore the quality of the data that was used in this work can be said to be trustworthy and of high quality.

#### Data Processing

data is involved in this work is obtained by GPS instrument and post processed using GNSS solution software and the final coordinates of the boundary of the study area determined as

shown in table 4.1. The data was further adjusted to obtain the final coordinates of the perimeter stations using Least Squares adjustments.

In Surveying measurements such as distances and angles are usually obtained not because they are of direct interest themselves, but because they are often needed to determine other quantities like the area, relative positions of points, elevations, volumes etc. they are generally related through mathematical models. As these measurements are carried out, unavoidable random errors must be committed and consequently, these errors cause the measurements to no longer fit the model exactly. So we need to resolve these apparent inconsistencies with model. This is done through the replacement of the given observations (x) by another set of observation called estimates (x<sup>^</sup>) such that this new sets x<sup>^</sup> fits the model exactly. Each estimated observation is looked upon as a corrected observation obtained from the measured values by adding a correction (v) to it.  $x^{\wedge} = x + v$ , where v is the residual.

This is dovetailed by plotting as defined (i.e. computerized) or mathematical process (manual) process by which points or details located are positioned in relation to their geographic or grid coordinates. Plotting was done using Auto CAD 2007 software. This software was used to plot the boundary and details on the study area. And surfer 7 software was used to generate contours and Digital Terrain Model (DTM) of the study area.

A model is used to conceptualize certain aspect of reality. Digital terrain model is a



numerical representation of features in terms of elevation and planimetric measurements obtained by sampling a topographic surface. In other words, it is a numerical representation of both planimetric details and height information that provides a continuous description of the terrain surface. For the purpose of this project, data in the form x, y, z

was used to produce the terrain model using a surfer software.

Using the spot height values typed and copied to surfer 7 software environments, the data saved under the Golden software data format was gridded to plot the contour lines. The contour interval was also be specified. Also the text was written by using the text box and edit.

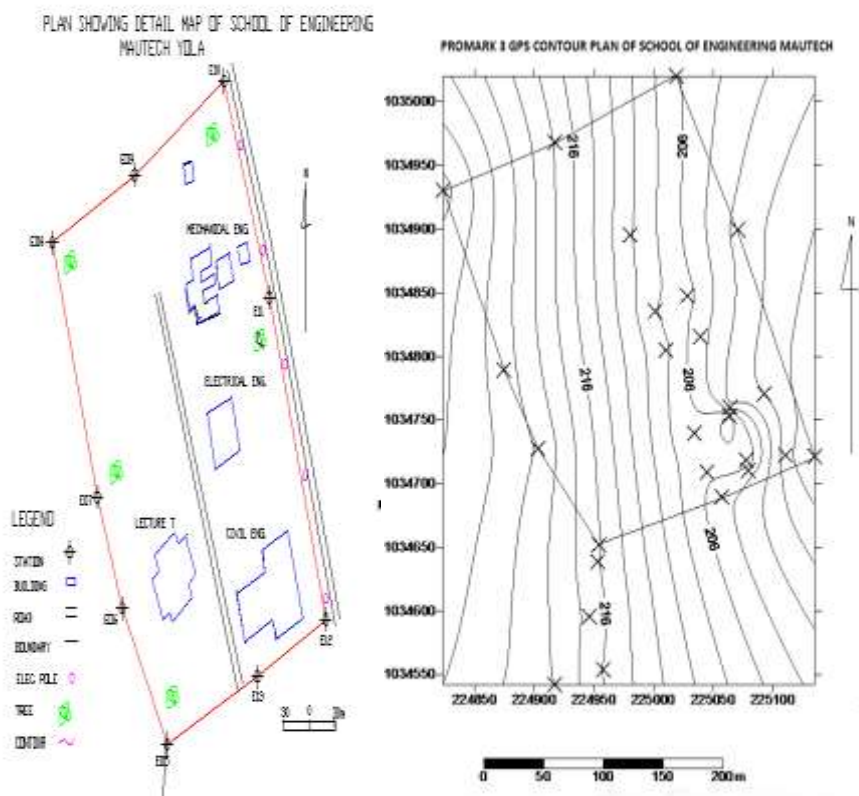
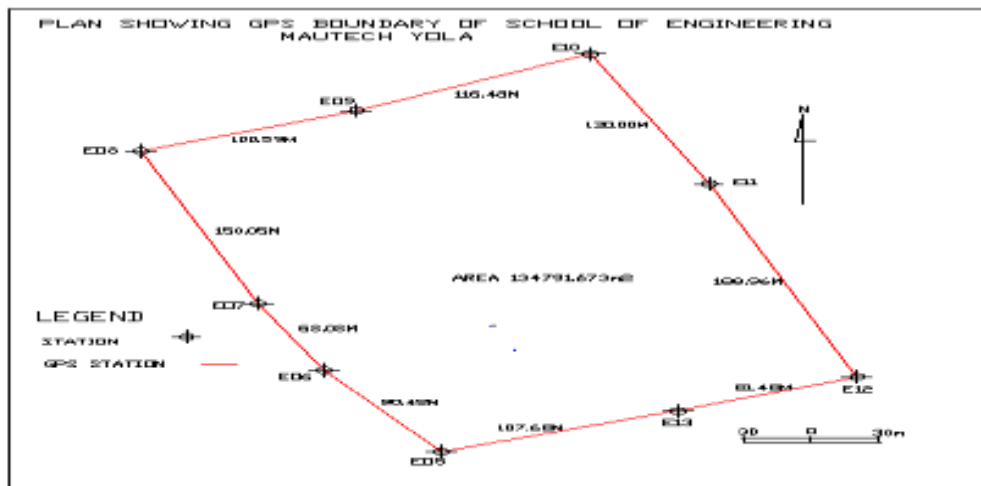


FIG 4.4 PLAN SHOWING DETAIL MAP OF SEET MAUTECH FIG 4.6 PROMARK 3 CONTOUR PLAN OF SEET MAUTECH

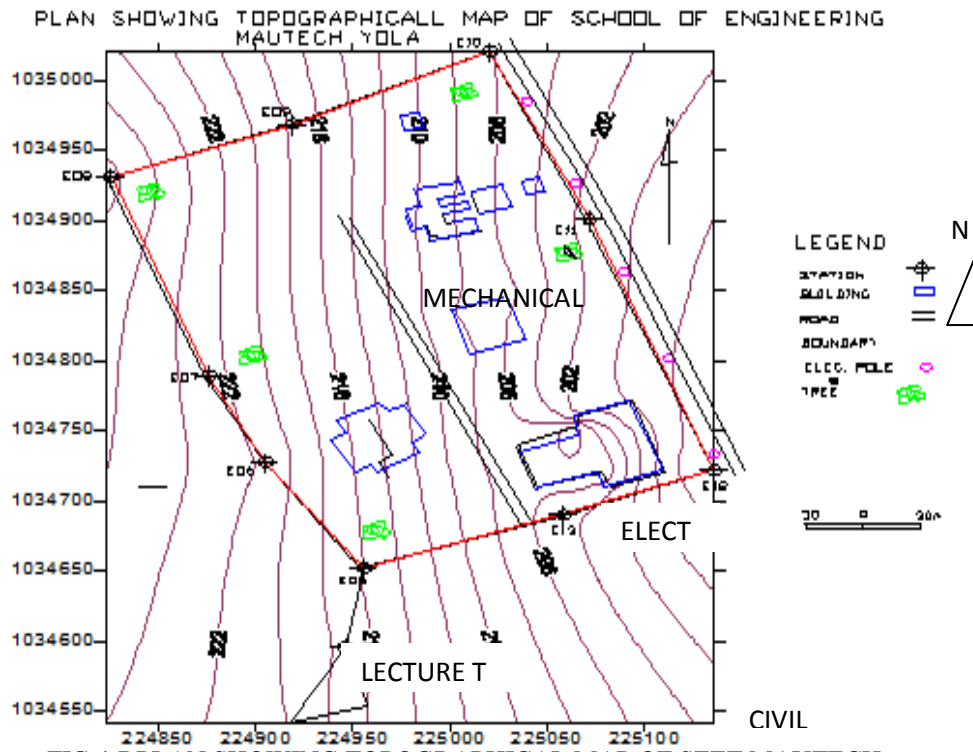


FIG 4.7 PLAN SHOWING TOPOGRAPHICAL MAP OF SEET MAUTECH

PROMARK 3 GPS DIGITAL TERRAIN MODEL OF SCHOOL OF ENGINEERING MAUTECH

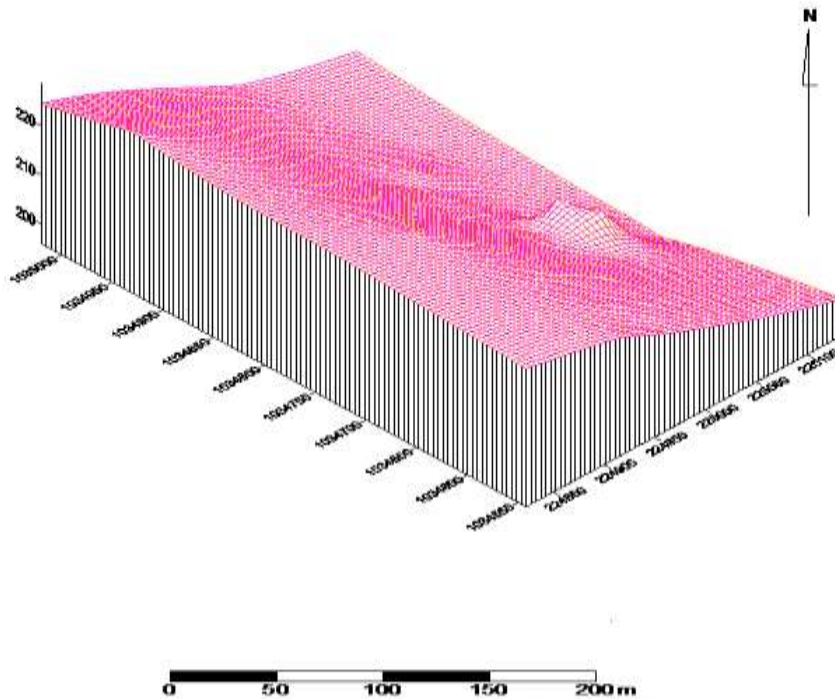


FIG 4.8 PROMARK 3 GPS DIGITAL TERRAIN MODEL OF SEET MAUTE

## V. SUMMARY, CONCLUSION AND RECOMMENDATION

### Summary

In carrying out Topographic mapping of permanent complex of School of Engineering, Modibbo Adama University of Technology Yola, the coordinates of the boundary were determined with the aid of GPS (Promark 3) instrument. The coordinates determined by The GPS coordinates determined were post processed using the GNSS solution software and the final adjusted coordinates determined. The final adjusted coordinates determined by the GPS was used to plot the boundaries of the study area. Details on the area were surveyed using the GPS instruments and also plotted.

### Conclusion

The GPS instruments is used in surveying the permanent complex of School of Engineering, Modibbo Adama University of Technology Yola, for the production of topographic map of the area, The instruments used is found to produce reliable data under any conditions for the production of topographic map. The final adjusted boundary coordinates determined by the GPS yield good result on the bases of its precision.

### Recommendations

Recommendation is hereby made, that Total Station and GPS instruments could both be used and their accuracy compared to determine the most suitable instrument for topographic mapping in future. Although the two methods can be recommended under the same working conditions, the variances of the two could be checked to aid choice of instrument.

Appendix 1 Table 4.1 Observed boundary coordinate using Promark 3 GPS

S/N	X(m)	Y(m)	Z(m)
E01	224946.123	1034595.396	217.468
E02	224953.186	1034638.517	216.156
E03	224954.134	1034651.835	216.194
E04	224903.122	1034727.416	221.793
E05	224874.383	1034789.246	222.914
E06	224823.433	1034930.449	228.772
E07	224917.178	1034968.028	217.884
E08	225019.031	1035020.143	206.245
E09	225070.652	1034899.578	201.314
E10	225135.06	1034721.335	196.000
E11	225057.102	1034689.551	204.574

Appendix II Table 4.2: Final Perimeter Coordinates Determined By GPS Instrument

S/N	X(m)	Y(m)
E01	224954.134	1034651.835
E02	224903.122	1034727.416
E03	224874.383	1034789.246
E04	224823.433	1034930.449
E05	224917.178	1034968.028
E06	225019.031	1035020.143
E07	225070.652	1034899.578
E08	225135.06	1034721.335
E09	225057.102	1034689.551

**Table 4.3 Observed Detail Coordinate using Promark 3 GPS**

S/N	X(m)	Y(m)	Z(m)	REMARK
1	225014.755	1034892.155	206.001	B1
2	225013.434	1034901.166	205.981	B2
3	225000.386	1034897.908	205.781	B3
4	224996.037	1034903.339	205.000	B4
5	225010.172	1034907.683	206.010	B5
6	225009.084	1034913.113	205.912	B6
7	224994.950	1034908.769	205.001	B7
8	224991.863	1034914.199	207.014	B8
9	225006.910	1034918.544	207.144	B9
10	225004.735	1034930.490	207.254	B10
11	224981.903	103494.802	210.157	B11
12	224985.165	1034909.855	209.325	B12
13	224977.554	1034907.683	210.721	B13
14	224980.816	1034891.392	213.228	B14
15	225025.393	1034927.232	205.000	B15
16	225011.259	1034918.544	205.502	B16
17	225015.608	1034904.425	205.701	B17
18	225031.917	1034909.855	204.923	B18
19	225038.441	1034916.371	204.802	B19
20	225049.313	1034922.888	204.219	B20
21	225046.052	1034930.490	204.825	B21
22	225034.092	1034926.146	205.345	B22
23	224986.680	1034982.345	210.254	SP1
24	224960.803	1034941.286	212.211	SP2
25	224934.926	1034829.513	214.316	SP3
26	224923.509	1034776.288	215.822	SP4
27	224925.793	1034704.811	214.983	SP5
28	224998.096	1034666.036	210.211	SP6
29	224893.827	1034910.871	218.345	SP7
30	224891.811	1034869.871	220.411	SP8
31	224874.800	1034794.537	222.124	SP9
32	224891.544	1034762.602	220.225	SP10
33	224851.206	1034888.821	223.217	SP11
34	224845.879	1034935.000	226.579	SP12
35	224951.459	1034720.879	213.125	B23
36	224959.070	1034725.223	212.423	B24
37	224962.332	1034719.793	212.123	B25
38	224984.077	1034733.912	211.257	B26
39	224980.816	1034740.428	210.571	B27
40	224987.339	1034745.859	210.001	B28
41	224978.641	1034768.666	211.211	B29
42	224968.856	1034763.236	211.722	B30
43	224963.449	1034769.752	212.324	B31
44	224941.674	1034756.716	212.332	B32
45	224946.023	1034748.031	212.121	B33
46	224938.412	1034743.687	213.211	B34

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