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**VECTORISATION AND DATABASE CREATION OF ABIA
STATE POLYTECHNIC ABA, NIGERIA WITH GEOGRAPHIC
INFORMATION SYSTEM (GIS)**

BY

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INTRODUCTION

- Collecting and communicating reliable geographic information about things and events requires knowing in a systematic fashion where they occur (Francis Harvey, 2008).
- With various techniques of recording location, surveying, GPS and digitalization are three generic ways of recording the locations and characteristics of things and events by directly observing them or indirectly measuring the location and possibly their attribute.
- Geospatial technology broadly includes mapping and surveying techniques, remote sensing, photogrammetry, cartography, Global Positioning Systems (GPS) and Geographical Information Systems (GIS).



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INTRODUCTION (CONTD)

- With its unique ability for acquisition, integration and analysis of geographically referenced spatial information, this technology has in recent times been recognized as an effective tool for planning, management and decision making locally and globally.
- Geographic information system (GIS) technology has over the years simplified mapping process.
- Vectorization and data base creation of Abia State Polytechnic, Aba with GIS is a pertinent project to embark on so as to have detailed information in GIS environment (spatial information linked with their attributes).
- This work was an attempt to explore the capabilities of GIS in vectorization and database creation.



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AIM AND OBJECTIVES

- The aim of the project is to distill point's lines and Area (polygons) object within Abia Polytechnic campus with the following underlying objectives:
- To identify and subset Abia State Polytechnic, boundary on Google satellite and Aerial Bing map.
- To georeference the Area of interest so as to have harmonized coordinates between the map and the ground.
- To digitize all spatial objects on the campus.
- To create a spatial database for the geographic entities – so that locational data can be linked to their attributes.



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STUDY AREA

- Abia was created on 27th August, 1991, out of the old Imo state by the military dictatorship of General Ibrahim Babangida with its capital is in Umuahia.
- Abia state is geographically located in the southeast region of Nigeria. It lies within approximate latitudes 4° 40' and 6° 14' north, and longitudes 7° 10' and 8° east.
- The state covers a geographical area of about 5243.7sqkm which is approximately 5.8 per cent of the total land area of Nigeria.
- Abia State Polytechnic, Aba is within a latitude of 5°07'N and longitude of 7°22'E.



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Fig. 1 Map of Nigeria showing Abia state



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Fig 2: map of Abia state



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Fig. 3 Map of the study Area in Google satellite.



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NEED FOR GIS APPLICATION IN THE FIELD OF SURVEYING AND GEO-INFORMATICS

- GIS is capable of acquiring spatial, indexed data from a variety of sources, changing data into useful formats, storing the data, retrieving and manipulating the data for analysis, and then generating the output required by the user.
- GIS applications are not exhaustive, GIS has more advantages than the analogue as of keeping the tracks of information in the fields of surveying because the spatial database is directly linked to the spatial entities of the map of the study area.
- Among the many benefits derive from application of GIS in surveying and Geo-informatics are: new and flexible form of output (customized mapping).
- quick and easy access to large volume of data about features within study area.
- Ability to merge one dataset to another, capability of speedily updating and
- The Ability to answer complex land related questions.



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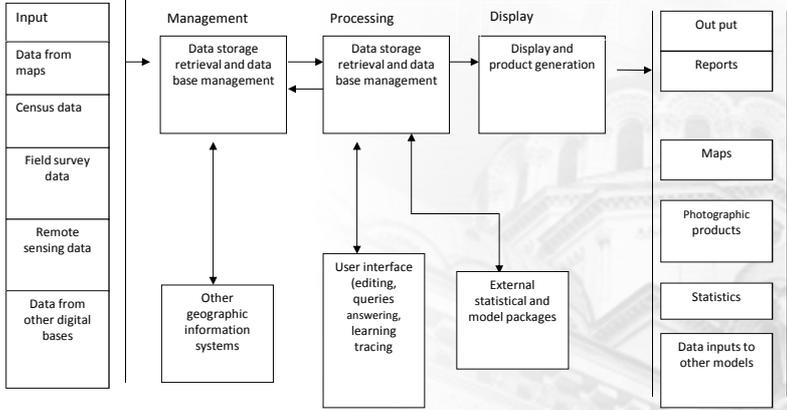
Among the many benefits derive from application of GIS in surveying and Geo-informatics are: new and flexible form of output (cus



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    graph LR
      subgraph Input
        I1[Data from maps]
        I2[Census data]
        I3[Field survey data]
        I4[Remote sensing data]
        I5[Data from other digital bases]
      end
      subgraph Management
        M1[Data storage retrieval and data base management]
      end
      subgraph Processing
        P1[Data storage retrieval and data base management]
      end
      subgraph Display
        D1[Display and product generation]
      end
      subgraph Output
        O1[Reports]
        O2[Maps]
        O3[Photographic products]
        O4[Statistics]
        O5[Data inputs to other models]
      end
      I1 --> M1
      I2 --> M1
      I3 --> M1
      I4 --> M1
      I5 --> M1
      M1 --> P1
      OI[Other geographic information systems] --> M1
      UI[User interface editing, queries answering, learning tracing] --> P1
      P1 --> D1
      EP[External statistical and model packages] --> P1
      D1 --> O1
      D1 --> O2
      D1 --> O3
      D1 --> O4
      D1 --> O5
  
```

Fig. 4 component subsystems of GIS




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DATA NEEDS

- To carry out this project, the following data were required:
- Google satellite imagery of the study area covering the study area
- Aerial Bing map of the study area.
- Topographic maps covering the study area.
- GPS observation to determine coordinates of some salient points necessary for Geo-referencing.
- Social surveys to determine the attribute information of existing spatial elements in the study area.




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SOURCES DATA ACQUISITION

- The data needed to carry out this study emanated from different sources.
- The map of the study area was obtained from Abia State Ministry of survey while the topographic map was obtained from the Federal Surveys.
- The google satellite imagery and Aerial Bing map was downloaded via the internet.
- Other non-spatial data were obtained directly by the team in the form of questionnaire.
- GPS observation is the direct observation of x, y coordinates for verification and georeferencing purposes.



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HARDWARE REQUIREMENT

- The hardware used in this project includes the following:
- GARMIN Map GPS 765 for the verification and Ground truthing exercise constituting the primary source of data.
- Pentium IV personal Zinox computer with the following configuration was used for data processing : 500 GB HDD, 2.30GHz, 2.0 GB RAM , DVD writer
- A flat screen VDU
- HP design jet plotter
- HP printer (A3)



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SOFTWARE REQUIREMENT

- The basic software for the project is quantum GIS (QGIS) 1.8.0 :
- Quantum GIS (QGIS) was used in this project for digitizing the study area from google satellite imagery and Aerial bing map and to create data base for the spatial features.
- AutoCAD Land Development was used indigitizing maps of Nigeria and that of Abia state showing the study area .
- Microsoft Word 2010 was for typing, editing and presentation of facts



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GEOREFERENCING

- There is a great deal of geographic data available in formats that cannot be immediately integrated with other GIS data. In order to use these types of data in GIS it is necessary to align it with existing geographically referenced data.
- The process of georeferencing relies on the coordination of points on the scanned image (data to be georeferenced).
- By "linking" points on the image with those same locations in the geographically referenced data you will create a polynomial transformation that converts the location of the entire image to the correct geographic location.



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GEOREFERENCING (CONTD)

- The georeferencing procedures adopted for this project in Quantum GIS are enumerated below:
- Launch QGIS
- Go to plugin and select georeferencer.
- On the georeferencer dialogue box, click on open raster and navigate to where Abia Poly image is stored and click open.
- Select WGS 84 on the coordinate setting and ok.
- Select the add point tool and click on the first corner of the image, enter the X- coordinates and then Y-coordinate (as picked by GPS).
- Pan to the second known point, click on the point and enter the X- coordinates and then Y-coordinate and ok.
- The procedures were repeated for the 3rd, 4th, 5th, and the 6th points.
- Go to setting, select transformation setting, click on output raster, supply the name and ok.
- Finally click on start georeferencing tool and the Google imagery covering Abia Polytechnic was georeferenced.



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DIGITIZING

- Digitizing is the process of interpreting and converting paper map or image data to vector digital data.
- On- screen method of digitizing was adopted for this project.
- On-screen digitizing is an interactive process in which a map is created using previously digitized or scanned information.
- This method of geocoding is commonly called "heads-up" digitizing because the attention of the user is focused up on the screen, and not on a digitizing tablet.
- This technique may be used to trace features from a scanned map or image to create new layers or themes



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PRESENTATION AND DISCUSSION OF RESULT

- The final map of Abia polytechnic was produced together with the associated attribute information.
- The project is a perfect representation of the entire campus.
- Also accomplished in the project is the associated attribute information especially for buildings.
- It is obvious that the area is highly developed and this information can serve as base for future infrastructural development and redesign if need be. Fig 5 shows the composite map.



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Fig. 5: Composite Map of Abia state polytechnic Campus



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RECOMMENDATION

- Creation of central data base for Abia state Polytechnic, Aba, while the final project will serve as an input into the data base.
- This type of project should be carried out in collaboration with Local Government Authority Survey department and Zonal Surveys office so as to create more awareness on the use of GIS as a tool for decision making.
- That the use of geospatial technology be encouraged in virtually all sector for maximum spatial output.



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CONCLUSION

- This project has shown the benefit and application of Remote Sensed data and GIS techniques in the mapping and sub-setting of Abia state Polytechnic Aba, through the production of an accurate, high quality, comprehensive and up-to-date composite map.
- It is worthwhile to state from this study that mapping using remotely sensed data and GIS technique is very important and less tasking compared to the traditional manual map making.
- In conclusion GIS has been a veritable tool in vector data extraction of the campus, having combined the locational and attribute information of geographic data discernible on the campus.



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