Volume: 5 | Issue: 10 | October 2019 || SJIF Impact Factor: 5.614||ISI I.F Value: 1.188 ISSN (Online): 2455-3662

EPRA International Journal of
Multidisciplinary Research (IJMR) *Peer Reviewed Journal*

HEIGHT EXTRACTION FROM SRTM AND TOPOGRAPHIC MAP OF ONITSHA SOUTH EAST NIGERIA

Chuma Obiamaka Vivian
Department of Hospitality and Tourism
Federal University Wukari,
Taraba State,
Nigeria.

Clement Anake PHD
Department of hospitality and Tourism,
Federal university wukari ,
Taraba State,

Inyang Oduduabasi E
Nigeria.

ABSTRACT

An assessment of the benefits of heights extracted from Onitsha metropolis using SRTM and Topographic map. This paper highhligts the procedure and materials used for the height extraction and also states applications of this extracted elevations. Differential GPS instrument was used to collect coordinates as well as elevations through field survey. Arc GIS was used to process and overlay the SRTM, Topographic map and elevation points. The result produced from this analysis shows that this database which can be stored can aid adequate planning, assist in environmental assessment and monitoring of the study area.

KEY WORDS: ***SRTM, DIFFERENTIAL GPS, TOPOGRAPHIC MAP, HEIGHTS***

INTRODUCTION

The SRTM data sets result from a collaborative effort by the National Aeronautics and Space Administration (NASA) and the National Geospatial-Intelligence Agency (NGA – previously known as the National Imagery and Mapping Agency, or NIMA), as well as the participation of the German and Italian space agencies, to generate a near-global digital elevation model (DEM) of the Earth using radar interferometry. The SRTM instrument consisted of the Space borne Imaging Radar-C (SIR-C) hardware set modified with a Space Station-derived mast and additional antennae to form an interferometer with a 60 meter long baseline. A description of the SRTM mission can be found in Farr and Kobrick (2000).

While Topographic maps represent the three-dimensional landscape with relief information in the form of contours, useful for Digital Elevation Modeling (DEM) and are quite indispensable in a National Geospatial data infrastructure for most development planning. They further quite accurately, represent natural and man-made landmarks and allow for modeling and visualizing of areas at risk from natural hazards (McChesney and McSweeney, 2005).

Topographic contours are shown in brown by lines of different widths. Each contour is a line of equal elevation; therefore, contours never cross. They show the general shape of the terrain. To help the user determine elevations, index contours are wider. Elevation values are printed in several places along these lines. The narrower intermediate and supplementary contours found between the index

contours help to show more details of the land surface shape. Contours that are very close together represent steep slopes. Widely spaced contours or an absence of contours means that the ground slope is relatively level. The elevation difference between adjacent contour lines, called the contour interval, is selected to best show

the general shape of the terrain. A map of a relatively flat area may have a contour interval of 10 feet or less. Maps in mountainous areas may have contour intervals of 100 feet or more. The contour interval is printed in the margin of each. U.S.Geological Survey (USGS) map.

In February of 2000, an unprecedented near-global elevation dataset based on single-pass INSAR technology was acquired as part of the NASA-JPL Shuttle Radar Topography Mission (SRTM), resulting in the most complete digital topographic database of Earth. In accordance with a memorandum of understanding between NASA and the primary mission sponsor, the National Geospatial Intelligence Agency, NGA (formerly NIMA), a raster digital elevation model (DEM) dataset was released at a resolution of 1 arc second (approximately

30 m) within the United States and 3 arc seconds (approximately 90 m) elsewhere. The vertical and horizontal accuracy of this dataset is key to accurate derived products, such as drainage network extraction (Curkendall *et al*., 2003).

Topographic maps offer a rich selection of data on the surface of the Earth, ranging from terrain type to land features, both natural and man-made. Perhaps one of the most ubiquitous features on topographic maps is the presence of contour lines to represent elevation data. These contour lines are often monochromatic brown and are closed with themselves or the edges of the map, by definition of being a contour. Christopher Hansen

No other mapping product has had widespread applications in developmental planning than the topographic map. Topographic maps represent the three-dimensional landscape by providing relief information in the form of contours in addition to plan information on which natural and man-made landmarks are quite accurately represented. Height information, extractible from topographic maps, comes in handy for most land use planning.

Ayer1*, et al 2016

The supposed height information derived from both Topographic map and SRTM will be used effectively in designing of sea ports in Onitsha since it is business oriented region, constructing good roads/ railways, building dams, controlling all kinds of erosion challenges, irrigation programs and mineral exploration in case of discovery of minerals

MATERIALS AND METHOD

The study is Onitsha Metropolis South East Nigeria and the following data sets which includes field data acquisition using Differential Global Positioning System (DGPS) for Elevation Points, SRTM DEM and Topographic map were used

DATA USED

Dataset	Coordinate system	Datum	Height system
SRTM DEM	Geodetic	WGS84	Orthometric
Topographic Map	Geodetic	Minna	Orthometric
DGPS Elevations	Geodetic	Minna	Orthometric

Two sets of points both from SRTM and Topographic Map which are coincident with the GPS points were extracted. Then For the height a triangulated irregular network (TIN) using the height values of the contours and the spot height was created before the TIN is converted to a raster. "TIN to raster is done through interpolation. Each cell which is in the output is then given a height or no data value determined on whether or not the cell falls in the range or within the TINS interpolation area . Then the pixel resolution is now set to 90m in order to be in unison with that of the SRTM.

Then the extracted heights from topographic map and SRTM images were put in the same coordinate system and overlaid and the verified using the DGPS. The various heights were analyzed and then results produced.

RESULT AND DISCUSSIONS

The surface heights which were obtained individually from SRTM and the Topographic map were cross checked. Fifty seven 57 GPS controls were used as control data for assessing the accuracy of the SRTM, and Topographic map DEMs. The ellipsoidal and orthometric heights of the GPS controls were provided. The figure below shows the different Tin produced from the topographic map and the SRTM.

The figure below shows an overlay of the hypsometry layers (contours and spot heights) on the

Tin. The contours that were produced from the SRTM and the topographic map. Then the height extractions were overlaid. The fitted in well but it was noticed that the contours from the topographic map at an interval of 50m was more in number than that of SRTM

The results obtained in the Figure below shows that heights can be obtained from SRTM and Topographic map even thou contours from SRTM is greatly affected by the nature of the topography of Onitsha.

The contours produced from the SRTM and topographic maps are very useful tools for abundant growth and massive development of the economy

CONCLUSION

Height Extraction for Onitsha is very necessary because it assists in evaluating the environment for effective monitoring. SRTM as well as topological maps has to be employed because of their ability to efficiently show heights adequately in addition to other features as in the case of topographic map. The results can be analyzed further and this will improve, decisions made by policy makers and the Government

REFERENCE

1. *Christopher Hansen Contour Extraction and Visualization from Topographic Maps Department of Electrical Engineering Stanford University Stanford, CA*
2. *Curkendall, D., E. Fielding, T. Cheng, and J. Pohl, 2003. A computational- grid based system for continental drainage network extraction using SRTM digital elevation models, IEEE ICPP Workshop Proceedings, pp. 181–190.*
3. *Farr, T.G., M. Kobrick, 2000, Shuttle Radar Topography Mission produces a wealth of data,Amer. Geophys. Union Eos, v. 81, p. 583-585.*
4. *J. Ayer1*, A.B. Agyemang1, F. Yeboah2, E. M. Osei Jnr.1, S. Abebrese1, I. Suleman1 A Comparative Analysis of Extracted Heights from Topographic Maps and measured Reduced Levels in Kumasi, Ghana.*
5. *McChesney, R., McSweeney, K. (2005). Topographic Maps:Rediscovering an accessible data source for land cover change Research. Journal of Geography, 104(4), 161-178.*
6. *US department of interior US geological survey Topographic Map Information*
7. *For more information about topographic maps produced by the USGS, please call: 1-888-ASK-USGS or visit us at http://ask.usgs.gov/ South African Journal of Geomatics, Vol. 5. No. 3, November 2016 313*