ICSESS 2015

BOOK OF EXTENDED ABSTRACTS

1st International Conference on Science, Engineering, and the Social Sciences

Organizers:

International Students Society (ISS) – Nigeria, Universiti Teknologi Malaysia

In collaboration with UTM International, ISC and SPS

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NUSATEK

PREFACE

On behalf of the ICSESS 2015 Local Organising Committee, It is a great pleasure for me to welcome all colleagues to the International Conference on Science, Engineering and the Social Sciences (ICSESS 2015) held at Universiti Teknologi Malaysia, Johor Bahru, Malaysia in May 11 – 13, 2015.

The conference is organised by the International Students Society- Nigeria (ISS-Nigeria), Universiti Teknologi Malaysia in collaboration with UTM International, International Student Centre (ISC) and School of Graduate Studies; with the main theme being Technology-Driven Sustainable Development for Global Solutions. The main aim of organizing this conference is to provide a platform for researchers to showcase their research findings and most importantly to further encourage interaction among researchers to boost networking and collaborations in the field of sciences, engineering, the social sciences and humanities. A total of 102 papers were received and after a round of peer review, 86 papers were accepted for oral presentations. These accepted and presented papers will undergo a second round of blind peer review for publication in 2 SCOPUS-indexed journals namely Jurnal Teknologi and Pertanika Journal of Social Sciences and Humanities.

In the course of the conference, two keynote speeches will be delivered by a renowned scholar, a Nigerian based in USA, Prof. Michael Adewumi and a Malaysian industrialist, entrepreneur and a philanthropist Dato' Dr. Ghazali Dato' Mohd Yossouf (Adjunct Prof.). Conference presentations have been grouped according to the following sub-themes: Sciences/Biosciences, Engineering, the Social Sciences, Built Environment, Education and Geoinformation.

Once again, on behalf of the conference organizing committee, a very warm welcome to all ICSESS 2015 participants, and I hope this conference will have a lasting impact in your careers as researchers and academics.

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THE IMPACT OF SATELLITE GEOMETRY ON THE PRECISION OF DGPS POSITIONING

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Abstract: This paper investigates the impact of Satellite Geometry in the Precision of DGPS positioning, since it has an amplifying effect on other sources of errors associated with GPS positioning. DGPS positional data were acquired at three epochs of a day using Promak3 DGPS and post-processed using GNSS solution software. The temporal variations in PDOP, number of visible satellites and the standard errors in relative positioning, (which are all functions of the satellite geometry) were analysed both graphically and statistically (using statext v1.0 software) to ascertain the impact of satellite geometry on the derived positions. The graphical results indicated various temporal variations in the parameters defining a GPS-based position on the earth surface; but the statistical tests conducted show no significant differences in the means of the populations of PDOP and standard error in relative positioning obtained in three epochs at 0.05 significant level. Also, for the short ranges, an average standard error of 0.046m, 0.043m and 0.092m were obtained at the three epochs respectively; while for the medium ranges an average standard error of 0.112m, 0.096m, and 0.123m were obtained at the three epochs respectively.it was concluded that the greater the occupation time, the better the satellite geometry and thus the higher the precision in DGPS positioning

I. INTRODUCTION

Satellite based positioning is improving continuously and various effort is being applied in making the accuracy and precision of the system very high. It is important to note that the precision of GPS positioning depends on the errors in the range measurement and the Dilution of Precision (DOP); these are functions of the satellite geometry [1]. The satellite geometry has an amplifying effect on the impact of GPS error sources from observations to adjusted parameter and this effect varies with the time of observation. Thus, the satellite geometry determines the level of propagation of GPS error sources [2]. The science of position determination using the GPS has gained applications in various disciplines and fields of human endeavour such as roads and highway, railway, telecommunication, aviation, marine, agriculture, mapping, recreation, public safety and relief etc. Consequently, this paper seeks to investigate the impact of satellite geometry on the precision of DGPS (Differential Global Positioning System) positioning.

II. MATERIALS AND METHODS

This study was carried out on four different control points spread across Minna in Niger State (Fig.1); Nigeria. Point L40 (Primary Control Point) was used as the base station for observations of other three points (secondary control points). The study area (Minna) lies within latitude 9° 25' 00" and 9° 40' 00" North of the equator and longitude 6° 24' 20" and 6° 36' 40" East of the Meridian.

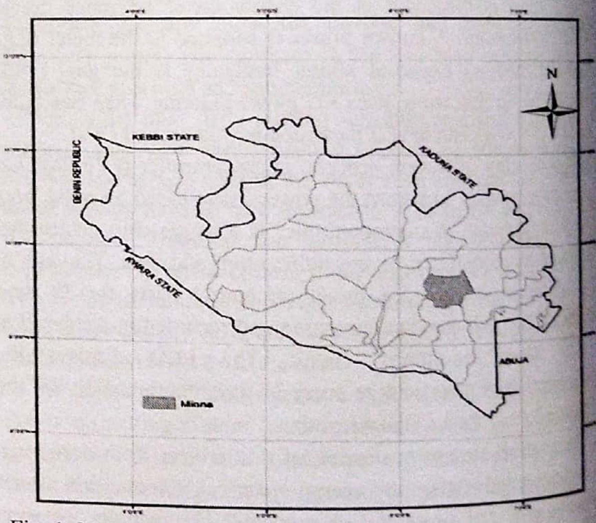

Fig. 1: Map of Niger State showing Minna

The data for the study was obtained using Differential Global Positioning System (DGPS) at three (3) epochs in a day. The study points were evenly selected covering Minna and its environs. The DGPS Rovers were referenced to a base station (i.e. L40 Nigeria's Datum) and its known coordinate was used in post processing the DGPS observations. Coordinates of the stations used are shown in the Table 2 below.

TABLE 2: Locations of Control Points used for DGPS observations in the Study Area

STATION ID	Control Category	COORDINATE (m)	
		Easting	Northing
L40 (Base)	Primary	227423.232	1066041.870
FUT09/ 055	Secondary	233413.820	1060188.295
CSN168S	Secondary	227914.615	1069224.788
SVG/GPS 01	Secondary	220563.650	1055093.618

The GPS data were processed using GNSS solution software. The coordinate data were analysed based on the satellite visibility, PDOP and standard error in the positioning. The relationship existing between standard error in range measurement and the Dilution of precision can be written as [2]:

$$\sigma_{pos} = DOP \times \sigma_r$$

Where: σ_{pos} is the standard error in positioning (m), DOP is the Dilution of Precision (unitless) and σ_r is the standard error in range measurements (m).

III. RESULTS AND DISCUSSION

The standard error in the processed vectors were obtained as shown in Table 2 below:

TABLE 2: Temporal Variations in Standard Errors of Relative Positioning

VECTOR IDENTIFIER	VECTOR LENGTH(m)	TIME(h)	PDOP	σ_r (m)	* σ_{POS} (m)
L40 - CSN168S	3218.942	9.35	1.6	0.016	0.0256
FUT09/055 - CSN168S	10573.851	9.35	2.1	0.054	0.1134
L40 - FUT09/055	8371.974	10.02	1.6	0.041	0.0656
L40 - SVG/GPS01	12913.677	10.43	1.6	0.063	0.1008
FUT09/055 - SVG/GPS01	13817.029	10.43	1.6	0.067	0.1072
L40 - CSN168S	3218.935	14.52	1.5	0.016	0.0240
L40 - FUT09/055	8372.006	14.90	1.5	0.041	0.0615
FUT09/055 - CSN168S	10573.868	14.90	1.5	0.051	0.0765
L40 - SVG/GPS01	12913.709	15.30	1.7	0.063	0.1071
FUT09/055 - SVG/GPS01	13817.069	15.30	1.7	0.067	0.1139
L40 - CSN168S	3218.911	19.08	1.9	0.016	0.0304
L40 - FUT09/055	8370.000	19.52	1.5	0.041	0.0615
FUT09/055 - CSN168S	10573.852	19.52	2.0	0.052	0.1040
L40 - SVG/GPS01	12913.650	19.87	1.6	0.063	0.1008
FUT09/055 - SVG/GPS01	13816.943	19.87	2.1	0.067	0.1407

The graphical representation of the standard error in positioning are shown in the Figure 2 below:

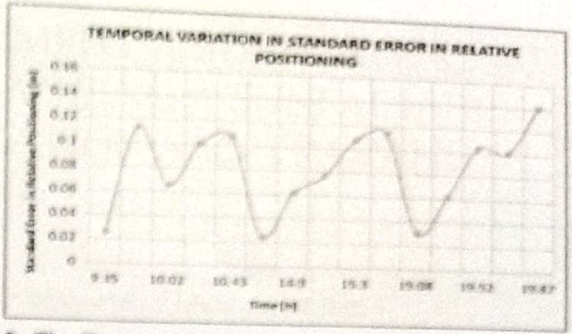

Figure 2: The Temporal Variations in relative positioning at the three epochs.

The results indicated various temporal variations in the parameters defining a GPS-based position on the earth surface; but the statistical tests conducted show no significant differences in the means of the populations of PDOP and standard error in relative positioning obtained in three epochs at 0.05 significant level. Also, for the short ranges, an average standard error of 0.046m, 0.043m and 0.092m were obtained at the three epochs respectively; while for the medium ranges an average standard error of 0.112m, 0.096m, and 0.123m were obtained at the three epochs respectively.it was concluded that the greater the occupation time, the better the satellite geometry and thus the higher the precision in DGPS positioning

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