iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 6 **Issue:** III **Month of publication:** March 2018

DOI: http://doi.org/10.22214/ijraset.2018.3141

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 6 Issue III, March 2018- Available at www.ijraset.com

Advanced Techniques used in Surveying: Total Station, GPS, GIS, Drone Arial Survey

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Surveying is an important constituent as planning and design of all civil engineering projects such as construction of highways, bridges, tunnels, dams etc are based upon surveying measurements. Surveying is the technique of determining the three dimensional positions of points, including the distances and angles between these points that are normally located on the surface of the earth, but may also be located above the surface. During execution, project of any magnitude is constructed along the lines and points established by surveying.
The present article shows the surveying using advanced equipment's i.e. Total Station, GPS, GIS & DRONE Arial surveying of total Shraddha Park College campus, Nagpur & Plotation of Map & comparing as well as checking the accuracy of these instruments. Thereby developing the knowledge skill as well as enhanced the knowledge about Modern electronic surveying instruments. GIS surveying was guided by IMAGIS Engineering Solution put. Ltd, Nagpur. From the study it is finalized that Total station survey is more accurate for plotation of map as well as Greenery Mapping is done using GPS survey & DRONE Arial survey provide the location of whole shraddha park college campus, Nagpur.
Keywords: Total Station, GPS, GIS, DRONE Arial Survey, Maps.

I. INTRODUCTION

Advanced instruments plays very vital role in investigating their basic technical parameters to improve the engineering, surveying measurements

Total station is a combination of an electronic theodolite and electronic distance meter makes it possible to determine the coordinates of a reflector by aligning the instrument cross hair on the reflector and simultaneously measuring the vertical and horizontal angles and slope distance a micro processor in the instrument takes care of recording reading, and the necessary computations. The data is easily transferred to a computer where it can be used to generate a map.

The GPS concept is based on time. The satellites carry very stable atomic clocks that are synchronized to each other and ground clocks. GPS satellites continuously transmit their current time and
position. GPS provides specially coded satellite signals that can be processed in a GPS receiver,
enabling the receiver to compute position, velocity and time.

GIS is more than a tool for map preparation or for generating presentation graphics that allows a user to bring together spatial data and databases containing attribute and other types of data (e.g., images or graphs). This provides users the opportunity to realize greater benefits from their data because most data include a significant geographic component.

Aerial survey is recognized for aero photogrammetry, part of photogrammetry using aeroplanes, helicopters, UAVs, balloons or other aerial methods, where the camera is placed in the air.

Drones are very popular in travelling sectors as mass media networks patronize its functionality and efficiency when capturing videos and images. Measurements on aerial images are provided by photogrammetric technologies and methods.

In the present study, Surveying of total Shraddha Park college, Nagpur campus was done to check the accuracy of these advanced instruments and to determine most accurate positioning of college campus as well as developing the map using the surveying coordinates in Auto Cad Software. The decisions based on essential characteristics of engineering that are accuracy in measurement, actual positioning, and economy.

A. Introduction to Advanced Instruments

1) *Total Station:*
2) *A total station or TST (total station theodolite) :* is an electronic/optical instrument integrated with an electronic distance measurement (EDM) used for surveying.

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Fig: Total Station

3) *Uses:* To read slope distances from the instrument to a particular point, and an on-board computer to collect data and perform advanced coordinate based calculations.
4) *GPS:* GPS use satellite data to calculate an accurate position on the earth. These calculations can relate the user's position to almost any map projection within milli-seconds.

Fig: GPS

5) *GIS:* Geographical Information System (GIS) is a technology that Visualize spatial information& has Power to create maps with images shown

Fig: GIS

6) *USES:* Specially used for a vast range of tasks involving geography.
7) *Advantages:* Provides ability to show lots of information on one map.
8) *DORNE Arial Surveying::* Aerial survey is a method of collecting geomatices or other imagery by using aeroplanes, helicopters…etc.

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Fig: DRONE Arial Survey

Measurements on aerial images are provided by photogrammetric technologies and methods.

B. Advantages of Advance surveying

1) Modern surveying instruments provide faster and more precise surveying than conventional instruments.
2) Fully automatic electronic measurement.
3) Digital display of staff reading and distance.
4) Data storage & Direct transfer in instrument possible.

C. Need of Advanced Techniques used in Surveying:

The planning and design of all civil engineering projects of any magnitude is constructed along the lines and points established by surveying and as these instruments integrated with an electronic distance measurement have capability of capturing measurements accomplish all tasks much more efficiently.

Thereby plotation of Map of any structure is become easy as well as enhanced the skills & reducing lengthy work & completed within a short duration of time.

Recent techniques in surveying using advanced instruments provide actual location of any structure with respect to all aspects.

D. Objectives

1) To Plot Shraddha park College Campus, using various advance techniques in surveying.
2) To understand the New techniques such as Total station, GIS, GPS, DGPS...etc.
3) To study the various plotation techniques in surveying.
4) To develope the map of shraddha park college campus using total station, GPS, GIS, DRONE Arial Survey.

II. LITERATURE REVIEW

Sami H. Ali, Najat Qader Omar [2016] provided recent technological developments surveyors with new high-tech surveying equipment, such as, prismless total station instruments. The results of the current practical field experiments, computations and analysis of these tests using various calculations and least squares theory (computer adjustment programs, Excel and AutoCAD 2010) are also presented in digital and/or graphical forms.

The results of the trials showed a considerable savings in the field time required to complete the surveying of the detail points of the building. There is a savings up to 35% of the field time by using the reflector less total station as compared with the prismatic total station.

Sanjeev Gill et.al [2016] presented the way to facilitate and manage surveying instrument theodolite and total station and take more accuracy for civil works methods to accomplish modernized and cost effective urban survey with best achievable accuracy. This is done by surveying methods with modern methods from both theoretical and practical point of view.

Check the machined surfaces and the polished faces of the lenses and mirrors. Try the clamps and motions for smooth operation.

Transport and store instrument in positions that are consistent with the carrying case design. For example, total station should be carried and stored in their correct position. Theodolite cases indicate the position in which they should be transported

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Brian E. Mennecke, Martin D. Crossland [1996] Provided an introduction to geographic information systems (GIS) and research framework for information systems researchers.The paper summarizes the main GIS features, functions and capabilities including research frameork of GIS. Miroslav Rusko et.al [2010] presented that the geographical information system (GIS) is a tool used generically for any computer based capability for manipulating geographical data. The hardware and software functions of GIS include data input, data storage, data management (data manipulation, updating, changing, exchange) and data reporting (retrieval, presentation, analysis, combination, etc.). We showed the GIS system as the powerful and effective tool for creating intelligent maps for, e.g., water, wastewater, and storm water systems. Abha Damani et.al [2015] used Global Positioning System for the tracking and navigation purpose. GPS is mainly used in the military, farming, civil, transportation and commercial users around the world. Here in this review paper, we describe how GPS Tracking System works and where it is useful in real world environment. Chun Fui Liew et.al [2017] Presented a review on Recent Developments in Arial Robotics: A survey & Prototypes &also showed show a pie chart and a map of the top ten countries distribution with the most drone papers. Zhiguo Gao et.al [2017] provided a view on Rapid acquisition and processing method of large scale topographic map data, which relies on the Unmanned Aerial Vehicle (UAV) low-altitude aerial photogrammetry system, is studied in this paper, elaborating the main work flow. In this paper, the production and application of the large scale topographic map for the aerial mapping of the micro unmanned aerial vehicle (UAV) is used in areas of simple terrain and relatively flat terrain, and the results meet the accuracy requirements though field test. The authors showed that most important characteristics which plays vital role in accurate positioning of any structure & their relative factors. especially; enhanced the knowledge about uses of these advanced technologies which has inbuilt electronic measurement capturing capacities helps to locate map using that coordinates to intensify actual structural location.

III. METHODOLOGY

1) Review of Literature (previous work done on Surveying)
2) Study about Advanced Equipment Total Station, GIS, GPS, DGPS & DORNE Arial Surveying.
3) Surveying to determine coordinates
4) Plotation of Maps
5) Comparision of Results i.e. map & Checking the accuracy.

A. Details & Surveying Coordinates

Surveying coordinates are taken by carrying out the Total Station & GPS Survey and then it is considered for plotation of map present study. Whereas GIS & DRONE Arial surveying is done with the help of measurement from images, location maps are plotted. The coordinates of total station & GPS Survey are as follows:

Survey	Point Location	Northing	Easting	Elevation
Total Station Survey	Gate	1024.94	642.83	3.77
	SPT	983.74	371.48	7.03
	Poly BT	1016.63	571.08	18.18
	Acdtb	1139.89	468.36	20.98
	Wm Bc B	1068.24	442.13	1.95
	Wm HT	1151.52	393.57	-0.94
GPS Survey	Gate	2337396.2	292644.77	328.83
	Corner	2337209.4	292537.78	390.36
	Temple	2337346.7	292629.80	325.02
	Boyd Bc	2337157.9	292713.18	325.62
	Acdimic	2337180.1	292550.82	325.57
	Ashok Layland	2337128.9	292671.11	323.25

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IV. RESULTS AND DISCUSSION

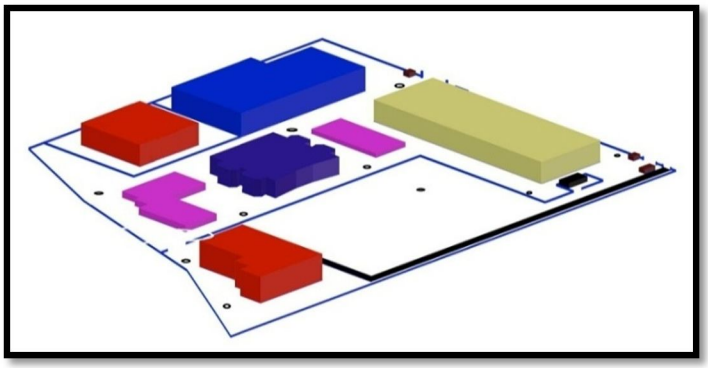

Fig-1: Solid Elevation using Total station coordinates

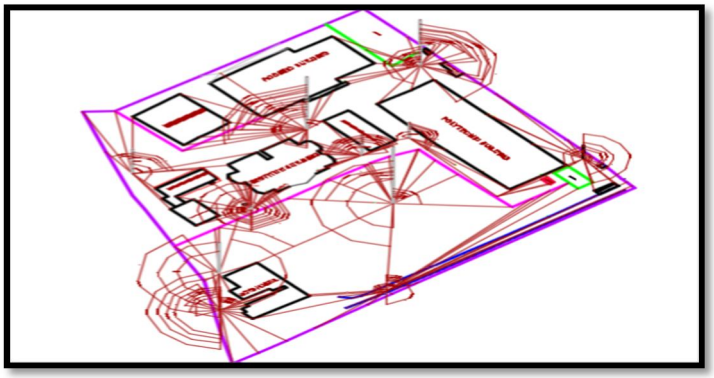

Fig-2: Auto cad Map showing projection with coordinates measured.

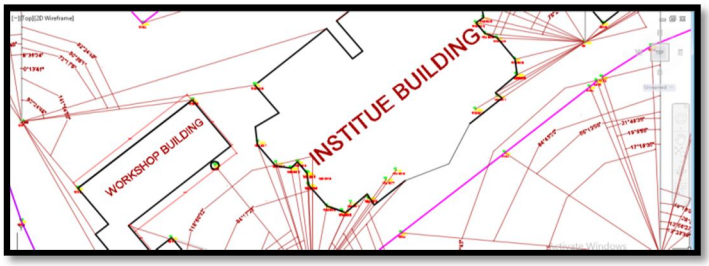

Fig-3: Showing Details of Each & every point established using Total Station Survey

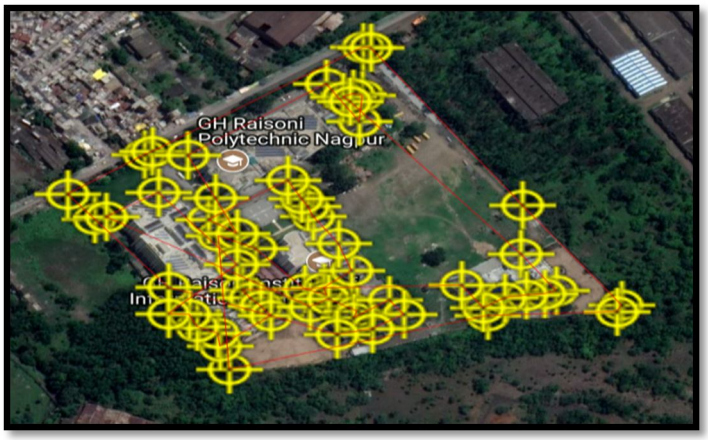

Fig-4: GPS Surveying Drawing

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Fig-5: Greenery Mapping using GPS.

Fig-6: Arial Survey of Total college campus

Fig-7: GHRAET building located by DRONE

V. CONCLUSIONS

As we compare the map & survey work of Total station & GPS survey. We got result as compare to total station the GPS survey work is not very much good in accuracy the international coordinates & RL is not match in the map of total station map. Theaccuracy of total station (0.001 M) & the accuracy of GPS is (0.500M to 0.050). From the present study it is concluded that total station survey is more accurate.

VI. FUTURE SCOPE

Beyond this advanced equipments, in future we can also used recently launched instruments, which is launched in February-2018 These are

A. GeoRadar
B. Echo Soundar
C. IDS GeoRadar

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D. Mobile Reality Capture- Multi Sensor N.S.V (Leica)
E. Continuous 3D rail capture.
F. Total Station Scaner.
G. UG Pipe Locator.

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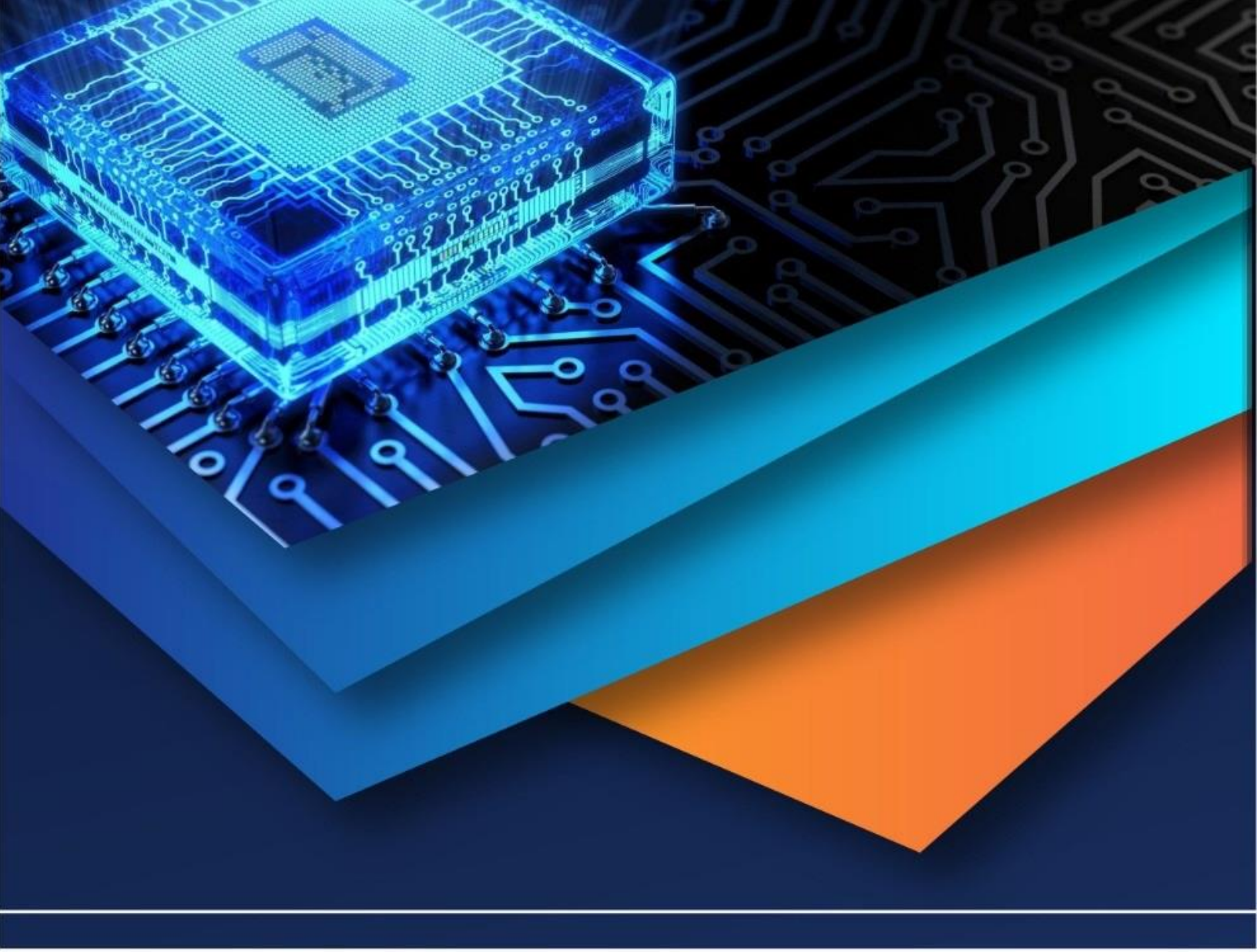

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