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# A Comparison of GPS and Manual Calculations for Measuring Agricultural Land

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**ABSTRACT**
Measuring the long distance and larger area is always remained tedious job for surveyor due to colorful factors like it consumes further time, bad rainfall, error in instruments being used etc. But among each, the most important factor is time needed to negotiate the particular task. Certain time Civil masterminds requires primary check data regarding the distance between two points or area of particular place snappily for deciding the possible alternate routes and knowing the area of particular position directly. Homemade surveying using chains, gates, position machines etc. bear time and fiscal help to negotiate the task. On the other hand, recent development in Global Information System(Civilians) made this task easy to perform by remote seeing and using Global Positioning System( GPS) operation grounded software. But delicacy of Civilians is need to be determined for getting the precise measures. thus, this exploration aims to probe the delicacy in distance and area of named position using Google Earth Pro(Civilians operation software). From field check data and homemade computation, it's observed that homemade computation of distance and area is more accurate than that of Google Earth Pro measures.

## I. INTRODUCTION

Google Earth is a computer program that renders a three dimensional(3D) representation of earth grounded on satellite imagery. The program maps the earth by the superimposition of images attained from satellite imagery, upstanding photography and Civilian's data onto a 3Dglobe, allowing druggies to see metropolises, places, roads, houses etc. at colorful angles. The Google Earth service has numerous tools that allow druggies to not only prize spatial data but also to add their own content to the imagery, similar as photos, milestones and notes. Now a day, the high-resolution imagery that Google Earth hosts allows mortal spectators to readily distinguish between major natural land cover classes and to discern factors of the mortal erected terrain, including; individual houses, artificial installations, and roads. This is the reason, Google Earth is popular for its stoner-friendly interface and real time operation for chart suckers, shipmen and armchair explorers. druggies of this software generally assume that it's a believable and dependable source of information. Within this fashion ability of Google Earth, druggies tend to assume that it's an accurate source of information and also tend not to question its credibility. In addition, its deduced equals generally being reported with a perfection that doesn't match its delicacy due to number of reasons like security pitfalls, necessary crimes etc. Eventually these crimes are hardly introduced for security reasons, which misleads druggies to believe that it's an accurate source of information. thus, in order to understand and reduce the misgivings associated with the use of Google Earth in different operations, delicacy assessments of its corresponding imagery are needed. Accordingly, a series of delicacy assessments of Google Earth imagery have been accepted by different experimenters. Unfortunately, nearly all experimenters don't state easily a unique estimated delicacy according to colourful factors that govern the affair, but they completely recommend that Google Earth coordinates should be handled with caution. According to the work by Ehsani et al,( 2004), 50 intimidator area was surveyed with GPS.

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The base station and four reference points were established over the loftiest point in the check area. Corrected GPS signals are transmitted in real time from a base receiver at a known position to one or further rover receivers. Results from GPS system, a vertical match delicacy of 1 cm has been achieved by compensating for atmospheric detention, orbital crimes and other variables in GPS figure. According to Lin,( 2004), delicacy test was made between GPS and total station. The results showed that a positional delicacy of 14 mm has been achieved using GPS while using total station it was possible to determine 16 mm positional delicacy.

## II. REVIEW OF LITERATURE

The Global Positioning System( GPS) and Geographic Information System( Civilians) are two distinct but nearly affiliated technologies that allow for the collection, storehouse, operation, analyses, and display of spatial data. The two technologies shouldn't be confused — a GPS is a system for collecting spatial data, a Civilians is a system for managing and assaying spatial data — and a Civilians may ormay not involve GPS data.

As utmost questions in primate behavioral ecology involve a spatial element, both GPS and Civilians are an necessary part of the primatologist's toolkit. still, despite the exponential increase in the advancement and vacuity of GPS/ Civilians technology in the early twenty-first century and their wide use in ecology, these tools particularly Civilians — remain underutilized in primatology GPS and Civilians are important tools for understanding primate behavioral ecology. The exemplifications handed in this encyclopedia entry are a small sample of the types of operations for these technologies in primatology. still, as mentioned over, primatologists have yet to employ the full eventuality of Civilians for addressing abecedarian questions in primate socioecology, particularly for thesis testing. This will bear that primatologists suppose creatively about how these tools can be applied to similar questions and to expand their ideas about what constitutes a spatial question.

## III. MATERIALS AND METHODOLOGY

### A. Materials

Accoutrements For measuring the distance manually, plastic tape recording is used having length of 100 bases. Chaining the check line for measuring the distance, ranging rods are used to make the chain line straight. optic forecourt is used to assuring the perpendicular of equipoises- measured on both side of chain line. Global Positioning System GPS) of interpretation German GPS was used for measuring the equals at each station point. Base camp software installed in computer for bridging the GPS with computer, to transfer the measured equals. Google Earth Pro software is used to detect the observed equals on specified ground and measure the distance and area of chosen ground.

### B. Methodology

Methodology espoused for measuring the vertical distance area of flat ground in both way- manually using chain check and using software Google Earth and also comparison is made for both results. Vertical ground (Entry Test Ground) is named first, which is located at Mehran UET Jamshoro, Sindh. For measuring the distance 1000feet chain line was decided and also ranging of chain line was done for making the chain line straight. Total 20 intermediate stations (C00 to C1000; where ABC shows chainage and number represent distance in bases) were marked with the help of measuring tape recording and sword arrows at each 50feet distance throughout chain line. After establishing the stations on chain line, equals of each station was measured with the help of GPS with uniqueness. C00, C50, C100etc. likewise, six vertical equipoises (three on left side OL00, OL600 and 1000; three on right side OR00, OR600 and OR1000; where OL is neutralize left side, OR is neutralize right side and number represent position of chain line where neutralize was taken). equipoises having 100feet length on both sides- left wing and right side of chain line were measured at chainage of C00, C600 and C1000. equipoises were drawn manually by right angle tringle system and also ranging rods are drawn in to a ground at neutralize position. Cross check is done with the help of optic forecourt for assuring the perpendicular of equipoises and GPS equals are measured at these equipoises for having blockish type of enclosed boundary, to measure the area. Completing field work, measured equals of GPS are transferred to the Google Earth Pro with the ground of Base camp- the connecting software, used to connect the GPS to computer for transferring the measured equals. On Google Earth, distance and area is measured using Google Earth tools i.e. Add Path for distance and Add Polygon for area dimension. Eventually results are compared for measuring the delicacy of software. In this methodology no other effecting factors like

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wind, temperature, error in tape recording due to sagging, temporal variation etc.

Were considered which might have affected the manually as well as Google Earth Pro results at any stage of dimension. This study is irrespective of other factors and it's considered that homemade computation is accurate as compared to software calculation.

## IV. RESULTS AND DISCUSSION

### A. Total Area Measurement

Area is measured on flat ground using "Add Polygon" tool of Google Earth Pro. In first trial area is measured by specifying only four corner points i.e. OR00, OR1000, OL1000 and OL00 as shown in Figure 2(a). In second trial similar measurement is done by specifying six points i.e. OR00, OR600, OR1000, OL1000, OL600 and OL00 This measured area, then compared with standard area of (34,750.65 m²).

Measured results are given in Table 1.

**Table No. 1 Total Campus Area**

| S. No | Description | Distance (m) | Error (m) |
|---|---|---|---|
| 1 | Standard area | 34,780.65 | - |
| 2 | Perimeter using tape | 3490.03 | 0.5% |
| 3 | Perimeter of campus using aerial image | 3440.03 | 50 |

**Figure 1. Location of CAET College for plotting of department wise allocation of space measurement on Google Earth Pro**

When number of points are lower than there's advanced delicacy in area results is observed and vice versa, as number of points increases. Google Earth Pro measured area is lower than standard area, when many points are specified. While, measured area is advanced than standard, when further points are specified.

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**Figure 2. Space allocated for college building**

**Table No. 2 Total Area of College Building**

| S. No | Description | Distance (m) | Error (m) |
|---|---|---|---|
| 1 | Standard area | 4,200.8 m² | - |
| 2 | Perimeter using tape | 380.00 | 0.5% |
| 3 | Perimeter of campus using aerial image | 385.00 | 5 |
| 4 | Remaining Space Excluding College Building | 3055 | |

**Figure 3. Space Allocated for Farm 1 (Strawberry/okra)**

**Table No. 3 Total Area of Farm 1 (Strawberry/okra)**

| S. No | Description | Distance (m) | Error (m) |
|---|---|---|---|
| 1 | Standard area | 4,276.79 m² | - |
| 2 | Perimeter using tape | 296.93 m | 0.5% |
| 3 | Perimeter of campus using aerial image | 305.93 m | 9 |
| 4 | Remaining Space Excluding College Building | 3134.07m | |

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**Figure 4. Space Allocated for Farm 2 (Watermelon)**

**Table No. 4 Total Area of Farm 2 (Watermelon)**

| S. No | Description | Distance(m) | Error(m) |
|---|---|---|---|
| 1 | Standard area | 1,984.06 m² | - |
| 2 | Perimeter using tape | 180.01m | 0.5% |
| 3 | Perimeter of campus using aerial image | 175.9 m | 5 |
| 4 | Remaining Space Excluding College Building | 3264.1m | |

**Figure 5. Space Allocated for Farm 3 (Banana Plantation)**

**Table No. 5 Total Area of Farm 3(Banana Plantation)**

| S. No | Description | Distance(m) | Error(m) |
|---|---|---|---|
| 1 | Standard area | 1,087.66 m² | - |
| 2 | Perimeter using tape | 138.08 m | 0.5% |
| 3 | Perimeter of campus using aerial image | 140.9 m | 2.28 |
| 4 | Remaining Space Excluding College Building | 3299.1 m | |

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**Figure 6. Space Allocated for Garden**

**Table No. 6 Total Area of Garden**

| S. No | Description | Distance (m) | Error (m) |
|---|---|---|---|
| 1 | Standard area | 1,093.72 m² | - |
| 2 | Perimeter using tape | 158.63 m | 0.5% |
| 3 | Perimeter of campus using aerial image | 168.63 m | 10 |
| 4 | Remaining Space Excluding College Building | 3271.37 m | |

## V. CONCLUSION

1. Why? To calculate the error rate between satellite image and human calculation rate using meter tape. The area calculated using meter tape and the areal footage the hardly difference is approximately 5 to 10 m.
2. How? Among all GIS and GPS Apps the reliable source of satellite images (real time) is google map/google earth.
3. What? To differentiate between the allocation of space for various crops using aerial view.
4. Where? DBSKKV Campus – College of agriculture engineering and technology dapoli.
5. Who? Aniket Arun Kale CAET, Akanksha Dipak Salvi, P.R. Kolhe.

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