Time Optimization in Reconnaissance Surveying

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Abstract - Number of operations in Surveying requires different instruments. While plotting a traverse, ranging rods are required for ranging, tape is used for linear measurements and theodolite is used for angular measurements. To avoid transportation and haulage of different instruments on site, we have manufactured a new instrument which has united all these operations by single set up. This instrument is able to perform different functions i.e. ranging, levelling, traverse plotting, angular measurements simultaneously. This invention consist of a ranging rod with metallic tape attached at bottom of rod, 360 degree protractor as main scale and vernier scale is provided to measure the horizontal angle between any two points to an accuracy of 20 seconds. With the help of this instrument, we are able to measure vertical angles and bearing of survey lines.

Key Words: Transverse plotting, ranging, reconnaissance, theodolite

1. INTRODUCTION

Surveying has been an element in the development of human environment since the beginning of recorded history. As it is the first step before planning and execution. It is also used in transport, communication, mapping, and other definitions of legal boundaries for land ownership.
2. COMPONENTS OF INSTRUMENT

![Schematic representation of Instrument](image)

Fig No. 1. Schematic representation of Instrument

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3. PROCEDURE OF MEASURING HORIZONTAL ANGLE

There are two ranging rods connected to each other by means of measuring tape. By placing one ranging rod at station a second rod is moved to the station B. While moving second rad vernier scale moves over main scale and pointer guides the angle on the main scale. In this way angle between two points can be measured.

4. PROCEDURE OF MEASURING VERTICAL ANGLE

Vertical circle is provided at the side of the telescope for measurement of vertical angle. Pointer is attached to denote the angle. As we rotate the telescope the needle rotates around the semicircular protractor to measure the vertical angle between two points. By knowing vertical angle between two points by using trigonometric calculations we can find out the level difference between two points.

5. CASE STUDY

We carried out the measurement of irregular plot with the help of theodolite and our instrument for the purpose of validation. We consider a following map for the measurement of area. We measured sides of quadrilateral with the help of measuring tape and measured the angles with the help of theodolite. Then we measured sides and angles of the quadrilateral with our instrument and validate the result as follows:

<table>
<thead>
<tr>
<th>Area measured using Theodolite</th>
<th>14876 sq.feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area measured by our instrument</td>
<td>14875.09 sq feet</td>
</tr>
</tbody>
</table>
6. ADVANTAGES OF INSTRUMENT

- Cost of Instrument: The cost of this instrument is Rs. 4, 500/- only which is very small as compared to other surveying instruments.
- Functions: This instrument can perform ranging, linear measurement, measurement of horizontal and vertical angles, centering, determination of level difference simultaneously.
- Transportation of Instrument: Easy to transport since this instrument takes very less time for its mantling and dismantling.
- User friendly: Non-technical person can use this instrument very easily.

7. POSSIBLE FIELDS OPERATIONS

- Area Measurement: It can be used to calculate the area of the irregular plot by measuring the lengths of the sides and angles between the sides.
- Level Difference: By observing vertical angle between two points and by using trigonometric calculations we can find out the level difference.
- Traverse plotting: It can be used to plot closed as well as open traverse.
- Ranging: Ranging can be done conveniently with main scale fixed at bottom.
- Measurement of Linear Distances
- Bearing of survey line

8. CONCLUSIONS

- Least count of this instrument is 20 seconds therefore results obtained from this instrument are competent with 20 second theodolite.
- This instrument has replaced use of various equipment’s in reconnaissance survey by combining 6 functions in single set up.
- Use of this instrument is limited for reconnaissance survey only.

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