Chapter 4:

INTERSECTION

AND

RESECTION

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1. INTRODUCTION

1.1 Background

Intersection method is used for locating a point by sighting from two or more known points or stations. Intersection method is mainly used for locating a point where setting up of station is very hard and which are also dominant physical feature like top of tower, top of temple or church, etc.

Resection method is used to find the position of an unknown station by sighting three known stations. It gives weaker solution than intersection however it is extremely useful technique for quickly fixing the position where it is required (*Triangulation Instruction Book*, 1976).

1.2 Objective

The main objective of this project is:

- To establish horizontal control point.

The secondary objectives of this project are:

- To find out the elevation of the point where it is impossible to setup the instrument.

1.3 Scope of work

The scope of intersection and resection is to establish the horizontal control point in the desired location. Furthermore, temporary monuments were used for the established stations.

2. METHODOLOGY

2.1 Area of the project

The project location is located in Dhulikhel-4, Kavre. It was carried out inside KU premises.
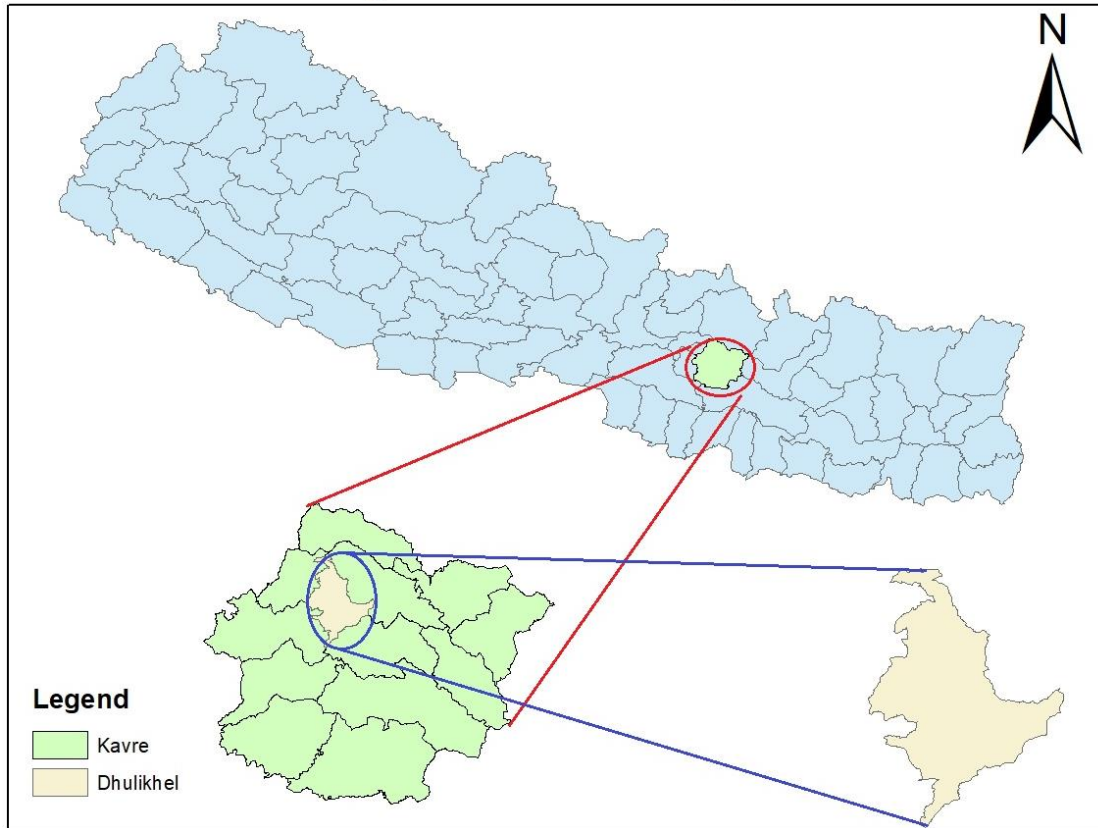
Study Area Of Project

Figure 1. Study Area of Project

2.2 Instruments used

- Theodolite
- Tripod
- Ranging rods
- Wooden peg

2.3 Study Method and its Workflow

A) Reconnaissance and Monumentation

Suitable area for the project, available instruments, human resource, and time was discussed during planning. And during reconnaissance area to be surveyed was visited and different factors like intervisibility between stations and also between the unknown point and station was checked. Also, monuments (wooden pegs) were established at the preplanned stations.

B) Observation

i. <u>Horizontal angle measurement</u>: Only one set data was taken during the measurement of horizontal angle in both intersection and resection method at 000º00´00´´. RO was taken in previous taken mostly on left hand side and interior angle was measured between RO and next station and RO was closed on first station.

ii. <u>Zenithal angle measurement</u>: Zenithal angle was only taken during intersection method and only one set reading was taken.

C) Computation
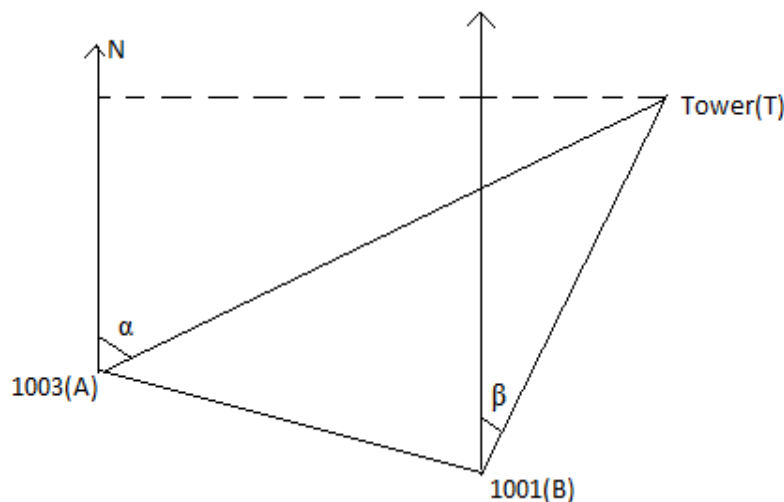
<u>Intersection:</u>

Figure 2: Intersection Network Layout

Let us suppose,

T is to be located by sighting from A (known point) and B (known point).

Coordinates of A = (E_A, N_A)

Coordinates of B = (E_B, N_B)

Coordinates of T = (E_T, N_T)

So, to find the coordinates of T,

For Northing we have,

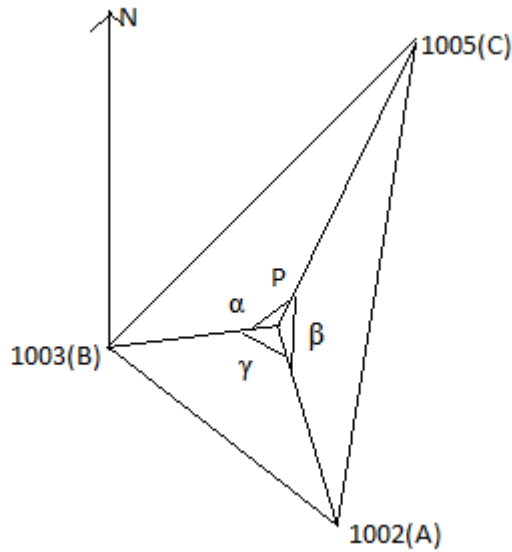$N_T = (E_B - E_A + N_A Tan\alpha - N_B Tan\beta)/(Tan\alpha - Tan\beta)$

And for Easting we have

$E_T = (N_B - N_A + E_A Cot\alpha - E_B Cot\beta)/(Cot\alpha - Cot\beta)$

Thus, we can find the coordinates of T by computing the values of N_T and E_T (Onoriode, n.d.).

<u>Resection</u>:

Tienstra or Barycentric method was used to find the unknown point in Resection method.

Figure 3: Resection Network Layout

Let us suppose,

A, B, C be the three known points with coordinates (E_A, N_A), (E_B, N_B), and (E_C, N_C) respectively and P (E_P, N_P) be the unknown point whose coordinate is to be measured.

For Easting we have,

$E_P = (E_A K_1 + E_B K_2 + E_C K_3) / (K_1 + K_2 + K_3)$

And for Northing we have,

$N_P = (N_A K_1 + N_B K_2 + N_C K_3) / (K_1 + K_2 + K_3)$

Where,

$1/K_1 = CotA - Cot\alpha$,

$1/K_2 = CotB - Cot\beta$,

$1/K_3 = CotC - Cot\gamma$.

3. RESULTS

3.1 Intersection

The coordinates of the unknown station and its elevation is:

Table 1. Coordinates of Tower

Station	Easting(m)	Northing(m)	Elevation(m)
T	355808.357	3055842.858	1498.77

3.2 Resection

The coordinates of the unknown station is:

<div align="center">Table 2. Coordinates of Unknown Point</div>

Station	Easting(m)	Northing(m)
P	355644.661	355814.034

4. CONCLUSION

Hence, by the method of theodolite intersection and theodolite resection the coordinates of the unknown point were determined. The coordinates obtained from these two methods can be used for other reference purpose.

5. REFERENCES

1. Onoriode, O. (n.d.). *TRIANGULATION AND TRILATERATION 1.1 GENERAL.* Retrieved January 30, 2021, from https://www.academia.edu/28835762/TRIANGULATION_AND_TRILATERATION_1_1_GENERAL

2. *Triangulation Instruction Book* (Second). (1976). Survey Department, Geodetic Survey Branch.