جامعة الفرات الاوسط التقنية /المعهد التقني سماوة

قسم / تقنيات المساحة

المحاضرة الخامسة

اسم المادة / المساحة-٢

المرحلة الدراسية / الثانية

العام الدراسي / 2022 - 2023

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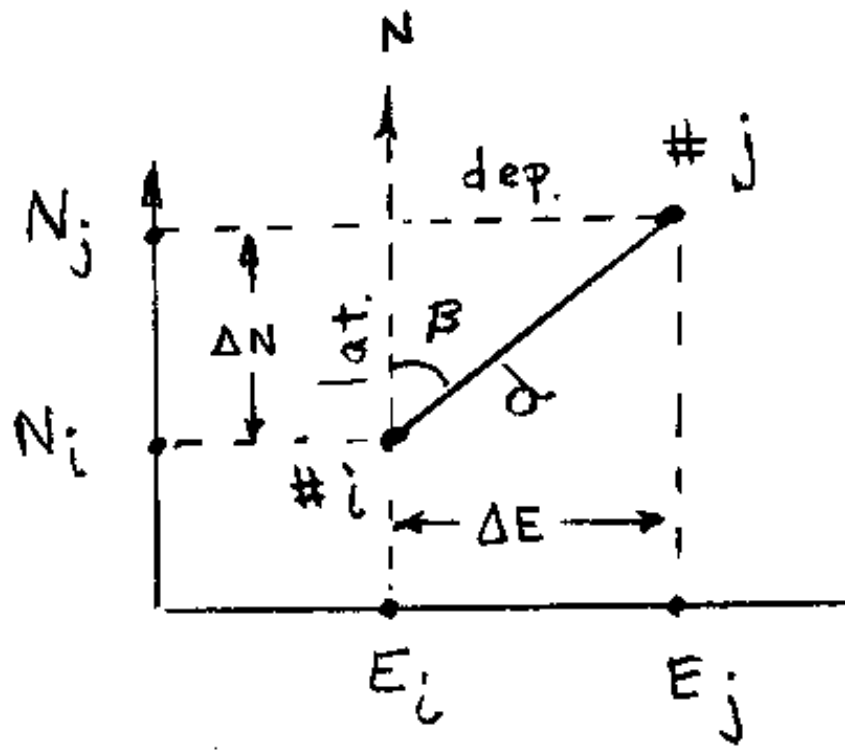
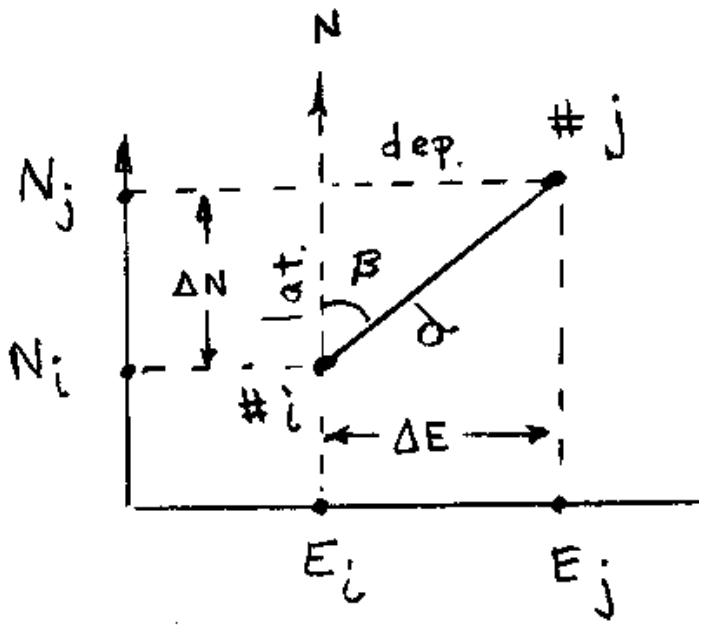
Inverse computation

- Inverse Problem - Given the coordinates of two points (i and j) find: the dir. and dist. between them.



Inverse Problem



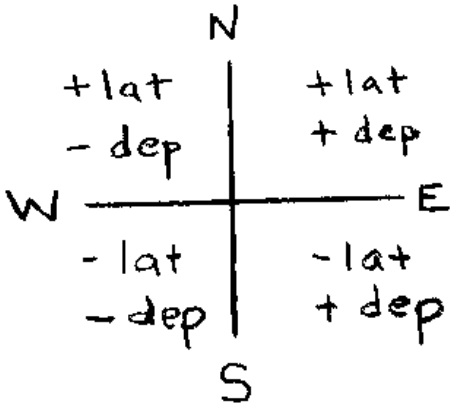
$$\mathbf{lat}_{i,j} = \Delta \mathbf{N}_{i,j} = \mathbf{N}_j - \mathbf{N}_i$$

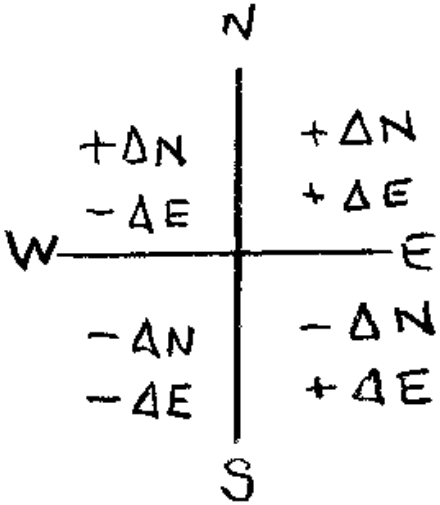
$$\mathbf{dep}_{i,j} = \Delta \mathbf{E}_{i,j} = \mathbf{E}_j - \mathbf{E}_i$$

$$\beta_{i,j} = \mathbf{arctan}\left|\frac{\mathbf{dep}_{i,j}}{\mathbf{lat}_{i,j}}\right| = \mathbf{arctan}\left|\frac{\Delta \mathbf{E}_{i,j}}{\Delta \mathbf{N}_{i,j}}\right|$$

$$\mathbf{d}_{i,j} = \sqrt{\mathbf{dep}_{i,j}^2 + \mathbf{lat}_{i,j}^2} = \sqrt{\Delta \mathbf{E}_{i,j}^2 + \Delta \mathbf{N}_{i,j}^2}$$

Determine Quadrant by Inspection





Inverse Problem (cont.)

Sample Calculation for line 1-2

$$\mathbf{lat}_{1.2} = \Delta \mathbf{N}_{1.2} = \mathbf{1098.581 - 1000.000 = +98.581}$$

$$\mathbf{dep}_{1.2} = \Delta \mathbf{E}_{1.2} = \mathbf{964.107 - 1000.000 = -35.893}$$

$$\beta_{1.2} = \mathbf{arctan}\left|\frac{-\mathbf{35.893}}{+\mathbf{98.581}}\right| = \mathbf{20°00'23''}$$

$$\mathbf{d}_{i.j} = \sqrt{(-\mathbf{35.893})^2 + (+\mathbf{98.581})^2} = \mathbf{104.912}$$

Note: The bearing quadrant is NW; therefore, the bearing is: N 20°00’23”W or the Azimuth is 339°59’37”

Inverse Problem (cont.)

- Find the corrected Azimuth and Distance between traverse stations by inversing.
- Example problem:

Line	Corrected Az	Corrected dist. (ft.)
1-2	339°59’37”	104.912
2-3	076°43’11”	217.619
3-1	229°48’55”	230.253