Online Surveying FE 208

Lectures 16
Traverse Adjustments

Learning Objectives for this Lecture

1. **Know the types of traverse adjustments**
2. **Know which method of adjustment to use in which conditions**
3. **Be able to compute departure and latitude adjustments**
4. **Be able to compute coordinate adjustments**

Methods of adjusting traverses:

1. Compass (or Bowditch rule)
2. Transit rule
3. Least Squares
4. Crandall method

Assumptions:

Compass rule: Distances and directions are measured with consistent precision

This means there is an equal chance of error from either measurement.
Rule is that the adjustment to any side is proportional to the distance of the side and the total distance of the traverse

Example: Staff compass and steel tape; Total Station

Transit rule: Directions are measured with higher precision than the distances
After adjustments, directions are disrupted less than distances. * Not generally used

Example: Staff compass and pacing; Theodolite for angles and steel tape

Least Square rule: Theoretically results in the least disturbance to the original measurements
This method minimizes the overall adjustments.

* This method requires replication of measurements

Crandall method: A weighted least squares method (this is a rigorous solution)
Higher weight is given to the directions, similar to the transit rule.

* This method requires replication of measurements

Compass Rule – ***Note that this is the most used method for adjusting almost any traverse***

Departures and latitudes are adjusted in proportion to their lengths.

$$\text{Correction in departure for } XY = \frac{-(\text{total departure misclosure})}{\text{Traverse perimeter}} \times \text{length of } XY$$

$$\text{Correction in latitude for } XY = \frac{-(\text{total latitude misclosure})}{\text{Traverse perimeter}} \times \text{length of } XY$$

<u>NOTE: Pay particular attention to the signs of the correction</u>

Example:

Sta	HD	LAT	DEP	LAT_{corr}	DEP_{corr}	LAT_{adj}	DEP_{adj}
A							
	421.97	-70.73	+416.00				
F							
	279.33	+216.16	-176.92				
E							
	452.66	+405.86	+200.44				
D							
	886.04	-489.68	-738.43				
C							
	392.28	-388.02	-57.64				
B							
	483.52	+326.87	+356.30				
A							
	2915.80	+0.46	-0.25				

Lat adjustment from A to B = -(+0.46’ /2915.80’) * 483.52’ = - 0.08’
Adjusted Lat = 326.87 + -0.08 = 326.79

Dep adjustment from A to B = -(-0.25’ /2915.80’) * 483.52’ = + 0.04’
Adjusted Dep = 356.30 + 0.04 = 356.34

The full adjustment for the survey is:

Sta	HD	LAT	DEP	LAT_{corr}	DEP_{corr}	LAT_{adj}	DEP_{adj}
A							
	421.97	-70.73	+416.00	**-.07**	**.04**	**-70.80**	**+416.04**
F							
	279.33	+216.16	-176.92	**-.04**	**.02**	**+216.12**	**-176.90**
E							
	452.66	+405.86	+200.44	**-.07**	**.04**	**+405.79**	**+200.48**
D							
	886.04	-489.68	-738.43	**-.14**	**.08**	**-489.82**	**-738.35**
C							
	392.28	-388.02	-57.64	**-.06**	**.03**	**-388.08**	**-57.61**
B							
	483.52	+326.87	+356.30	**-.08**	**.04**	**+326.79**	**+356.34**
A							
	2915.80	+0.46	-0.25	**-0.46**	**+0.25**	**0.00**	**0.00**

Coordinate computations

Coordinate computations are made by simply adding the adjusted departures and latitudes to the previous coordinates.

In a closed traverse these coordinates should agree in balance back at the first.

Example:

Coordinates of A

Northing = 10000.00
Easting = 10000.00

Sta	LAT_{adj}	DEP_{adj}	Northing	Easting			
A			**10000.00**	**10000.00**			
	-70.80	+416.04					
F			**9929.20**	**10416.04**			
	+216.12	-176.90					
E			**10145.32**	**10239.14**			
	+405.79	+200.48					
D			**10551.11**	**10439.62**			
	-489.82	-738.35					
C			**10061.29**	**9701.27**			
	-388.08	-57.61					
B			**9673.21**	**9643.66**			
	+326.79	+356.34					
A			**10000.00**	**10000.00**			
	0.00	0.00					