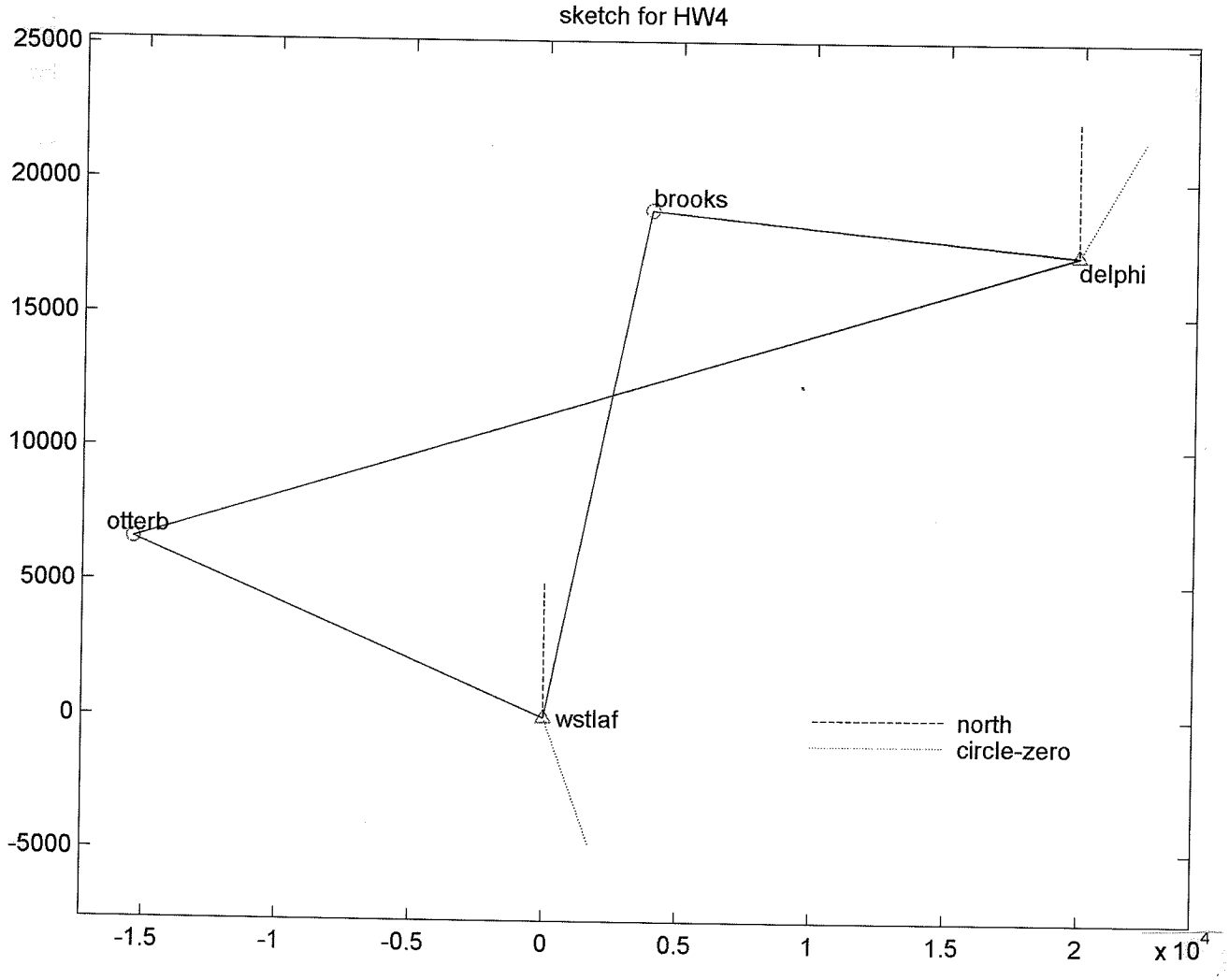
Homework 4 Assigned 18 Oct. 2019



There are 4 points in the network, 2 fixed, 2 unknown. Use LS indirect observations to solve for the 2 unknown point coordinates, X, Y, Z, and the 2 orientation unknowns at the observing stations.

Point	ϕ	λ	h	fixed
wstlaf	40° 25' 57."5328	-86° 54' 54."1728	200.000	yes
otterb	40 29 31.2	-87 05 49.7	215	no
brooks	40 36 10.7	-86 52 08.6	215	no
delphi	40 35 17.4444	-86 40 49.9728	205.000	yes

The following observations are taken,

obs. type	points	value	σ
direction	from wstlaf to otterb	133° 10' 04".39	1"
direction	from wstlaf to brooks	211 37 53.19	1"
direction	from delphi to otterb	223 17 51.68	1"
direction	from delphi to brooks	245 56 02.82	1"
zenith angle	from wstlaf to otterb	90 02 21.41	2"
zenith angle	from wstlaf to brooks	90 01 36.39	2"
zenith angle	from delphi to otterb	90 09 25.91	2"
zenith angle	from delphi to brooks	90 01 01.42	2"
distance	from wstlaf to otterb	16791.59 m	0.15 m
distance	from wstlaf to brooks	19310.51	0.15 m
distance	from delphi to otterb	36873.84	0.15 m
distance	from delphi to brooks	16041.22	0.15 m

Estimate initial approximation for Z_{wstlaf} and Z_{delphi} from the sketch.
Are residuals consistent with σ's ?

compute the covariance matrix for the unknowns (Σ_{aa}).
compute the distance between the 2 unknown points. What is its σ?
(Solve by error propagation)