

## 12.215 Homework #2

Due Monday, November 4, 2009

### Latitude and Longitude determination.

The data needed for this homework are given below.

- Find the time and the value of the maximum angle between the sun and its reflection using the data given below. On the web version, the data is [this link](#) (26 points). (The file in the link has no headers so that load can be used in Matlab. The columns are those shown below).
- Find the mean index error of the sextant (data below) (5 points)
- Using the mean index error for distance objects, compute the elevation angle to the Sun at its maximum (5 points)
- Compute the approximate atmospheric bending contribution to this measured elevation to the sun (15 points)
- Given the declination of the Sun and the in vacuum estimate of the elevation angle to the Sun, compute the latitude of the Green building. (25 points)
- Given Greenwich hour angle at the Greenwich meridian crossing, compute the longitude of the Green building (25 points)

### Data for Homework:

Index errors (minutes of arc): Measured values -10.0, -7.2, -5.0, -4.0

Measured sextant data (date Oct 14, 2009)

Hrs (EDT)	Min	Sec	Sun Deg	Sun Min
14	50	26	68	54.8
15	13	54	72	39.0
15	26	8	74	18.6
15	29	13	74	50.8
15	35	39	75	29.2
15	39	43	75	56.0
15	44	9	76	23.4
15	55	51	77	19.0
16	6	17	77	47.6
16	5	10	77	54.0
16	12	15	78	17.6
16	18	21	78	37.2
16	20	28	78	31.8
16	24	26	78	24.2
16	25	47	78	31.8
16	29	9	78	31.6
16	30	24	78	37.8
16	32	8	78	30.0

16	35	19	78	31.6
16	36	36	78	34.2
16	37	49	78	36.0
16	39	11	78	30.0
16	43	98	78	18.0
16	44	24	78	20.8
16	48	38	78	10.0
16	50	27	78	5.0

Almanac from:

<http://www.tecepe.com.br/scripts/AlmanacPagesISAPI.isa/pages?date=10%2F14%2F2009>

2009 OCT. 14 (WED)

		SUN			
G.M.T		GHA		Dec	
d	h	°	'	°	'
14	0	183	28.7	S 8	06.8
	1	198	28.8	S 8	07.7
	2	213	29.0	S 8	08.7
	3	228	29.1	S 8	09.6
	4	243	29.3	S 8	10.5
W	5	258	29.4	S 8	11.5
E					
D	6	273	29.6	S 8	12.4
N	7	288	29.7	S 8	13.3
E	8	303	29.8	S 8	14.2
S	9	318	30.0	S 8	15.2
D	10	333	30.1	S 8	16.1
A	11	348	30.3	S 8	17.0
Y					
	12	3	30.4	S 8	18.0
	13	18	30.6	S 8	18.9
	14	33	30.7	S 8	19.8
	15	48	30.8	S 8	20.7
	16	63	31.0	S 8	21.7
	17	78	31.1	S 8	22.6
	18	93	31.3	S 8	23.5
	19	108	31.4	S 8	24.5
	20	123	31.5	S 8	25.4
	21	138	31.7	S 8	26.3
	22	153	31.8	S 8	27.2
	23	168	32.0	S 8	28.2