CE603 Spr. '07 Homework 5

Satellite image resection based on physical model and ground control points

- Using HW4 results, including comments, revisions or using sample code provided, repeat the misclosure calculation for 2 additional points in the image.
- Graph the misclosure vectors (with scale exaggeration where needed) to show consistency among points in a single image.
- Convert your condition equation/misclosure code into a function with syntax miscl_vect=qb_ceq(line_px,samp_px,X,Y,Z,par, auxpar, pare)
- Note the last two arguments can be eliminated if you just declare constants where needed. But you need the par array with parameter order as specified in the supplied resection framework/template code: satres.m
- Supply functions geo2ecf.m (returning an ECF vector from lat,lon,h), and jd.m returning a julian date
- Also supply an input file: satres.inp with a line for each control point to use: ID,latd,latm,lats,lond,lonm,lons,h(ae),line,sample

•When all code and data have been prepared, experiment with parameter selection to get a “good” solution. Good = small misclosure, small number of parameters, small condition number.

•You may use either the DG image space convention with z-down or the conventional photogrammetry convention with z-up but be consistent

•You will need to add to your function some polynomial correction terms to permit refinement of the nominal position trajectory and the nominal attitude trajectory.

•Model:

$$\begin{bmatrix} 0 - x_0 \\ s - y_0 \\ -f \end{bmatrix} = \mathbf{M_1}(\pi)\mathbf{M_{camatt}}\mathbf{M_A}(\Delta\omega, \Delta\varphi, \Delta\kappa)\mathbf{M_B}\left[\begin{pmatrix} X \\ Y \\ Z \end{pmatrix}_{ECI} - \left(\begin{pmatrix} X_L \\ Y_L \\ Z_L \end{pmatrix}_{ECI} + \begin{pmatrix} \Delta X \\ \Delta Y \\ \Delta Z \end{pmatrix}\right)\right]$$

$$\mathbf{M_B} = \mathbf{M}_{ECF(A7)}\mathbf{M}^{\mathbf{T}}_{\mathbf{ECF-ECI}}$$

$$\mathbf{M_A} \text{ provides attitude refinement} + \text{motion model}$$

$$\Delta x = dx_0 + dx_1 \Delta t + dx_2 \Delta t^2$$

$$\Delta y = dy_0 + dy_1 \Delta t + dy_2 \Delta t^2$$

$$\Delta z = dz_0 + dz_1 \Delta t + dz_2 \Delta t^2$$

$$\Delta \omega = d\omega_0 + d\omega_1 \Delta t + d\omega_2 \Delta t^2$$

$$\Delta \varphi = d\varphi_0 + d\varphi_1 \Delta t + d\varphi_2 \Delta t^2$$

$$\Delta \kappa = d\kappa_0 + d\kappa_1 \Delta t + d\kappa_2 \Delta t^2$$

Δt : offset time from time at middle line