Sat. Photogrammetry Homework 4

assigned Monday 20 Feb, 2017, due Wed. 1 March

RESECTION

1. Confirm that your HW3 results are correct, if not fix them using detailed intermediate result listing provided.

2. construct a main script and 4 related functions to solve the resection problem by LS for the laf01 image and 7 control points GCP1, GCP2, ... GCP7. The 4 functions should have syntax:

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix} = \text{fizg}(l, s, h, dp) \qquad dp = \begin{bmatrix} dq_i \\ dq_j \\ dq_k \\ dq_s \end{bmatrix}$$

$$\begin{bmatrix} \phi \\ \lambda \end{bmatrix} = \text{fizg\_pl}(l, s, h, dp)$$

$$\begin{bmatrix} \Delta\phi \\ \Delta\lambda \end{bmatrix} = \text{fizg\_pl\_O}(l, s, h, \phi, \lambda, dp)$$

$$\begin{bmatrix} \frac{\partial F_\phi}{\partial l} & \frac{\partial F_\phi}{\partial s} & \frac{\partial F_\phi}{\partial q_i} & \frac{\partial F_\phi}{\partial q_j} & \frac{\partial F_\phi}{\partial q_k} & \frac{\partial F_\phi}{\partial q_s} & F_\phi \\ \frac{\partial F_\lambda}{\partial l} & \frac{\partial F_\lambda}{\partial s} & \frac{\partial F_\lambda}{\partial q_i} & \frac{\partial F_\lambda}{\partial q_j} & \frac{\partial F_\lambda}{\partial q_k} & \frac{\partial F_\lambda}{\partial q_s} & F_\lambda \end{bmatrix} = \text{fizg\_pl\_O\_part}(l, s, h, \phi, \lambda, dp)$$

use class notes and published notes to construct the functions.

3. The main script should =
   (a) read in or explictly assign needed image support data (global)
   (b) input or assign (l,s) measurements and (ϕ, λ, h) coords, for all 7 GCP's.
   (c) obtain quaternion vector for line $11340 = 22680/2$ and unitize it (q_m). this will be used to construct the constraint equation
   (d) use function fizg_pl_O_part to obtain elements of the linearized condition equations for 7 control points *

(e) form the linearized constraint equation:

$$F_c = (q_{m_i} + dq_i)^2 + (q_{m_j} + dq_j)^2 + (q_{m_k} + dq_k)^2 + (q_{m_s} + dq_s)^2 - 1 = 0$$

$$C\Delta = g : \begin{bmatrix} \frac{\partial F_c}{\partial dq_i} & \frac{\partial F_c}{\partial dq_j} & \frac{\partial F_c}{\partial dq_k} & \frac{\partial F_c}{\partial dq_s} \end{bmatrix} \begin{bmatrix} \Delta dq_i \\ \Delta dq_j \\ \Delta dq_k \\ \Delta dq_s \end{bmatrix} = \begin{bmatrix} -F_c \end{bmatrix}$$

(f) make iterations until the Δ vector is not significant.

(g) report the final parameter vector and the residuals V_e, V_s at each of the measured points.

* linearize the condition equations at original observations (you do not need to refine observations during iterations, and the "$-A(\ell-\ell^0)$" term goes away in the f vector)

4. In the base function fi2g:

(a) obtain interpolated quaternion as currently done

(b) unitize

(c) add the dp vector $\longrightarrow$ $\begin{bmatrix} q_i' \\ q_j' \\ q_k' \\ q_s' \end{bmatrix} = \begin{bmatrix} q_i \\ q_j \\ q_k \\ q_s \end{bmatrix} + \begin{bmatrix} dq_i \\ dq_j \\ dq_k \\ dq_s \end{bmatrix}$

correction (also the unknowns)

(d) unitize again

(e) proceed as before