Observation Equations for 2 photo configuration

Collinearity

Camera parameters

GCPs

$$
\begin{bmatrix} \dot{A} & \ddot{A} \\ I & 0 \\ 0 & I \end{bmatrix}
\begin{bmatrix} \Delta \dot{X} \\ \Delta \ddot{X} \end{bmatrix}
-
\begin{bmatrix} b_1 \\ b_2 \\ b_3 \end{bmatrix}
=
\begin{bmatrix} v \\ v_2 \\ v_3 \end{bmatrix}
$$
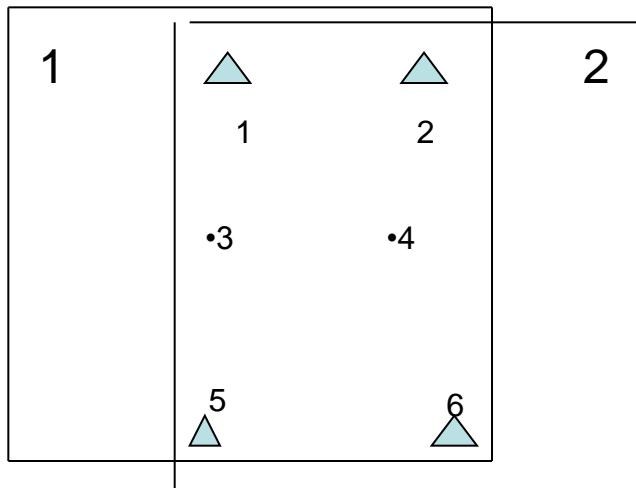
6 points are observed on 2 photos. Camera station positions have been determined by GPS. Points 1, 2, 5 and 6 are GCPs as shown by the triangles.

One the following page, the non-zero elements of the above matrices have been shown in their correct locations. There are zeros in all other locations.
Due to limitations in space, vectors **b** and **v** have not be shown.

Observation Equations

$\dot{A}$ 24,12   Pt Nos $+$

$\dot{X}$ 12,1 $+$

$\ddot{A}$ 24,18

$\ddot{X}$ 18,1

$$\begin{bmatrix} a_{11}\,a_{12}\,a_{13}\,a_{14}\,a_{15}\,a_{16} \\ a_{21}\,a_{22}\,a_{23}\,a_{24}\,a_{25}\,a_{26} \\ a_{11}\,a_{12}\,a_{13}\,a_{14}\,a_{15}\,a_{16} \\ a_{21}\,a_{22}\,a_{23}\,a_{24}\,a_{25}\,a_{26} \\ a_{11}\,a_{12}\,a_{13}\,a_{14}\,a_{15}\,a_{16} \\ a_{21}\,a_{22}\,a_{23}\,a_{24}\,a_{25}\,a_{26} \\ a_{11}\,a_{12}\,a_{13}\,a_{14}\,a_{15}\,a_{16} \\ a_{21}\,a_{22}\,a_{23}\,a_{24}\,a_{25}\,a_{26} \\ a_{11}\,a_{12}\,a_{13}\,a_{14}\,a_{15}\,a_{16} \\ a_{21}\,a_{22}\,a_{23}\,a_{24}\,a_{25}\,a_{26} \\ a_{11}\,a_{12}\,a_{13}\,a_{14}\,a_{15}\,a_{16} \\ a_{21}\,a_{22}\,a_{23}\,a_{24}\,a_{25}\,a_{26} \end{bmatrix}$$

Point numbers 1, 2, 3, 4, 5, 6 — Photo1

$$\begin{bmatrix} a_{11}\,a_{12}\,a_{13}\,a_{14}\,a_{15}\,a_{16} \\ a_{21}\,a_{22}\,a_{23}\,a_{24}\,a_{25}\,a_{26} \\ a_{11}\,a_{12}\,a_{13}\,a_{14}\,a_{15}\,a_{16} \\ a_{21}\,a_{22}\,a_{23}\,a_{24}\,a_{25}\,a_{26} \\ a_{11}\,a_{12}\,a_{13}\,a_{14}\,a_{15}\,a_{16} \\ a_{21}\,a_{22}\,a_{23}\,a_{24}\,a_{25}\,a_{26} \\ a_{11}\,a_{12}\,a_{13}\,a_{14}\,a_{15}\,a_{16} \\ a_{21}\,a_{22}\,a_{23}\,a_{24}\,a_{25}\,a_{26} \\ a_{11}\,a_{12}\,a_{13}\,a_{14}\,a_{15}\,a_{16} \\ a_{21}\,a_{22}\,a_{23}\,a_{24}\,a_{25}\,a_{26} \\ a_{11}\,a_{12}\,a_{13}\,a_{14}\,a_{15}\,a_{16} \\ a_{21}\,a_{22}\,a_{23}\,a_{24}\,a_{25}\,a_{26} \end{bmatrix}$$

Point numbers 1, 2, 3, 4, 5, 6 — Photo 2

$$\begin{bmatrix} \Delta X_1^C \\ \Delta Y_1^C \\ \Delta Z_1^C \\ \Delta \omega_1 \\ \Delta \phi_1 \\ \Delta \kappa_1 \\ \Delta X_2^C \\ \Delta Y_2^C \\ \Delta Z_2^C \\ \Delta \omega_2 \\ \Delta \phi_2 \\ \Delta \kappa_2 \end{bmatrix}$$

$+$

Photo 1 blocks ($1 =$ pt No):
$$\begin{bmatrix} a_{17} & a_{18} & a_{19} \\ a_{27} & a_{28} & a_{29} \end{bmatrix}$$ repeated for points 1, 2, 3, 4, 5, 6

Photo 2 blocks:
$$\begin{bmatrix} a_{17} & a_{18} & a_{19} \\ a_{27} & a_{28} & a_{29} \end{bmatrix}$$ repeated for points 1, 2, 3, 4, 5, 6

$$\begin{bmatrix} X_1 \\ Y_1 \\ Z_1 \\ X_2 \\ Y_2 \\ Z_2 \\ X_3 \\ Y_3 \\ Z_3 \\ X_4 \\ Y_4 \\ Z_4 \\ X_5 \\ Y_5 \\ Z_5 \\ X_6 \\ Y_6 \\ Z_6 \end{bmatrix}$$

Eqns for Camera stn obs [6,12]

$$\begin{bmatrix} 1 & & \\ & 1 & \\ & & 1 \end{bmatrix} \qquad \begin{bmatrix} 1 & & \\ & 1 & \\ & & 1 \end{bmatrix}$$

0

0

Eqns for GCPs [12,18]

$$\begin{bmatrix} 1 & & \\ & 1 & \\ & & 1 \end{bmatrix} \quad \begin{bmatrix} 1 & & \\ & 1 & \\ & & 1 \end{bmatrix}$$

$$\begin{bmatrix} 1 & & \\ & 1 & \\ & & 1 \end{bmatrix} \quad \begin{bmatrix} 1 & & \\ & 1 & \\ & & 1 \end{bmatrix}$$