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ERRATUM

Erratum to: On weighted total least-squares with linear and quadratic constraints

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In the afore-mentioned publication, Eqs. (19) and (30) contain some typos, which need to be corrected for. Eq. (19) should read

$$\left.\frac{\partial\Phi}{\partial\xi}\right|\tilde{\mathrm{e}}_{\mathrm{y}},\tilde{\mathrm{e}}_{\mathrm{A}},\hat{\lambda}_1,\hat{\lambda}_2,\hat{\lambda}_3,\hat{\xi} = -2(-A^T\hat{\lambda}_1+\tilde{\mathrm{E}}_{\mathrm{A}}^{\mathrm{T}}\hat{\lambda}_1+K^T\hat{\lambda}_2+M\hat{\xi}\hat{\lambda}_3)=0, \quad (19)$$

and Eq. (30) should read

$$\hat{\lambda}_2=[K\mathrm{R}_3\mathrm{M}\hat{\xi}\hat{\xi}^TM^T\mathrm{R}_3\mathrm{K}^{\mathrm{T}}/\hat{\xi}^TM\mathrm{R}_3M\hat{\xi}+\mathrm{KR}_3\mathrm{K}^{\mathrm{T}}]^{-1} \times[-K\mathrm{R}_3\mathrm{M}\hat{\xi}\hat{\xi}^TM^T\mathrm{R}_3(A^{\mathrm{T}}R_1+R_2)\mathrm{y}/\hat{\xi}^TM\mathrm{R}_3M\hat{\xi} + a_0^2K\mathrm{R}_3\mathrm{M}\hat{\xi}/\hat{\xi}^TM\mathrm{R}_3M\hat{\xi} + \mathrm{K}_0-\mathrm{KR}_3(A^{\mathrm{T}}R_1+R_2)\mathrm{y}] \quad (30)$$

When taking these corrections into account, the proposed WTLS algorithm is as follows:

1st step: $[N,c]=A^TP_y[A,y]$, $\xi^{(0)}=N^{-1}c$.

2nd step: For $i\in N$ compute:

$$R_1^{(\mathrm{i})}=\left[Q_y+\left(\hat{\xi}^{(i-1)^{\mathrm{T}}}\otimes I_n\right)Q_A\left(\hat{\xi}^{(i-1)}\otimes I_n\right)\right]^{-1} \quad (31)$$

$$\hat{\lambda}_1^{(i)}=R_1^{(\mathrm{i})}\left(y-A\hat{\xi}^{(i-1)}\right) \quad (32)$$

$$R_2^{(\mathrm{i})}=\left(I_{\mathrm{m}}\otimes\hat{\lambda}^{(i)^T}\right)Q_A\left(\hat{\xi}^{(i-1)}\otimes I_n\right)R_1^{(\mathrm{i})} \quad (33)$$

$$R_3^{(\mathrm{i})}=(A^{\mathrm{T}}R_1^{(\mathrm{i})}A+R_2^{(\mathrm{i})}A)^{-1} \quad (34)$$

$$\hat{\lambda}_2^{(i)}=\left[KR_3^{(\mathrm{i})}\mathrm{M}\hat{\xi}^{(i-1)}\hat{\xi}^{(i-1)^T}M^TR_3^{(\mathrm{i})}\mathrm{K}^{\mathrm{T}}/\hat{\xi}^{(i-1)^T}MR_3^{(\mathrm{i})}M\hat{\xi}^{(i-1)} +\mathrm{K}R_3^{(\mathrm{i})}\mathrm{K}^{\mathrm{T}}\right]^{-1}\times\left[-KR_3^{(\mathrm{i})}\mathrm{M}\hat{\xi}^{(i-1)}\hat{\xi}^{(i-1)^T}M^TR_3^{(\mathrm{i})}(A^{\mathrm{T}}R_1^{(\mathrm{i})} +R_2^{(\mathrm{i})})\mathrm{y}/\hat{\xi}^{(i-1)^T}MR_3^{(\mathrm{i})}M\hat{\xi}^{(i-1)} +a_0^2KR_3^{(\mathrm{i})}M\hat{\xi}^{(i-1)}/\hat{\xi}^{(i-1)^T}MR_3^{(\mathrm{i})}M\hat{\xi}^{(i-1)} +\mathrm{K}_0-\mathrm{K}R_3^{(\mathrm{i})}(A^{\mathrm{T}}R_1^{(\mathrm{i})}+R_2^{(\mathrm{i})})\mathrm{y}\right] \quad (35)$$

$$\hat{\lambda}_3^{(i)}=\left[\hat{\xi}^{(i-1)}MR_3^{(\mathrm{i})}((A^{\mathrm{T}}R_1^{(\mathrm{i})}+R_2^{(\mathrm{i})})\mathrm{y} +K^T\hat{\lambda}_2^{(i)})-a_0^2\right]\Big/\hat{\xi}^{(i-1)^T}MR_3^{(\mathrm{i})}M\hat{\xi}^{(i-1)} \quad (36)$$

$$\hat{\xi}^{(i)}=R_3^{(\mathrm{i})}\left(\left(A^{\mathrm{T}}R_1^{(\mathrm{i})}+R_2^{(\mathrm{i})}\right)\mathrm{y}+K^T\hat{\lambda}_2^{(i)}+M\hat{\xi}^{(i-1)}\hat{\lambda}_3^{(i)}\right) \quad (37)$$

3rd step: Repeat 2nd step until

$$\left\|\hat{\xi}^{(i)}-\hat{\xi}^{(i-1)}\right\|<\delta \quad (38)$$

for some chosen threshold δ.

Unfortunately, a general proof of convergence of this algorithm cannot be given. Therefore, the statement made before Eq. (26) need to be modified. Instead of saying

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"… and due to the invertible property of $(A^{\mathrm{T}} R_1 A + R_2 A)$ (since $(A^{\mathrm{T}} R_1 A)^{-1}$ exists) …",

it should read:

"… and when assuming that the inverse of $(A^{\mathrm{T}} R_1 A + R_2 A)$ exists …".

In example 3: rapid satellite positioning using the constrained WTLS algorithm as a regularized approach, we found that the unconstrained solution suffers from ill-conditioning; adding constraints has a regularizing effect.