A FORTRAN VERSION IMPLEMENTATION OF BLOCK ADJUSTMENT OF CCD FRAMES AND ITS PRELIMINARY APPLICATION

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ABSTRACT. A FORTRAN version implementation of the block adjustment (BA) of overlapping CCD frames is developed and its flowchart is shown. The program is preliminarily applied to obtain the optical positions of four extragalactic radio sources. The results show that because of the increase in the number and sky coverage of reference stars the precision of optical positions with BA is improved compared with the single CCD frame adjustment.

1. FLOWCHART OF BA COMPUTER PROGRAM

Since the field of view of a CCD is usually too small to cover enough reference stars, the block adjustment (BA) of overlapping CCD frames was proposed in order to extend the sky coverage of observations, mitigate the effect of the position biases of reference stars, and consequently improve the local reference frame of the observation (Yu et al, 2004). In order to understand the basic principle of BA easily and develop the computer program conveniently, we showed the observation equations of BA in vectorial expressions. A FORTRAN version implementation of BA is developed and its flowchart is shown in Figure 1.

2. DETERMINATION OF OPTICAL POSITIONS OF FOUR EXTRAGALACTIC RADIO SOURCES

The observations of four extragalactic radio sources were carried out with the 2.16 m telescope in Xionglong station of the National Astronomical Observatories of China (NOAC) from June 6 to 10 of 2004. The CCD FOV is $10' \times 10'$ with 2048×2048 pixels, the scale is 0.015 mm/pixel.

UCAC2 (Zacharias et al, 2004) is taken as the reference catalogue in the reduction. The results of optical positions of the four extragalactic radio sources with BA and SPA are listed in Table 1. Column 2 to 4 are for BA and 5 to 7 are for SPA. 'Nref' represents the number of reference stars and 'O-R' means the difference $(\Delta\alpha cos\delta, \Delta\delta)$ of the optical position from the radio one. The uncertainties of the deduced positions of objects are depended on those of the model parameters and measured coordinates. Since in BA and SPA the same measured coordinates are used and so the difference in the uncertainties of the deduced positions from BA and SPA are mainly determined by the uncertainty of model parameters. Because of the increase in the number and sky coverage of reference stars, the precision of model parameters is improved by BA compared with SPA, and so as shown by the formal error estimations in Table 1 BA is capable to provide more precise position determinations of objects.

3. REFERENCES

Yu Y, Tang Z H, Li J L, Wang G L & Zhao M., 2004, AJ 128, 911
Zacharias, N. et al. 2004, AJ 127, 3043

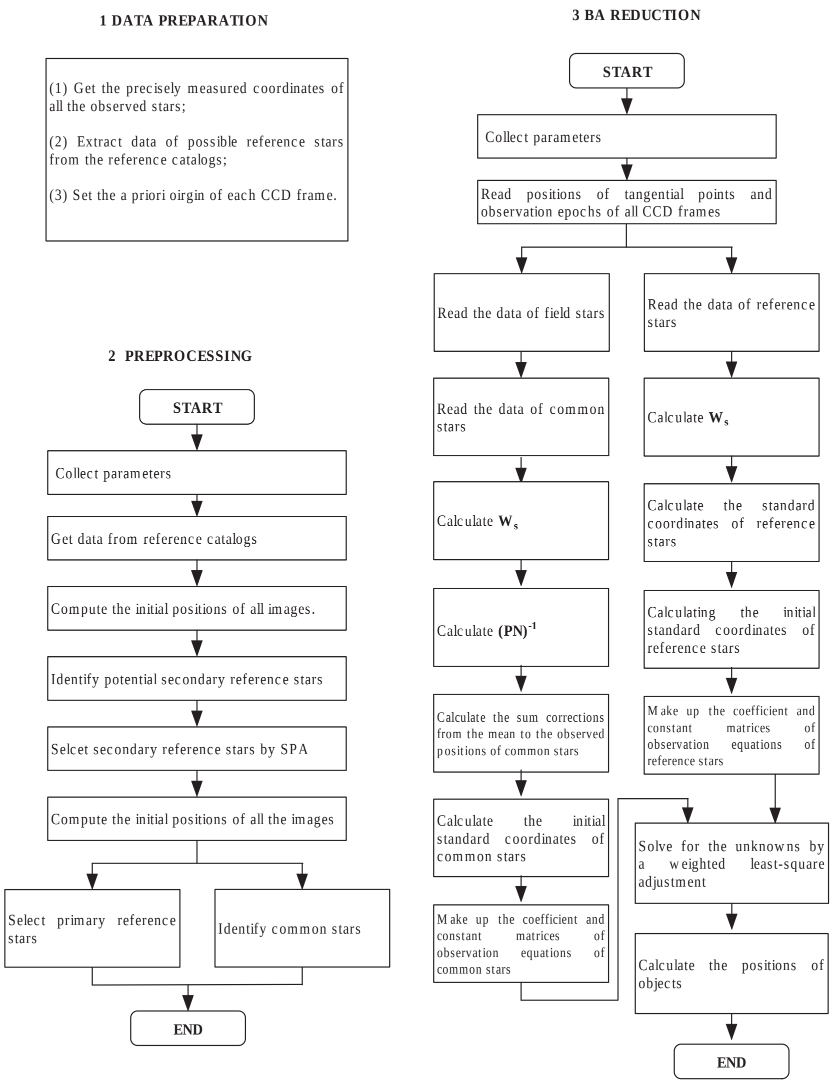

Figure 1.: Flowchart of the FORTRAN version realization of BA reduction of overlapping CCD frames.

	BA			SPA		
Object	α $(h\ m\ s)$ $\pm\sigma_\alpha$ (ms) O-R (ms)	δ $(^\circ\ '\ '')$ $\pm\sigma_\delta(mas)$ O-R (mas)	Nref	α $(h\ m\ s)$ $\pm\sigma_\alpha(ms)$ O-R (ms)	$\delta\ ^\circ\ '\ ''$ $\pm\sigma_\delta(mas)$ O-R (mas)	Nref
1252+119	12 54 38.2530	11 41 05.865	14	12 54 38.2582	11 41 05.854	6
	±1.0	±15		±2.5	±28	
	-2.5	-30		2.5	-41	
1307+121	13 09 33.9318	11 54 24.533	20	13 09 33.9328	11 54 24.559	5
	±1.0	±16		±2.5	±45	
	-0.6	-19		2.5	-41	
1743+173	17 45 35.2071	17 20 01.419	127	17 45 35.2043	17 20 01.383	15
	±0.7	±14		±3.0	±46	
	-0.9	-4		-3.7	-40	
1749+096	17 51 32.8166	09 39 00.768	170	17 51 32.8189	09 39 00.760	21
	±0.7	±11		±0.9	±15	
	-2.0	40		0.3	32	

Table 1: OPTICAL POSITIONS OF FOUR EXTRAGALACTIC RADIO SOURCES.