

Suggestions for *Randlsq* Program Parameter Naming

by

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(See change summary at end.)

Stuart has suggested that I draft some suggestions for the format and names to be used for parameters in the *randlsq.F* program. I previously implemented the limited naming of parameters in this program in the array “namep”, so that when outputting uncertainty values it would at least be clear what type of parameter was being considered.

However, as noted in my write-up “Modeling and Adjustment of THEMIS IR Line Scanner Camera Image Measurements” (2004 December 9, Version 1.0), section 4.2.2, page 21, the use of such an array could be expanded to keep track of all of the parameters uniquely. This will not only assist in debugging and general output in keeping track of a specific parameter (vs. just its number or location in any array), but will also assure that parameters can be counted, or checked whether turned on, or used for other manipulations, without going back to something like the program initialization steps where the parameter accounting is first done.

I propose that the “namep” character array be expanded in size from the current 8 characters, to 40 characters. Each variable would include 8 characters (as now) describing the parameter type generally (or uniquely, for e.g. global parameters like body semi-axis size), and 32 characters to indicate the control point name or image name. Although we are currently using only 7 character control point names and 10 character integer image names, both are expected to be expanded so allowance is made now for 32 characters (e.g. MER images now have 32 character (file) names and the *qmatch* match point format will allow up to 32 character point names (see my documentation of that file format, RUPG-FMT1001.doc of 2004.12.22)).

So below, I list the current and to-be-added parameter type names, and the format for the point and image names.

Parameter type names

This list breaks down in to those already in use, and those to be added for handling (THEMIS IR) line scanner camera images. These parameters are both global and local, the latter being parameters tied to a specific point or image. Units are shown, as carried during internal calculations.

Names currently in use:

1. 'LATITUDE' - Point planetocentric latitude (radians). From -90° to $+90^\circ$.
2. 'LONGITUD' - Point longitude (radians). These are eventually internally carried as east longitudes, from -180° to $+180^\circ$.
3. 'RADIUS' - Point radius (km).
4. 'C-ALPHA' - J2000.0 right ascension of image boresight (radians). Note 1.
5. 'C-DELTA' - J2000.0 declination of image boresight (radians). Note 1.
6. 'C-KAPPA' - J2000.0 twist of image boresight (radians). Note 1.
7. 'POLERA' - J2000.0 right ascension of body pole (radians) (*).
8. 'POLEDEC' - J2000.0 declination of body pole (radians) (*).
9. 'POLEROT' - J2000.0 rotation? of body pole (radians) (*).
10. 'A-AXIS' - A semi-axis of body (km) (*).
11. 'B-AXIS' - B semi-axis of body (km) (*).
12. 'C-AXIS' - C semi-axis of body (km) (*).
13. 'ELONGOFF' - Orientation of A semi-axis of body (radians?) (*).
- (10.) 'FCLLNNGTH' - Focal length (mm) (*).

For reference, the numbers are those currently used to designate these parameter types in `randlsq.F`, array "idtot". If focal length is solved for, the number "10" is used to represent that parameter rather than the ellipsoid a semi-axis. The designation "("*)" indicates the parameter is applied body wide (no point or image name should be added to the parameter name).

Note 1: In the above, the parameters C-ALPHA, C-DELTA, and C-KAPPA apply at time t_0 , which for a framing camera is the center time (ephemeris time in Julian date format) at which the image is acquired, and for a line scanner camera is the time (ephemeris time in Julian date format) at which the "reference line" is acquired.

The following names are to be added (along with suggested numbering if needed) in order to handle the additional parameters to optionally be solved for when processing (THEMIS IR) line scanner camera image data.

Names to be added:

15. 'C-ALPVEL' - J2000.0 right ascension velocity of image boresight (radians/s). Note 2.
16. 'C-DELVEL' - J2000.0 declination velocity of image boresight (radians/s). Note 2.
17. 'C-KAPVEL' - J2000.0 twist velocity of image boresight (radians/s). Note 2.
18. 'C-ALPACC' - J2000.0 right ascension acceleration of image boresight (radians/s²). Note 2.
19. 'C-DELACC' - J2000.0 declination acceleration of image boresight (radians/s²). Note 2.
20. 'C-KAPACC' - J2000.0 twist acceleration of image boresight (radians/s²). Note 2.

21. 'X-SATPOS' - Body inertial X coordinate of satellite/camera (km).
Note 2.
22. 'Y-SATPOS' - Body inertial Y coordinate of satellite/camera (km).
Note 2.
23. 'Z-SATPOS' - Body inertial Z coordinate of satellite/camera (km).
Note 2.
24. 'X-SATVEL' - Body inertial X velocity of satellite/camera (km/s).
Note 2.
25. 'Y-SATVEL' - Body inertial Y velocity of satellite/camera (km/s).
Note 2.
26. 'Z-SATVEL' - Body inertial Z velocity of satellite/camera (km/s).
Note 2.
27. 'X-SATVEL' - Body inertial X acceleration of satellite/camera
(km/s²). Note 2.
28. 'Y-SATVEL' - Body inertial Y acceleration of satellite/camera
(km/s²). Note 2.
29. 'Z-SATVEL' - Body inertial Z acceleration of satellite/camera
(km/s²). Note 2.

Numbers are arbitrary, but suggested here if there is a need to use them (e.g. for input from the control file to the “idot” array. “14” has been skipped, to hold it in reserve for possible use with FCLNGTH (instead of the current alternate “10”). The order of parameters here is also arbitrary, listing the velocity and acceleration parameters for image angles first, and then the position, velocity, and acceleration for image (satellite) position last.

Note 2: In the above, the camera parameters apply at time t_0 , which for a framing camera is the center time (ephemeris time in Julian date format) at which the image is acquired, and for a line scanner camera is the time (ephemeris time in Julian date format) at which the “reference line” is acquired.

Parameter Point and Image names

As indicated above, the first 8 characters of each parameter name should include the parameter type. Non-global parameters (those dealing with points and images) should additionally have in columns 9-40 the name of the involved point or image. For now these point and image names can be either left or right justified (one should be chosen). However, note that for point names care should be taken to maintain the name as justified in the input measurement file (usually a right justified maximum 7 character name in recent runs, but in some older data these names are also left justified).

Sample full parameter names

Following are some sample parameter names, as they might look for the “sample” small Mars base map run stored on

laxmi:/work1/barchina/rupg/mars/marsbase0003/brent_control_test .

Using left justified point and image names within the parameter names:

-----+-----0-----+-----1-----+-----2-----+-----3-----+-----4

LATITUDE E2741
LONGITUD E2741
RADIUS E2741
LATITUDE E2742
LONGITUD E2742
RADIUS E2742
LATITUDE E2743
LONGITUD E2743
RADIUS E2743
Etc. for E2744 to E2755.

C-ALPHA 50494429
C-DELTA 50494429
C-DELTA 50494429
C-ALPHA 50494430
C-DELTA 50494430
C-DELTA 50494430
C-ALPHA 50494458
C-DELTA 50494458
C-DELTA 50494458
C-ALPHA 50494459
C-DELTA 50494459
C-DELTA 50494459

Using right justified point and image names within the parameter names:

-----+-----0-----+-----1-----+-----2-----+-----3-----+-----4

LATITUDE E2741
LONGITUD E2741
RADIUS E2741
LATITUDE E2742
LONGITUD E2742
RADIUS E2742
LATITUDE E2743
LONGITUD E2743
RADIUS E2743
Etc. for E2744 to E2755.

C-ALPHA 50494429
C-DELTA 50494429
C-DELTA 50494429
C-ALPHA 50494430
C-DELTA 50494430
C-DELTA 50494430
C-ALPHA 50494458
C-DELTA 50494458
C-DELTA 50494458
C-ALPHA 50494459
C-DELTA 50494459
C-DELTA 50494459

Revisions

2005.06.07 - Version 2. Numbers corrected (due to Word renumbering) for suggested parameter numbers 15-29. Time corrected from UTC to ephemeris time in Julian date format.