Image Mosaicking

Overview

The Image Mosaicking algorithm creates an greyscale, color or color ratio image mosaic using a list of geo-registered OCAMS image cubes.

History

Initial version - 3 Dec 2013

Algorithm Description

This algorithm uses the ISIS libraries to create an image mosaic from a list of geo-registered level 2 OCAMS images, the current shape model of Bennu and the current camera orientation information (CK or C-matrix kernel). In the lists of processing steps below the ISIS library that corresponds to the described processing is listed in parentheses (function).

Greyscale Image Mosaic

1. Apply a geometric correction to each image to remove optical distortions (noprog)
2. Project each image on to the shape model of Bennu (cam2map)
3. Create an uncontrolled/semi-controlled image mosaic using the projected images from step 2 (mapmos)
4. Create a preliminary control network / update existing control network using the mosaic from step 3 (autoseed/seedgrid)
5. Match tie points in each image to the control network from step 4 (findimageoverlaps/overlapstats/pointreg)
6. If the fit in step 5 above is poor update the update the CK using photogrammetric triangulation (qmos/jigsaw/deltack/ckwriter)
7. Return to step 2
8. If the fit in step 5 is good use the current CK to update the illumination angles in the OCAMS image cubes (qmos/campt)
9. Apply the photometric correction to each input OCAMS image (photmet)
10. Create a controlled image mosaic using the photometrically corrected OCAMS images (mapmos/automos)
11. Project the image mosaic to the desired map projection (map2map)
12. Save the image mosaic in the desired image format (TIFF, GeoTIFF, JPEG, PNG) (isis2std)

Color Image Mosaic

The process for creating a color image mosaic is similar to the process of creating a greyscale image mosaic except that the input OCAMS image cubes will have additional plane for the images acquired with the color filters (ECAS b', v, and x)

1. Apply a geometric correction to each plane (ECAS b', v, w, and x) of the image cubes to remove optical distortions
2. Project each ECAS v image on to the shape model of Bennu
3. Create an uncontrolled/semi-controlled ECAS v image mosaic using the projected images from step 2
4. Create a preliminary control network / update existing control network using the mosaic from step 3
5. Match tie points in each ECAS v image to the control network from step 4
6. If the fit in step 5 above is poor update the CK using photogrammetric triangulation
7. Return to step 2
8. If the fit in step 5 is good use the current CK to update the illumination angles in the OCAMS image cubes
9. Apply the photometric correction to each of the color images (ECAS b', v, w, and x)
10. Combine the ECAS b', v, and x image planes in each image cube color image (histeq/algebra)
11. Create controlled image mosaic using the color images created in step 10
12. Project the color image mosaic to the desired map projection
13. Save the color image mosaic in the desired image format (TIFF, GeoTIFF, JPEG, PNG)

Color Ratio Maps

The process for creating a color ratio maps follows the same process for creating a color image mosaic for steps 1-9. Using the photometrically corrected image cubes from step 9 in the color image mosaic procedure create the following color ratio maps:

1. B-V: Subtract the ECAS v image plane from the ECAS b' image plane to create B-V color ratio images (algebra)
2. V-X: Subtract the ECAS v image plane from the ECAS x image plane to create B-V color ratio images
3. 0.7 micron absorption feature: create color ratio images using the ECAS b', v, w, and x image planes with the following relation: (w - ((x-v)*0.4984))/v
4. Create color ratio mosaics using the color ratios images created in steps 1-3
5. Project the color ratio mosaics to the desired map projection
6. Save the color ratio mosaics in the desired image format (TIFF, GeoTIFF, JPEG, PNG)

Parameters

Input Parameters

- Geo-registered level 2 OCAMS images (in ISIS cube format)
- CK kernel created from the quaterions downlinked from the spacecraft
- A reconstructed SPK kernel from NAV
- The most recent shape model of Bennu

Output Parameters

- one or more image mosaics (in TIFF, GeoTIFF, JPEG or PNG format)

Example

An example of the type of processing needed to create image mosaics in ISIS can be found on the USGS ISIS webite: Working_with_Mars_Reconnaissance_Orbiter_HiRISE_Data#HiRISE-to-HiRISE_Geometric_Control

The example is for HiRise images, but the process for OCAMS should be similar.