

Pointing Correction for Mars Surface Mosaics. R. G. Deen¹, S. S. Algermissen², N. A. Ruoff³, A. C. Chen⁴, O. Pariser⁵, K. S. Capararo⁶, and H. E. Gengl⁷; ¹Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Dr, Pasadena, CA 91109, Bob.Deen@jpl.nasa.gov, ²same, Stirling.S.Algermissen@jpl.nasa.gov, ³same, Nicholas.A.Ruoff@jpl.nasa.gov, ⁴same, Amy.C.Chen@jpl.nasa.gov, ⁵same, Oleg.Pariser@jpl.nasa.gov, ⁶same, Kris.Capararo@jpl.nasa.gov, ⁷same, Hallie.E.Gengl@jpl.nasa.gov.

Introduction: The Multimission Image Processing Lab (MIPL) generates a significant volume of mosaics in support of Mars mission surface operations (for MSL, MER, and Phoenix, as well as InSight and Mars 2020). Quicklook mosaics use the raw camera pointing (as determined by encoders or resolvers) to get a mosaic that is close to correct. However, pointing knowledge errors (as well as uncorrectable parallax) lead to seams between the frames of a mosaic, or errors in coregistration between images taken by different cameras. [1]

This poster will describe the pointing correction process used by MIPL to reduce or eliminate these seams, and present several examples of how this process is used in practice.

Pointing Correction: The pointing correction process uses tiepoints between the frames, which can be derived automatically or by hand. These tiepoints are used in a bundle-adjustment process to minimize error by adjusting the pointing of the cameras (and/or the surface model) and re-computing the tiepoint error. This process will be described.

A recent innovation is the use of “miss distance” tiepoints as an error metric. This new type of tiepoint replaces the line/sample pixel-space error with the distance in XYZ space between the projected rays of the left and right tiepoints. This eliminates reliance on the surface model, which should be better for correcting pointing of 3D terrain meshes.

Corrected Mosaic Examples: Examples and use cases of pointing corrected mosaics will be presented. These may include (space permitting):

- Post-drive navcam mosaics [2]
- Cross-instrument coregistration
- Drive-direction mastcam/navcam combos
- Arm-camera mosaics
- Mastcam “gigapan” (RockNest) [3]
- XYZ mosaics
- Correction using miss-distance tiepoints

References:

[1] Deen, R.G., “In-Situ Mosaic Production at JPL/MIPL”, poster from 1st Planetary Data User’s Workshop, Flagstaff, AZ, 2012.

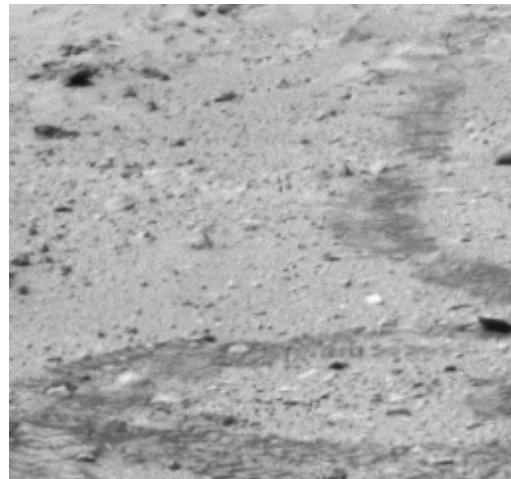
[2] <http://mars.nasa.gov/msl/multimedia/mosaics/>

[3]

<http://mars.nasa.gov/multimedia/interactives/billionpixel/>



Portion of pointing-corrected Navcam mosaic, MSL Sol 548



Portion of raw (uncorrected) MSL Sol 719 mosaic showing geometric seam (note the “doubled” features down the middle of the image).



Same mosaic after seam correction.