

The **lidar_image_align** application coregisters LIDAR and image data to form a consistent map. Specifically, it takes a set of Lunar Orbiter Laser Altimeter (LOLA) readings from the Lunar Reconnaissance Orbiter (LRO) and an Apollo metric camera image as input. It then aligns the two data sources to form a consistent map, and outputs a transformation from the original image coordinates to the adjusted image coordinates.

1 Files:

- `lidar_image_align.cc`, The main method, parses command line arguments and calls high level functions.
- `LidarImageAlign.cc` and `LidarImageAlign.h`, Gauss-Newton algorithm to align tracks to images. Also implements currently unused brute force search, and computes homographies between pairs of images, or two sets of LOLA track coordinates.
- `TracksGCP.cc` and `TracksGCP.h` implementaion of functions to update and save ground control points.

2 How to install:

1. *Install Prerequisites* - Install GDAL 1.9, OpenCV 2.4.9, ISIS 3.1, Eigen 3, Boost 1.5
2. *Build* - In the `lidar2image_processing/tests` directory, run “`cmake .`” followed by “`make`” to create the `tests/lidar2image` executable.

3 How to run

The command “`lidar_image_align -l lola_tracks.csv -i image.cub`” will align the LOLA tracks in the CSV file `lola_tracks.csv` to the image file `image.cub`. The transformation matrix and the ground control point files will be output in results directory under `filename_transf.txt` and `filename_trackIndex_shotIndex_gcp.txt` where `filename` is the stem of the image filename (filename with no path and no extension). The following options may be passed to `lidar_image_align` at runtime.

- `-l, -lidarFile filename`: a CSV file containing the LOLA shots to process or a file containing a list of LOLA CSV shots to process, separated by linebreaks
- `-i, -inputCubFile filename`: a cub image to align tracks to
- `-r, -results directory name`: optional parameter for the directory name where results are saved
- `-s, -settings filename`: optional parameter containing the settings filename
- `-t, -test mode`: optional parameter to run in test mode
- `-h, -help`: display a help message

`lidar_image_align.sh` is an script example to run data available in `lidar2image_processing/tests/data` directory.