

POSTER ID : 01 | QGIS Plugin for Browsing of Multiband Imager Data from SELENE Lunar Probe



Divij G. Singh | Alexander P. Vazhenin | Makiko Ohtake

SDU Cluster, University of Aizu, Fukushima

Abstract

The Multiband Imager(MI) of the SELENE Lunar Probe was part of the Lunar Imager/Spectrometer (LISM) of the SELENE Lunar Probe. It collected data via usage of visible and near infrared sensors, whose data covers 9 spectral bands [1]. The data gives information about mineral distribution on the lunar surface, allowing for derivation of mineral maps. The derived data is available publicly via the SELENE Data Archive, provided by the Japan Aerospace Exploration Agency (JAXA) [2]. The data can be viewed using various GIS software. QGIS is a free, open source, cross-platform GIS application which allows viewing, editing and analysing geospatial data [3]. It also contains support for plugins via the Python programming language. While there are many freely available plugins, additional functionality is desired in order to easily browse and annotate MI MAP data. Thus, we developed a QGIS plugin designed specifically for MI MAP data. Current functionality allows for saving selected coordinates with associated band data and annotations in the csv format, loading coordinates and annotations from the csv format, displaying and saving spectral graphs and programmatically marking selected coordinates on the visual map.

Background and Approach

Basic Requirements

- Create a tool to assist in browsing of data from the SELENE lunar probe, specifically Multiband Imager MAP data.
- Be able to browse spectral data in MAP data.
- Be able to select specific pixels of interest.
- Be able to view spectral graphs.
- Be able to overlay spectral graphs for comparison.
- Be able to annotate data.
- Be able to save coordinates, annotations and corresponding spectral data.

Additional Considerations

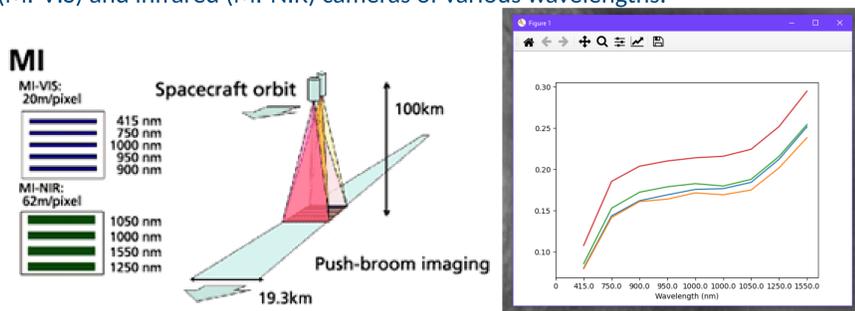
- Existing GIS software has some, but not all desired features.
- Some GIS software is paid/very costly.
- Creating a new solution from scratch is time consuming and difficult.

Development Approach

- QGIS is a widely used, supported, open-source GIS software.
- QGIS allows for plugins developed in Python, and has freely available documentation for developers.
- Many of the desired features exist in QGIS plugins, but they are insufficient/spread out across plugins.
- Creating a single, consolidated plugin with the desired features allows for faster development and better fulfillment of requirements.
- Using OOP principles and well documented code, the plugin can be adapted to other data, such as Spectral Imager data from SELENE lunar probe.

The Multiband Imager Data

The MI MAP data is a processed form of the raw data from the SELENE Multiband Imager. It consists of several 'tiles', each consisting of spectral readings from visible (MI-VIS) and infrared (MI-NIR) cameras of various wavelengths.

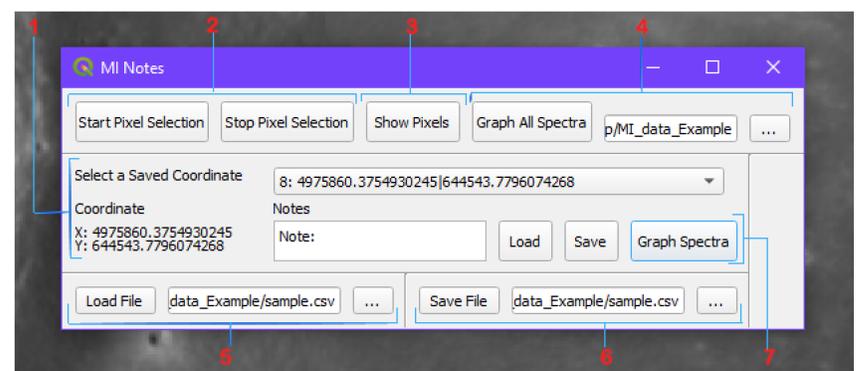


Left Image: The Multiband Imager [4] | Right Image: Spectral Graph of multiple point readings. Graph generated by the plugin.

These readings are organised into 9 raster layers in the .img format. Each raster image has a corresponding label file, which has information about the image and the conditions in which it was taken.

These readings can then be viewed in various GIS software, such as QGIS, and give a researcher information about a location's mineral distribution by viewing the spectral values of the wavelengths.

Interface and Features



The plugin currently has some basic features, which are listed here:

1. Pixel Information and notes
Marked pixels can be selected via a drop down menu, which populates as pixels are selected on the map. Individual pixel coordinates and notes can be loaded via the 'load' button, and once notes are added they can be saved via 'save'.
2. Pixel Selection Buttons
Swaps the current QGIS map tool to the pixel emitter tool, or swaps the current tool to the pan tool.
3. Show Pixels
Adds an annotation layer to the QGIS canvas, with visual markers for each selected pixel.
4. Graph All Spectra
Graphs each selected pixel's spectral data, and saves as a .png image in a folder.
5. Load File
Loads a .csv file with coordinates and notes into the plugin.
6. Save File
Saves the currently selected coordinates, with associated notes and band data in a .csv file.
7. Graph Spectra
Graphs the currently loaded coordinate's spectral data. Multiple spectra can be overlaid.

Further Work

There is still a lot of work to be done on the plugin, to refine and extend its capabilities. A few key points are:

- Adding Coordinate Reference System settings and scripts.
- Quick-saving utility for single pixel data
- Inclusion in online QGIS plugin repository for wider use and feedback

References

- [1] M. Ohtake, J. Haruyama, T. Matsunaga, Y. Yokota, T. Morota, and C. H. and, "Performance and scientific objectives of the SELENE (KAGUYA) multiband imager," *Earth, Planets and Space*, vol. 60, no. 4, pp. 257–264, Apr. 2008. DOI: 10.1186/bf03352789. [Online]. Available: <https://doi.org/10.1186/bf03352789>.
- [2] JAXA. "Selene data archive." (Feb. 13, 2022), [Online]. Available: <https://darts.isas.jaxa.jp/planet/pdap/selene/index.html.en>.
- [3] "Qgis project." (Feb. 13, 2022), [Online]. Available: <https://www.qgis.org/en/site/>.
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