Open source tools for VHR processing and ARD generation

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Abstract

Process Very High Resolution (VHR) data to generate Analysis Ready Data request up to date algorithms in geometric, radiometric and atmospheric corrections and and efficient implementation. Open source tools in remote sensing are the best way to share these update methods in effficient processing frameworks. We can cite the following tools by others which corresponds to these criteria : Orfeo Toolbox (OTB), Rugged, Sirius and S2P (Satellite Stereo Pipeline).

Rugged (https://www.orekit.org/rugged/) is an open source (APACHEv2 license) library used operationally into the Sentinel-2 Instrument Processing Facility (S2-IPF) to generate geo-location grids in an accurate way. With the last version it offers also a refining framework to improve the relative geo-location accuracy based on homologous points provided by external tool. This library has been used by CNES to evaluate successfully its performance against CNES solution and also to cross-validate internal developments of the Airbus internal solution.

OTB (https://www.orfeo-toolbox.org/) is an open source (APACHEv2 license), remote sensing-oriented, image processing library[1]. It has been initiated by French Space Agency (CNES) in the frame of the ORFEO accompaniment program [2]. Based on the medical image processing library Insight ToolKit (ITK), OTB provides to its users an extensive set of algorithms and functionalities dedicated to remote sensing data exploitation : orthorectification, image registration, optical calibration and atmospheric correction (based on 6SV). More specifically, it embeds approaches to handle large data using advanced streaming and multi-threading strategies. Thus, OTB-based processing chains take advantages of both optimized Input/Output access and streamed/multithreaded filtering to perform efficient processing. This library is already used in operational context as S2-IPF and in processing chain used to generation ARD for Copernicus mission like MAJA, WASP, and S1-Tiling used in the french THEIA intiative.

Sirius (https://github.com/CS-SI/SIRIUS) is a open source (GPLv3 license), fast and simple to plug-in C++ image resampling library that is taking advantage of the Fourier Transform. This tool is a key component to increase in a quality controlled way the spatial resolution.

S2P (https://github.com/MISS3D/s2p) is a open source (AGPLv3 license) library and tool to compute digital surface model (DSM) by stereo matching of VHR optical sensor [3]. Its allow to generate endogenous DSM to perform orthorectification of the optical data.

All these tools embedded in the same processing chain allow to generate easily ARD on specific site. For example in the frame of the CNES Kalideos project (https://www.kalideos.fr/drupal/), we build a processing chains which can perform ARD generation on 5 sites (4 in French and one in Haiti) from raw data to BOA level. These chain produces continuously data from 2016 in the same geographic grid for scientific purpose.

In the presentation we will illustrate the performance of the different tools in various operational and research context.

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