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Design and study of a post-processing tool for long-term thermal infrared image sequences and multi-sensor data exploitation

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Latest improvements on uncooled infrared cameras has brought new opportunities for non-invasive diagnostics in the Civil Engineering's field. In particular, such technology has been studied and tested for long-term in-situ monitoring [1]. However, in order to perform a complete thermal monitoring of an infrastructure, ones need to setup a complex instrumentation based on various sensors. Furthermore, the use of multiple infrared camera generate huge amount of dataset that require new processing approaches. Even if some tools have already been studied and developed for gathering and recording all the data from such instrumentation [2], a software that could entirely exploit all this amount of data was lacking. In such context, a thermal infrared images post-processing tool has been developed under Matlab® in order to visualize infrared images and process data from various sensors. The objective of this tool is to enable the user to easily import data, navigate between the different time stamps of the experiment, visualize and export data.
One of the main feature of this tool is its ability to read and convert infrared images from various files formats (e.g. .proprietary or .hdf ones). By using the Hierarchical Data Format (HDF), one can select the imported data of a large amount of sensors and save them into one single or multiple compressed (or not) file. HDF format allows to gather sensor information (Metadata) and measurements data in a same file. For instance, the user has the ability to extract 2D thermal profiles and to fit them with theoretical models previously established [4]. Moreover, many processing for infrared images are available. The user can select a conversion physical model for computing the temperature either on CPU or through a CUDA library. This post-processing tool implements spatial resectioning algorithms [3] for real field scenes and a newly developed thermal calibration tool for Infrared Camera will be integrated in a near future.
Finally, we will also present how a large amount of files can be easily batch processed through a YAML (Yet Another Marking Language) configuration file system. The objective of this paper is to present concepts and studied developments made around this post-processing tool through different cases of study we had to deal with. Moreover, this is an opportunity to discuss and share about the needs and the perspectives of such software.
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