
SPECCHIO for Australia: taking spectroscopy data from the sensor to discovery for the Australian remote sensing community

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Field and laboratory spectroscopy is a common method applied by different remote sensing user communities for various purposes, ranging from calibration/validation experiments to material identification (Milton 2009; Haest, et al. 2013). In all cases a large number of spectra tend to be collected, yet the value and sharing of such collections is often restricted because the data are stored in disparate silos with little, if any, metadata to aid their discovery. These datasets have significant potential to benefit the wider remote sensing community as well as to contribute to international spectral libraries to fill existing gaps in collections. Until now there has been no consistent method in Australia for publishing, discovering and accessing this data. As recommended by an international group of experts attending a TERN ACEAS (Terrestrial Ecosystem Research Network Australian Centre for Ecological Analysis and Synthesis) workshop on best practices associated with bio-optical data in June 2012, the
existing SPECCHIO system (Hueni et al. 2009) was proposed as the standard for spectral data exchange and adopted as the system of choice for further development.

Spectral databases provide the means to store data in an organised manner, described by appropriate metadata documenting the sampling setup as well as the sampling conditions (Hueni et al. 2011). Such systems facilitate: (a) long-term storage of spectral data and metadata; (b) the retrieval of existing spectral data using metadata space queries; (c) the provision of provenance and hence a repeatability of data processing; and (d) a platform not only for mere data storage but also for streamlined processing and generation of information. A spectral database with associated, intelligent software is thus serving as a spectral information system (Herold, 2003). Spectral information systems take spectral databases a step further by making data held by the databases retrievable and usable by other users or systems and by adding processing functionalities that further transform the data or information held by the system, in turn generating more information. This could e.g. involve the generation of higher-level products or spectral data corrected for sampling equipment or sensor artefacts (Hueni et al. 2012). In the case of the Australian remote sensing community, it was envisaged to develop not just a mere data repository for spectroscopy data, but instead, to move towards a system that could support scientists in analysing their data using the full potential of combined metadata spaces (Wason and Wiley, 2000) and spectral spaces (Hueni et al. 2012).

Based upon extensive stakeholder consultation, feedback, and testing, a central spectral database for Australia has been established and the SPECCHIO code re-factorised to accommodate a change in architecture to a web-based application (Figure 1). The system incorporates a metadata standard to improve interoperability and data sharing, has links to best practice guidelines, has spatial search capabilities, contains mechanisms to house validation data associated with spectra and several enhancement which facilitate ease-of-use. In addition, it has links to other existing national and/or discipline-specific database systems, for example, TERN Auscover repository, which houses satellite image data and associated field validation data. The new SPECCHIO version is now deployed as a spectroscopy database adapted for the Australian remote sensing community to meet common needs of data and metadata storage linked to best practice protocols.
This paper will feature the process undertaken in the development of the Australian version of SPECCHIO, along with an explanation of the new features available and case studies from operational testing which highlight the capacity of the system to capture and manage an expanding range of spectroscopy research data. As the basis of a spectral information system, it is delivering a benefit to the end users by greatly improved management of existing and new data, increased data quality by applying algorithms to a centralised and well-defined data pool and quicker acquisition to product/publication cycles. The newly structured and enhanced version of SPECCHIO can serve as a potential model for international adoption.

Bibliography


