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Mobile field data acquisition in geosciences

Pavel Golodoniuc (1), Jens Klump (2), Nathan Reid (3), and David Gray (4)

(1) CSIRO, Mineral Resources, Perth, Australia (pavel.golodoniuc@csiro.au), (2) CSIRO, Mineral Resources, Perth, Australia (jens.klump@csiro.au), (3) CSIRO, Mineral Resources, Perth, Australia (nathan.reid@csiro.au), (4) CSIRO, Mineral Resources, Perth, Australia (david.gray@csiro.au)

The Discovering Australia's Mineral Resources Program of CSIRO is conducting a study to develop novel methods and techniques to reliably define distal footprints of mineral systems under regolith cover in the Capricorn Orogen – the area that lies between two well-known metallogenic provinces of Pilbara and Yilgarn Cratons in Western Australia. The multidisciplinary study goes beyond the boundaries of a specific discipline and aims at developing new methods to integrate heterogeneous datasets to gain insight into the key indicators of mineralisation.

The study relies on large regional datasets obtained from previous hydrogeochemical, regolith, and resistate mineral studies around known deposits, as well as new data obtained from the recent field sampling campaigns around areas of interest. With thousands of water, vegetation, rock and soil samples collected over the past years, it has prompted us to look at ways to standardise field sampling procedures and review the data acquisition process. This process has evolved over the years (Golodoniuc et al., 2015; Klump et al., 2015) and has now reached the phase where fast and reliable collection of scientific data in remote areas is possible. The approach is backed by a unified discipline-agnostic platform – the Federated Archaeological Information Management System (FAIMS).

FAIMS is an open source framework for mobile field data acquisition, developed at the University of New South Wales for archaeological field data collection. The FAIMS framework can easily be adapted to a diverse range of scenarios, different kinds of samples, each with its own peculiarities, integration with GPS, and the ability to associate photographs taken with the device embedded camera with captured data. Three different modules have been developed so far, dedicated to geochemical water, plant and rock sampling. All modules feature automatic date and position recording, and reproduce the established data recording workflows. The rock sampling module also features an interactive GIS component allowing to enter field observations as annotations to a map. The open communication protocols and file formats used by FAIMS modules allow easy integration with existing spatial data infrastructures and third-party applications, such as ArcGIS.

The remoteness of the focus areas in the Capricorn region required reliable mechanisms for data replication and an added level of redundancy. This was achieved through the use of the FAIMS Server without adding a tightly coupled dependency on it – the mobile devices could continue to work independently in the case the server fails. To support collaborative fieldwork, "FAIMS on a Truck" offers networked collaboration within a field team using mobile applications as asynchronous rich clients. The framework runs on compatible Android devices (e.g., tablets, smart phones) with the network infrastructure supported by a FAIMS Server. The server component is installed in a field vehicle to provide data synchronisation between multiple mobile devices, backup and data transfer. The data entry process was streamlined and followed the workflow that field crews were accustomed to with added data validation capabilities.

The use of a common platform allowed us to adopt the framework within multiple disciplines, improve data acquisition times, and reduce human-introduced errors. We continue to work with other research groups and continue to explore the possibilities to adopt the technology in other applications, e.g., agriculture.