Multispectral Imaging for Environmental Monitoring

Unlike traditional aerial photography, Remote Sensing Australia's digital multispectral mapping service uses the state of the art SpecTerra sensor to capture four-band imagery. These four discrete spectral bands correspond to the blue, green, red and near infra-red parts of the spectrum, and are only 10nm wide. Calculations based on the data stored in these bands makes it possible to extract a huge amount of information about land cover - especially vegetation - which is contained within the image.

The true power of RS-Aus's multispectral imaging is change detection: every year RS-Aus flies data collection flights at the same time of day, at the same time of year, and under identical weather conditions. This ensures that any changes detected by the sensor are due solely to actual changes in vegetation health, and not interference from other factors.

Multispectral remote sensing is very adaptable: it can be applied to many remote monitoring applications. The end user can specify what it is they are trying to monitor or investigate, and data can be analysed accordingly. The three examples below give a brief introduction to what can be done with RS-Aus's multispectral image data.

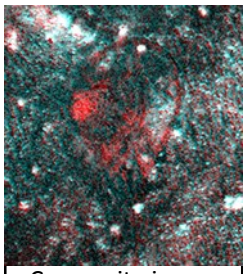
1. Detecting presence / absence changes in vegetation

Calculations using the red and near infra-red spectral bands enable plant health to be measured. Importantly, when these values are compared year-on-year, it is clear which regions have a declining or an increasing trend in vegetation cover, or where specific plants or communities have disappeared entirely.

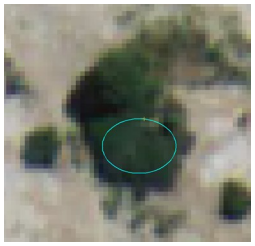
The red features in the 'composite' image on the right show where there has been significant vegetation loss; in this instance, caused by the construction of a new road. Similarly, changes in vegetation losses due to natural processes can be detected, as well as manmade changes.

2011

2012



Composite image

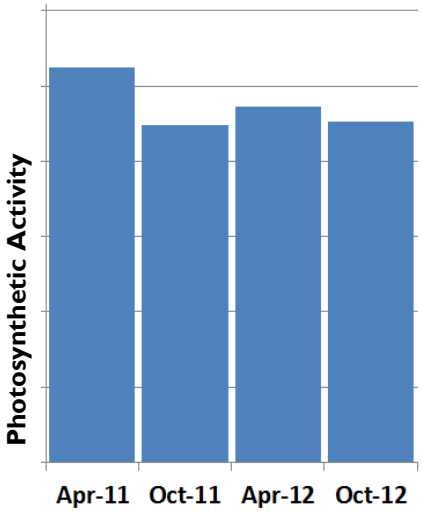


2. Remote monitoring of health in specific plants.

Again using the red and NIR bands, it is possible to monitor how individual plants change over time. A shrub (shown on the left) was imaged in both April 2011 and April 2012. It has been calculated that the plant's NDVI (a mathematical indicator of photosynthetic activity) has reduced by 25.9%.

3. Monitoring changes in vegetation health over a given area or object.

The technique for monitoring individual plants can easily be up-scaled to wide areas or large objects. This is particularly useful for features that need on-going monitoring, such as haul roads. The image on the right shows an area 250m each side of a haul road where vegetation monitoring was undertaken. The graph below shows how NDVI has changed across years and seasons. From April 2011 to April 2012 there was a 1.5% decline in vegetation, whilst from October 2011 to October 2012 there was a 0.1% gain. This suggests that there is currently no cause for concern about the impact of the road.



Further advantages of remote monitoring

- it is cost-effective in comparison to ground-based surveys
- it reduces fieldwork, and hence exposes employees to fewer risks - data analysis can be undertaken in an office.
- Ground crews can target specific identified problem areas
- It complements other survey techniques, such as ground-based ecological surveys
- The imagery forms a permanent record of vegetation health that can be used immediately, or archived for subsequent analysis

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