Australian earth data on-line

A new on-line source of imagery for disaster management

by Rick McRae, ACT Emergency Services Bureau, and Prame Chopra, Department of Geology, Australian National University

Introduction

When a broad-scale natural disaster strikes —flood, wildfire or earthquake—one of the most frustrating things for incident managers is not knowing the full extent of the impact. Information flow is difficult enough at the best of times, but when people feel compelled to 'get their hands dirty' there are few people left to focus on the backroom tasks.

One of the best 'overview' tools is a remotely sensed image. By definition, the sensor is remote, away from the disruption of the disaster, and able to function to full capacity. Imagery can be from a range of sources these days. Sensor platforms can be on satellites or they can be airborne. They can record different parts of the electro-magnetic spectrum: visible; infra-red; radar, etc. Each has its limitations and strong-points. They vary in the information collected, and the resolution at which it is collected. The time to acquire the imagery may be days for some satellite systems or an hour or so for some aircraft systems. Once acquired, the data have to be transferred to where they will be processed and interpreted, using techniques ranging from the Internet to a weighted drop bag. Once collated, the data have to be processed and interpreted. This latter task requires skilled personnel linked to the emergency management teams.

Some areas have put considerable effort into developing systems for 'routine' work —the airborne infra-red used in Victoria for mapping wildfires and the AVHRR imagery system in northwest Australia used for mapping the progress of the many dry season burns are good examples. However real-time use of new data during disasters has always been difficult due to the problems of: timely data collection; processing; and dissemination to where it is needed. Many of the most memorable remotely sensed images of Australian disasters were done retrospectively.

Scoping a typical problem

An indication of the problems that have prevented widespread use of image data in emergency response work can be gained by studying a hypothetical example. If, for example, we wanted to obtain a useful satellite image of a flood to support real-time decision making, what steps would be needed?

1. Ask the right question. If that question is 'can a satellite image show us where the flood is now, so that we can plan for the next shift's tasking' then we are getting close to the mark.
2. Find out what sensors can delimit flood waters. This is easy if your organisation has a remote sensing expert on staff. Otherwise you need to find one. This may not be easy if it is 2 o'clock on a Sunday morning.

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3. Choose a sensor based on the time of next fly-over and the likelihood of cloud cover obscuring the scene (a problem for visual bands).
4. Get a copy of the image datafile. In principle this is getting easier with Internet technology but problems such as how the data are going to be paid for and how it is going to be securely transferred still arise.
5. Process the image. An organisation that routinely handles imagery will have on-hand the hardware, software and trained staff to do this. For other organisations there may be difficulties and delays. Moreover, without care imagery can be misinterpreted, which can lead to erroneous decisions being made.

AEDOL

A consortium of organisations interested in Internet delivery of digital spatial data has been formed in the ACT to focus on many of these problems. Australian Earth Data On-Line, or AEDOL as it is known, includes the Australian National University, Praxa Pty Ltd and the ACT Emergency Services Bureau, and is facilitated by the Technik Group. The work of the consortium has been underwritten by ACT AusIndustry and the Federal Department of Industry, Science and Tourism's Information Technology On-Line program. Additional in-kind support has been provided by the consortium members.

The AEDOL consortium has now developed a working prototype system which show-cases many of the key components of a comprehensive Internet delivery system. This prototype can be accessed through AEDOL's site on the World Wide Web (http://aedol.anu.edu.au). The prototype (see *Figure 1* next page) provides free access to a number of spatial data sets thanks to the support of the Australian Centre for Remote Sensing (ACRES), the CSIRO Marine Labs and the Australian Land Information Group (AUSLIG). These data sets include Landsat Thematic Mapper imagery, SPOT panchromatic scenes, AVHRR images and a number of vector datasets from AUSLIG and the Digital Chart of the World including roads, rivers and creeks, and towns and cities. At this stage the data are limited in spatial extent because AEDOL is providing free access as part of its proof-of-concept aims. The AEDOL prototype also includes an integrated WWW commerce engine to demonstrate the architecture and functionality of a full commercial system.

AVHRR data can already be provided one hour after it has been acquired by CSIRO in Hobart. Using the ER-MAPPER package, AEDOL can merge geographic data and satellite data. An application being developed would take AVHRR coverage of a local government area and drape it over a high resolution digital terrain model to give an oblique 'aerial view' (*see Figure 2* next

page). The user can then use the terrain to aid in interpreting the image. This is vastly superior to the interpretational tools that are currently available to most users.

The future

The current version will only demonstrate how the system can work. We are seeking funding for the next stage of development, which would take us to a comprehensive system which will include:

- The use of secure credit card transactions to pay for data.
- Pay-by-the-pixel. Current systems require a minimum purchase, and it has been shown the for a small parcel of land, pay-by-the-pixel can reduce costs by as much as three orders of magnitude.
- A Java based web page that does many image manipulation tasks on-line. It is possible to do first-approximation analysis without training or technical skills.
- Stored user profiles, which make it easier for the returning user to go straight to the information needed.
- Stored algorithms, which can be re-run for any user and which take the latest data and manipulate it in a standard way to give a standard product.
- Data transfer on-line. AEDOL is already an approved distributor for some remotely sensed data, and can go from acquisition to suppling users in a short length of time.

Whether AEDOL progresses or not, it is inevitable that in the near future we will be able to use such systems for accessing many different types of spatial data. Many agencies are involved in collaborative development towards such systems. AEDOL and similar systems will provide the information infrastructure needed for the future. Internet technology is so flexible that, rather than competing, these systems will be cooperating.

Emergency managers will have a vast array of raw data available for immediate delivery at a reasonable cost. A range of value-adding companies will intercept the data for us and manipulate it to be exactly what we need and pass it on to us. We may not even notice that they will add their costs to the single transaction charge we see on the credit card balance sheets. We will get onto a web page and say we want information about a flood at some location and get a current map of it that our computers can read straight-away.

Conclusions

More information on AEDOL's capabilities is available on the web site: (http://aedol.anu.edu.au). Watch this site as we develop it to meet more of the needs of emergency management.

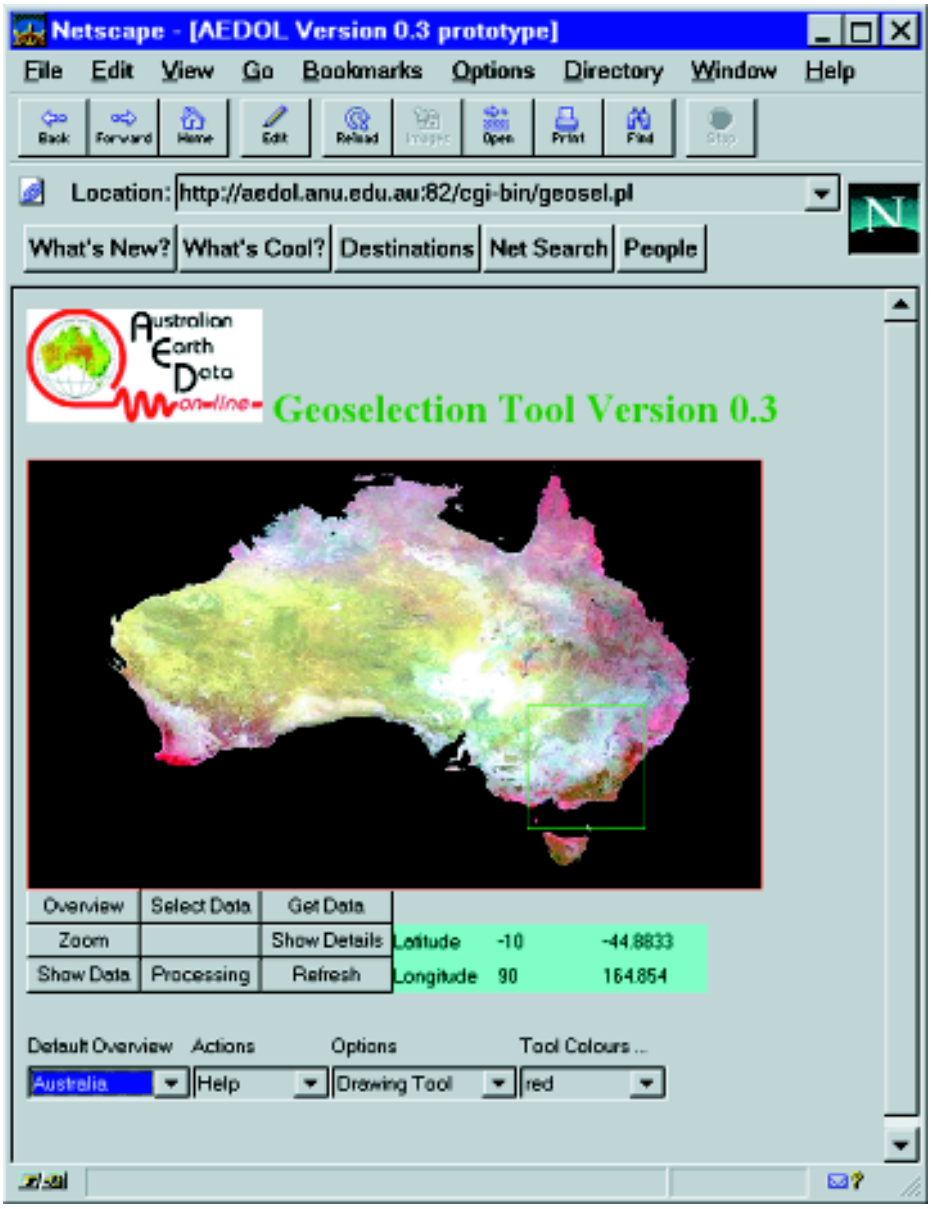

Figure 1: An example of an AEDOL web page.

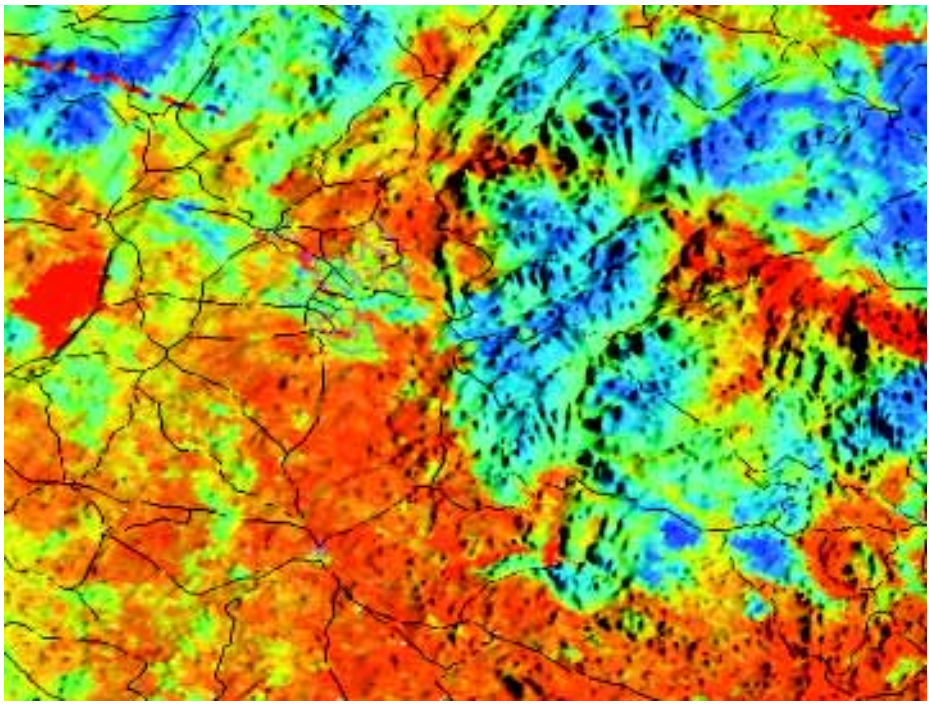

Figure2: AVHRR-derived grassland curing imagery draped over AUSLIG's digital elevation model for the ACT and surrounding areas of NSW. Red represents water (and cloud). Blue is the tree cover. The gradation from yellow to orange shows increasing grassland flammability.