Integration of Remotely Sensed Data and Geographic Information Systems

by

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Abstract

Canada is heavily dependent upon the effective utilization of its resources. To better manage the nation's resources, resource managers are increasingly turning to computer-based technologies. Two particularly important technologies for resource information management systems are remote sensing and geographic information systems (GIS). Operational resource managers are using the geographic information systems to store digital representations of their resource maps. Associated with these graphical digital maps are databases containing the attributes of map features.

The major (in terms of contribution to the GNP) land-based renewable resources are forestry and agriculture. In agriculture, the resource cover changes annually and should be monitored frequently during the growing season. For forestry, the changes are slower, but some provinces require annual updates of their forest inventories. Geographic information systems for forestry are loaded by manually digitizing existing forest cover maps. Approximately 6,000 1:20,000 scale maps are required to cover British Columbia, for example. Traditionally, the updating of maps has required re-flying the area of interest. This is a costly procedure. The aerial photos do provide, however, high resolution imagery. Cost savings in geographic information system updating can be achieved by incorporating remote sensing data from satellites.

Since 1978, we have conducted experiments to integrate remote sensing data from satellites and aircraft. We have also investigated the integration of these data with geographic information systems. The experiments have shown that this integration is difficult for several reasons. The remote sensing data may not have sufficient spatial resolution to show the features of interest. The remote sensing data is geometrically corrected in Canada using federal NTS maps, usually 1:50,000 scale. There are substantial (up to 200m) geometric errors between the provincial maps of some provinces and the federal maps. Labelling of some ground features in the GIS may be inconsistent. As a result, we have concluded that artificial intelligence techniques are required to handle the combinatorial explosion of problems reducing the effectiveness of integrating remote sensing data and GIS.

In this presentation, we review the efforts in integrating remote sensing data and GIS and present the approach at the Canada Centre for Remote Sensing. A brief discussion of the problem of exchanging data amongst geographic information systems will also be addressed.