

SATELLITE IMAGE MAP AIDS IN PLANNING AT THE GREATER VANCOUVER REGIONAL DISTRICT

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ABSTRACT:

A Satellite Image Map was created for the Greater Vancouver Regional District (GVRD) by Pacific Geomatics Limited of Surrey, British Columbia using multitemporal satellite imagery orthorectified using EASI/PACE image analysis software. The Image Map provides accurate information about land use providing the GVRD with a valuable tool for the management of the urban and surrounding areas of the Fraser Delta area of British Columbia. It illustrates the usefulness of satellite imagery in providing data at an overview scale in urban applications. The use of satellite imagery in an urban application also proved suitable since the area encompassed by the regional planning department covered a relatively large tract, and so had some advantages over higher resolution aerial photography in processing time, data storage, and cost.

INTRODUCTION

The study area for the GVRD Strategic Planning Department covers 762,000 hectares of mostly urbanized land. The satellite image data produced by Pacific Geomatics Ltd. is used mainly as a visual reference tool for identifying, classifying and correcting new or existing vector layers within this area. These layers include spatial elements such as landuse types, environmentally sensitive areas, and infrastructure. At 10 meter resolution, the satellite image contains enough detail for regional analysis. It also provides a visual context for discussion of regional land use, transportation and environmental issues.

METHODOLOGY

The image map is a compilation of scenes from two separate earth observation satellites acquired in different seasons during 1991, 1992, and 1993. All imagery was ortho-corrected using high resolution Province of British Columbia, Terrain Resource Information Management (TRIM) data. These data were derived from a province wide aerial survey with rigorous accuracy standards. TRIM planimetric data were used as the source for Ground Control Points, while TRIM elevation data were used as the terrain model for orthorectification. The

Image Map is accurate to within 10 metres RMS in X and Y.

Landsat-5 visible and infrared data, encompassing all bands from 1 to 5, acquired August 17, 1992, were orthorectified and resampled to a 10 metre grid using EASI/PACE satellite orthorectification programs which implement algorithms developed by Toutin and Carbonneau (1985, 1989). Atmospheric corrections and colour enhancements were applied using proprietary algorithms developed at Pacific Geomatics, which were implemented through programs using the EASI procedure language within EASI/PACE. Multispectral data provided information about land use within the extents of urbanization, as well as providing land cover type information in the surrounding, less anthropogenically affected watersheds.

The Landsat data were then fused with two panchromatic SPOT scenes that had also been orthorectified and radiometrically corrected. Data fusion was accomplished with proprietary algorithms developed at Pacific Geomatics, also implemented through EASI procedures. The SPOT images were acquired on September 17, 1993, and November 13, 1993. Ground resolution of the fused data set was 10 metres.

The November 1993 SPOT image provided up-to-date

road network information, however it was imaged at a very low sun angle. Image quality was poor, containing low contrast and noticeable shadows. Two additional SPOT scenes acquired in July 1991 were incorporated into the fused data to enhance spatial detail.

The Image Map was geometrically corrected using EASI/PACE satellite image orthorectification software. A similar data set was produced in 1994 using a separate -27.6 degree off nadir SPOT image, giving Pacific Geomatics the ability to compare the consistency of the orthorectification tools between various data sets. This provided the opportunity to evaluate the geometric correction capabilities of the software when incorporating digital elevation data to aid in increasing the accuracy of the Image Map.

SUMMARY

The Strategic Planning Department of the GVRD uses the Image Map in digital format as a GIS backdrop for regional planning and to update older and less accurate maps. It is also used extensively in photographic and print format for educational and communications programs.

One important use of this data is in updating and verifying historical information. Currently the Strategic Planning Department is producing a 1995 generalized landuse map of the GVRD. This is an update to a landuse map produced in 1979. The map contains 12 categories of

landuse such as residential, commercial, industrial, farm, etc. The satellite image data is being used to guide the development of spatial layers where the landuse has changed significantly. In addition, point and polygon data layers from surveys are used to identify such things as residential densities.

The satellite image data is considered a valuable addition to the other tools used in regional planning such as forecasting, modeling and demographic analysis.

Future use of the satellite data may include research into urban landuse classification and urban landuse development over time. Other departments are using it as an important aid for watershed analysis in the Vancouver region, and the Parks and Recreation Department currently has plans to use it in their planning work.

REFERENCES

- Toutin, T., 1985. Analyse mathématique des possibilités cartographiques du système SPOT. Thèse de Docteur-Ingenieur en Sciences Géodésiques, ENSG, Paris, France, pp. 1-163.
- Toutin, T., Y. Carbonneau, 1989. La Multi-Stereoscopie Pour Les Corrections D'Images SPOT-HRV, Canadian Journal of Remote Sensing, 15(2), pp. 110-119.