TEN YEARS OF TECHNOLOGY ADVANCEMENT IN REMOTE SENSING AND THE RESEARCH IN THE CRC-AGIP LAB IN GCE

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This paper briefly reviews the development of remote sensing technologies in the last ten years, including the development of optical, radar, and laser sensors and the trend of remote sensing software development. It also introduces some of the research activities and achievements of the Canada Research Chair Laboratory in Advanced Geomatics Image Processing (CRC-AGIP Lab) in the Department of Geodesy and Geomatics Engineering (GGE) at the University of New Brunswick (UNB). According to literature review and our research experience, we have concluded that the "bottle neck" of remote sensing is still the lack of software tools for effective information extraction from remote sensing data, especially after the rapid advancement of remote sensing sensor technologies in the last ten years and the increased demand for quickly updated, accurate geo-spatial information.

Cet article examine brièvement le développement des technologies de télédétection au cours des dix dernières années, y compris le développement des capteurs radars, optiques et lasers et les tendances du développement des logiciels de télédétection. Il présente également certaines activités de recherche et certaines réalisations du Laboratoire des chaires de recherche en traitement de pointe des images de la géomatique (CRC-AGIP Lab) du Département de géodésie et de génie géomatique (GGE) de l'Université du Nouveau-Brunswick (UNB). À la suite d'une analyse documentaire et de notre expérience de recherche, nous avons conclu que le « goulot d'étrangement » de la télédétection demeure toujours le manque d'outils logiciels permettant d'extraire des renseignements utiles des données de télédétection, plus particulièrement après le progrès rapide des technologies de télédétection au cours des dix dernières années et l'augmentation de la demande d'information géospatiale précise et rapidement actualisée.

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1. Introduction

In the last ten years, remote sensing technologies and remote sensing applications have been experiencing a revolutionary advancement in various areas, including sensor development, software development, and applications.

1.1 Remote Sensing Sensor Development

In the area of sensor development, all of the sensor technology domains (optical, radar, and laser) have exhibited evidence of the revolution:

- In optical remote sensing:
  1) The spatial resolution of satellite images dramatically increased from tens of metres to metres and to sub-metre (Table 1). This allows users to see increased detail of the earth's surface, from streets and buildings 10 years ago to cars and even individual people now.
  2) The first digital aerial cameras were presented to the photogrammetric community in 2000 at the ISPRS congress in Amsterdam. Now, digital airborne cameras/sensors with 50-cm to 5-cm resolution are increasingly used by the mapping industry (Table 2). Traditional film-based cameras are being gradually phased out.
- In radar remote sensing:
  1) The spatial resolution of radar images has also increased from tens of metres to metre level (Table 3).
  2) More importantly, the sensor capacity has improved from collecting single-polarization images to capturing multi-polarization images (Table 3). This improvement provides more textural information of land cover types and allows for better land cover classification.
- In laser remote sensing:
  1) Laser was invented in 1960 [*Lidar Remote Sensing Overview* 2007]. The use of LiDAR (Light Detection and Ranging) for producing high-accuracy digital elevation