

The developing Actuality of Photogrammetry and Remote Sensing Technology in China

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1. Introduction

A lot of developments have been achieved in the field of earth observing in China for the last 40 years. Firstly, a series of sensors have been developed and more than 50 earth observing satellites have been launched, which made up four earth observing satellite systems, such as Meteorology, Ocean, Resource, Environment and disaster relief. Secondly, an interdisciplinary research group has been constructed and some subjects relative to “3S” have been set up by more than 160 scientific institutes. Moreover, a series of software have been developed by some geo-informatic corporations. Finally, geo-information management system, standard and criterion required for industrial development are being constructed. Details of the current research status of photogrammetry and remote sensing (PRS) technology will be discussed in this paper.

2. Construction of Earth observing system

Four earth observing satellite systems, such as Meteorology, Ocean, Resource, Environment and Disaster relief, have been constructed. At the meantime, some projects have been put into practice in the satellite research on earthquake, surveying and mapping etc.

Meteosat is the pioneer of remote sensing satellite systems of China, such as FY satellites, which were started in 1988. In present, FY-2C and FY-2D are on orbit while FY-3 and 4 are in plans.

The HY-1A launched in May 2002 is the first ocean satellite of China, which has obtained a mass of ocean color data during its two years' operation and played an important role in many fields of ocean research. HY-1B is also in schedule and will be launched in the near future.

In resource satellites, CBERS-1 (China Brazil Earth Resources Satellite No.1) and CBERS-2, which were developed by China and Brazil, were launched in Oct., 1999, and Oct., 2003 respectively. Furthermore, projects of CBERS-3 and CBERS-4 are in progress.

In addition, great breakthroughs were made in the development of scientific experimental & environmental satellite etc. The Environment and Disaster Monitoring and Forecasting Constellation System, which comprises 2+1 small satellites in the preliminary stage is currently under preparation and the first satellite will be launched in 2007.

As for commercial high-performance mini satellites, one of a good example is the 'Beijing No.1' mini satellite, which was successfully launched in Oct 2005 with a panchromatic camera and a multi-spectral CCD camera on board. The panchromatic camera can scan the earth surface in 24 km swath with 4 m resolution and the multi-spectral CCD camera in over 600 km swath with 32 m resolution

3. A set of key RS technologies have been developed and a series of RS productions are being created

A set of core sensors has been developed by self-innovation. With the support from '863' plan and other sectors, RS technology in China has witnessed unparalleled development. As for spectral coverage, sensors with spectral ranging from visible, infrared to microwave have been successfully carried in aircraft. Sensors such as visible camera, visible-infrared multi-spectral scanner, multi-resolution imaging spectrometer, multi-spectral microwave radiometer, microwave scatter meter, microwave altimeter etc. have been developed.

What's more, the development of remote sensing instruments such as air-borne 3-d imaging system, thermal infrared imaging system etc., has reduced the reliance of RS sensors for foreign technology.

4. Aviation remote sensing system is being consummated and efficiency is being improved

The operation of aviation remote sensing is being constructed step by step and the group is growing bigger and bigger. In order to meet the demands for high resolution spatial data in China, especially for aerial photogrammetry, a group of aviation remote sensing including the nation, army and private enterprises is coming into being, such as the first aviation remote sensing department of national remote sensing center of China, aviation remote sensing center of china science institute and Geostar corporation of Wuhan University and so on.

Platforms of aviation remote sensing have been improved gradually which include mainly homemade Yun series aeroplane and introduced ones such as Citation, King Air and so on. Research on unmanned aerial vehicle has also been progressed quickly in China in the last 10 years.

Sensors used include the traditional cameras such as RC30, RMK TOP30, ADS40 system, DMC camera and ADL ladar etc. many domestic air-borne sensors such as

hyper-spectral imaging instrument, SAR have been put into practice.

5. Ground infrastructures of RS satellite are being improved

Ground receiving systems have covered the whole country and the technique of data storage and searching is advanced now.

With the improvement of ground system for meteorology, ocean and resource satellite, the ability of ground reception, process, storage and distribution is improving. Four ground reception systems have been built up. Up to now, there are four ground reception systems available for civil use and abundant experience has been accumulated. The operating mode of ground station of China Center for Resource Satellite Data and Applications (CRESDA) proves to be a successful mode, which presents the principle of combining civilian and military production and letting military production reside in civilian production.

In addition, China now has the ability of dependently developing satellite ground station and relevant data processing system.

6. Domestic Geo-informatic software develops fast

Firstly, the digital photogrammetric software has entered the international market. One example is VIRTUOZO, which is independently researched and developed by China. It has the ability of automatic aero triangulating and producing maps such as Digital Line Graphic (DLG) and Digital Raster Graphic (DRG) in every scale and recognized to be one of the world's three practical digital photogrammetric systems.

Secondly, many small remote sensing image processing software systems have been developed by many sections and applied into many fields.

Furthermore, GIS software develops very fast in China. Great improvements and breakthrough in technology innovation have been achieved, which makes the Chinese GIS software enter the international market. Many products have finished concept transformation in system framework and spatial database organizing technology and realized the integrated storage of spatial geometry data and attribute data, with the manipulating ability of spatial data and stability greatly improved. At present, more than 50% software in the market is domestic software.

7. Applications are extending and benefits improve greatly

The use of RS satellites and researches on its application in China were started from

the early 1970's. Up to now, the application fields range from meteorology, geology, mining, topography, to water conservancy, earthquake and urban construction etc. Moreover, many institutes such as China center of remote sensing have been constructed. Researches in many fields including weather prediction, crop estimation, environment protection, urban planning etc. have been developed by them, which plays an important role in the economic of the country and people's daily life.

Modern geo-informatic technology is becoming the breakthrough point for social public participating in the urban construction and development. The spatial data is becoming the integrated information carrier for reflecting the urban development, change and improvement.

Finally, earth observing technology provides new ways and technological method for exploring the relation between human environment factors and human health and improving the people's health and welfare.

8. Conclusions

This paper focuses on the developing actuality of PRS in China. Discussions include the construction of earth observing system, key RS technologies and productions, aviation remote sensing system, ground infrastructures of RS satellite, domestic Geo-informatic software, extending applications of PRS.

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