

IAF EARTH OBSERVATION SYMPOSIUM (B1)
Earth Observation Data Management Systems (4)

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ON-ORBIT DATA MINING TECHNOLOGY FOR EARTH OBSERVATION IMAGE PROCESSING

Abstract

The high resolution earth observation satellite has developed rapidly, and the earth observation system has been developed from single-star mode to many small and medium satellites joint network. Full earth observation in twenty-four hours under all kinds of climate all around the earth has been realized. However, due to the limited bandwidth and energy resources, these data are not appropriate to be completely downloaded, and on-orbit image processing and data mining techniques are required. On one hand, redundant or invalid data can be removed to save limited bandwidth and energy, on the other hand, the on-orbit images are effectively processed in real time, and the intelligence and emergency response capabilities of earth observation system are enhanced.

First, a high-performance computing architecture is established, and a high-performance computing platform based on Xilinx Zynq7000 series SOC chip and Nvidia Jetson TX2 series chip is designed to accomplish the on-orbit high-performance image processing with single point computing capacity of 2TFLOPS, storage capacity of 16Tb.

Secondly, the image semantic segmentation on the TX2 hardware platform is realized by using the compressed lightweight deep neural network, and the classification of remote sensing image is achieved with accuracy 87% and 1 image per second prediction speed; On the basis of semantic segmentation, the semantic information of forest coverage and the number of houses is extracted.

Finally, the image data retrieval technology is used to effectively organize and manage the images, complete the reception and response after receiving the ground commands, and transmit the effective data information to the ground in time.

The verification system is further built to verify the rationality, availability and real-time aspects of the image data modeling and data mining platform, which lays the foundation for the future establishment

and improvement of earth observation system.

The systematic method proposed in this paper transforms the earth observation mode from the image data downlink reprocessing to the intelligent real-time processing on orbit, thus solve the contradiction between the limited space-earth data bandwidth and the transmission of massive data, and satisfy the real-time monitoring and identification of time-sensitive targets demand. In addition, data mining platform can effectively accomplish tasks such as cloud computing and disaster emergency in various satellites and spacecrafts, leading the transformation of spatial information acquisition and processing mode in China.