# A PARALLEL-PROCESSING PLATFORM FOR HJ-SATELLITE DATA

*Fengbin Zheng[1], Shenshen L1[1,2], DongHan[2], Jibao Lai[1] , BaohuaHe[2]*

1. Computer and Information Engineering College, Henan University, Kaifeng, China

2.State Key Laboratory of Remote Sensing Science, Jointly Sponsored by the Institute of Remote Sensing Applications of Chinese Academy of Sciences and Beijing Normal University, Beijing, China

E-mail: lishenshen@126.com

## 1. INTRODUCTION

Satellite remote sensing as a quantitative method can retrieve the atmosphere, water and ecology parameters, and different sensors include Moderate Resolution Imaging Spectrometer (MODIS), Advanced Very High Resolution Radiometer (AVHRR), Multiangle Imaging SpectroRadiometer (MISR), Polarization and Directionality of Earth's Reflectance (POLDER), etc., have been put into practices to a large extent (Ichoku et al., 2004; Liang, 2004). In September 2008, China launched "Environment Satellite" A, B with Charge-Coupled Device camera (called HJ-CCD), which provides a new data set for the environment of remote sensing. However, the calculation using HJ-CCD with high spatial resolution (30m) is a time-consuming problem, which can't carry out wide-range and real-time monitoring. To improve the calculation speed of HJ-satellite, a parallel-processing platform is introduced in this paper.

## 2. PARALLEL PROCEDURES

From the point view of image process, the retrieval using satellite data is based on pixel computation. The tasks in parallel platform can be divided into a number of images which are retrieved in sub-process. Our implementation follows a master-worker strategy and depends on the MPI exchanging the message and data. The master (main-process) distributes data and merges the results; the workers (sub-process) get the partitioned data and run the retrieval model (see Fig.1).

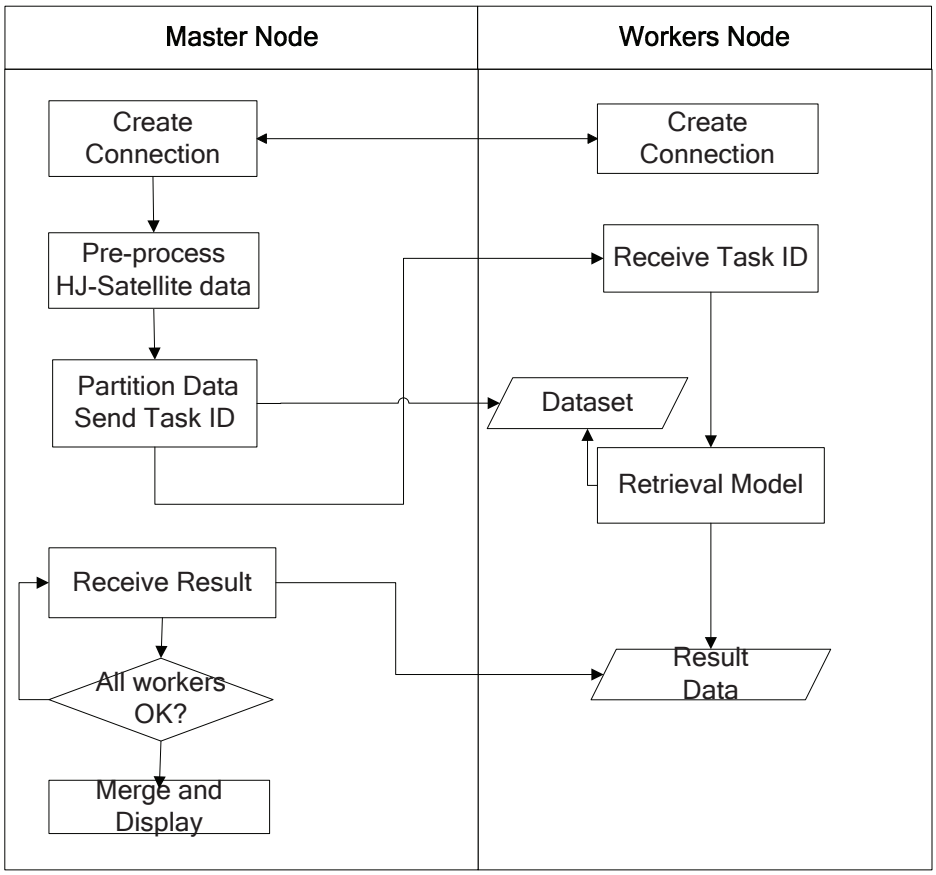


Figure 1. Parallel procedures

## 3. ARCHITECTURE

The parallel-processing platform is built using the most economical PCs and consists of five main functional blocks: a) a file database for storing the HJ-Satellite data, b) user interface layer for displaying the result, c) the task-management component for pre-processing and partitioning the HJ-Satellite data, d) the retrieval model, and e) communication interface between the master and workers.

## 4. EXAMPLES AND PREFORMANCE ANALYSIS

To check the performance of the parallelization, we ran the original serial code and parallel code using the HJ- Satellite data. As an example, to retrieve the aerosol optical thickness over the North China area at 100m resolution for one day on a single CPU needs about 8 hours, the parallelization significantly reduce the computation time as more numbers of workers employed. The following formula can be used to compare the serial ($T_{serial}$) and parallel run time ($T_{retrieval}$):

$$T_{serial} = T_{ini} + T_{retrieval} \quad (1)$$

$$T_{parallel} = T_{ini} + T_{com} + T_{distrib} + \frac{T_{retrieval}}{m} + T_{gather} \quad (2)$$

where $T_{ini}$ is the pre-process time , $T_{retrieval}$ is the retrieval time, $T_{com}$ is the communication time between master and workers, $T_{distrib}$ is the distribution data time for workers, $T_{gather}$ is the time of master merging results.

## 5. CONCLUSION

HJ satellite carry large-scale, high-resolution CCD camera for the monitoring of environment, and the parallel-processing platform will be used to derive the wide-range and real-time atmosphere, ecology and water parameters to better understand their impact on climate and environment.

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