# Development of Ground Control Point Collection and Management System based on High resolution Satellite Images

Kwang-Yong Kim, Chang-Rak Yoon, Kyung-Ok Kim

Spatial Imaginary Information Research Team, EETRI,
161 Kajong-dong, Yusong-gu, Taejon, 305-350, Korea

E-mail: { kimky,cryoon,kokin }@etri.re.kr

**Abstract:** This paper describes the system development for the Ground Control Point collection and management through the major coastline region in KOREA, which will collect and manage the ground control point based on high resolution satellite image database.

The module of this system is following

   1) GCP/Coarstline research plan module

   2) GCP/Coarstline ground collection module

   3) GCP/Coarstline post processing module

   Our team developed the core components of "High Resolution Satellite Image Processing Technique" project, and this system, among applications of our project, is constructed to apply to practical use. In this application, you will also see how to apply core components of our project.

**Keywords:** GCP Collection System, component

## 1. Introduction

The Ministry of Maritime Affairs & Fisheries keeps the high resolution satellite image through the major coastline region in KOREA. As shown the image, the organization has set up the regions through the major coastline, and has established the raw images and meta-datum of the satellite images each region. Using that
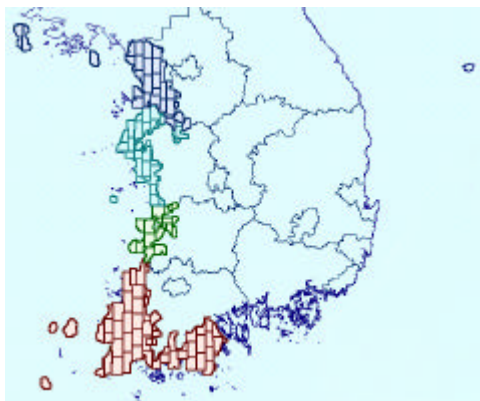


Fig. 1. Index Map.

Image DB, to apply to basic data of coast analysis, coastline observation, etc, it must be preceded to develop the Ground Control Point(GCP) data collection & management system.

## 2. System

### 1) Core Component of High Resolution Satellite Image Processing Technology

The final objectives of "Development of High Resolution Satellite Image Processing Technology" are developments of technologies and component-based software for the high-resolution satellite imagery, retention of high-level technologies for KOMPSAT-2 satellite which will be launched in 2004, and stimulation on the related industries. High resolution satellite images will be extensively utilized to acquire the geographic information and the needs for high value-added information production using satellite imagery are more increasing now. Also, component-based image processing software are required in satellite image processing fields because component-based software are easy to maintain and upgrade, and able to reduce the software developments periods.[1][2]
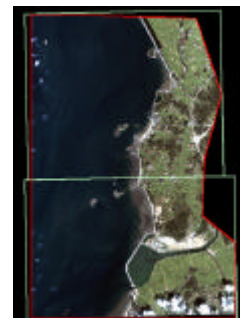


Fig. 2. Sample Image.

The used Core-Component list is below.

- Data Provider component
- 2D Viewer
- Visual enhancement component
- Spatial filter component
- Plane geometry correction
- Image mosaicing component
- GCP collection control

**2) System Configuration**

1. GCP management Module

This module is management program, which manage the image data, image meta data, GCP meta data, and plan the field collection processing, and integrate the final result.

1) Image Meta Data management
- Image register : Band composition,
          Image Enhancement

2) GCP Meta Data management
- GCP DB integration
- GCP meta extraction for field collection mod-

ule
3) Search
- Image meta data search
- GCP meta data search
4) GCP Collection Plan
- Temporary geometric correction
- Field collection project setting
5) Geometric Correction

2. Ground Collection Module

This module is field program, which is actually used to collect the data in field, using the image and GCP meta data exported management module.

1) Project Info view
- Load the Image data
- Load GCP meta data
- View project info
2) Field collection
- GCP collection
- Image Filtering
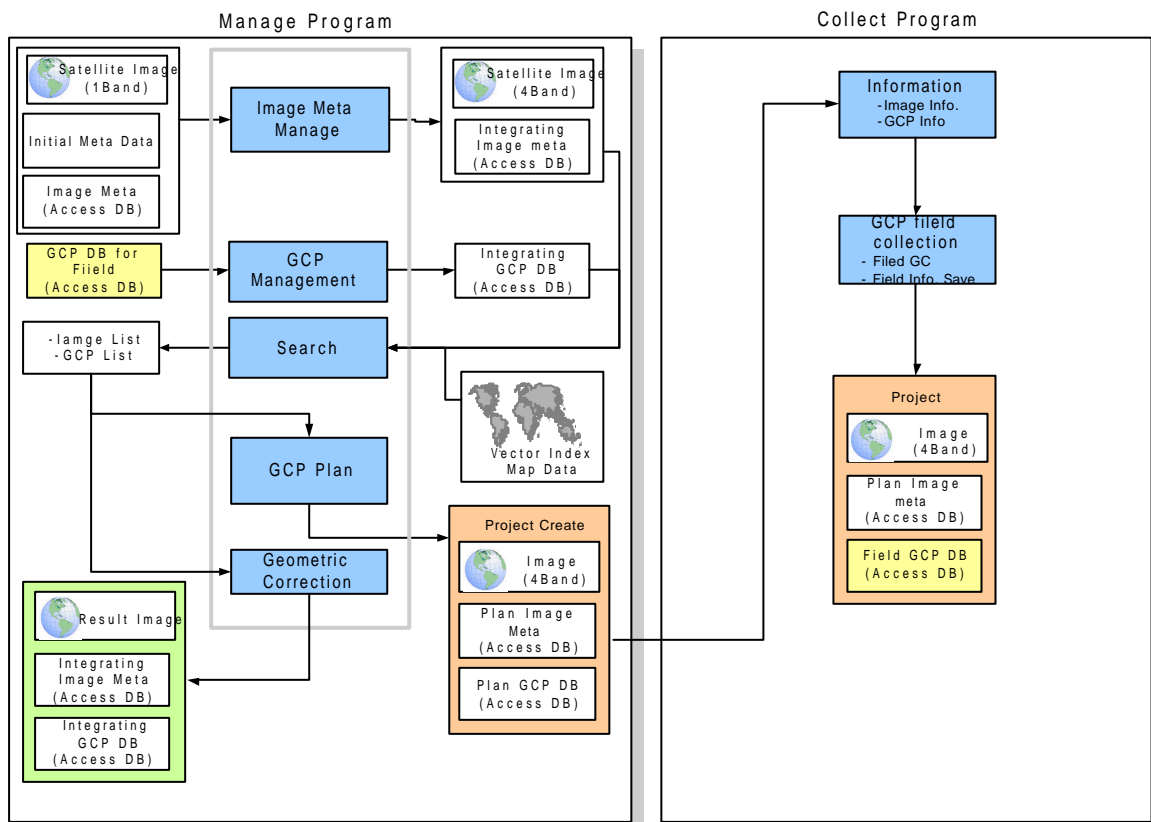- Image Enhancement
3) Temporary geocorrection / mosaic



Fig. 3.   Program Diagram

# 3. Conclusions

This paper describes the system development for the Ground Control Point collection and management through the major coastline region in KOREA, which will collect and manage the ground control point based on high resolution satellite image database.

Through the development of this system, we verified the benefit to reduce the software developments periods, and to reuse the component. In Future, through distributing the core component, we hope to aid to develop many other applications.

## Acknowledgement

## References

[1] Soo, Jeong, Y. J. Lim, C. R. Yoon, K. O. Kim, Y. K. Yang, 2002. Design and Implementation of the Component Software for High Resolution Satellite Image Processing, *Spring conference Proc. of. the Korean Society of Remote Sensing,*

[2] RADIO RESEARCH LABORATORY, 2002, "Development of High Resolution Satellite Image Processing Technology *" 2002 Final Report.*

**Table 1. Core component list of "Development of High Resolution Satellite Image Processing Technology"**

| Purpose | Component | Function |
|---|---|---|
| Basic Image Processing | Data Provider Component | o **Input and output function for satellite data and commercial software data**<br>o **Vector data provider function**<br>o **Input and output function for application data**<br>o **OGC Grid Coverage**<br>o **Improvement of very large dataset processing technique** |
| | Coordinate Transformation Component | o OGC Coordinate Transform Services |
| | Image Display Component | o **2D Viewer**<br>o Functionalities and rendering speed of 3D visualization<br>o **Visual enhancement technique**<br>o Image conversion technique |
| | Image Map Print Component | o Input technique of annotations and remarks<br>o Print technology using WYSIWIG |
| Basic Module for Expert | Satellite Image Processing Component | o Unsupervised classification technique<br>o Supervised classification technique<br>o **Spatial filtering technique**<br>o Frequency filter technique<br>o Information restoration technique<br>o SAR image processing technique |
| | Satellite Information Processing Component | o **Plane geometry correction**<br>o Multi-sensor information fusion technique<br>o **Image mosaicing technique** |
| | Information Extraction Component | o Semi-automatic 2 dimensional information extraction technology for urban facilities<br>o Change detection technology |
| Advanced Module for Expert | Stereo Satellite Imagery Processing Component | o Physical sensor model for satellite imagery<br>o Mathematical sensor model for satellite imagery<br>o SAR geometric-modeling technique improvement<br>o Technology to generate epipolar images from satellite images by push-broom sensor<br>o DEM extraction technique using optical stereo imagery<br>o DEM extraction technique from the Stereo SAR<br>o DEM extraction technique from the SAR Interferometry<br>o DEM edit and processing technology<br>o Ortho image generation technique |
| | 3D Feature Extraction Component | o Stereo image display technique<br>o Satellite imagery stereo mapping technique<br>o 3D vector edit/modify technique |
| | Visual Modeler Component | o Visual programming supporting technology |
| | Development of Prototype Package | o Integrated prototype package development |
| | Fundamental Technology for Laser Scanning Data Processing | o Technology for urban height information extraction from airborne LiDAR<br>o Technology for urban facility information extraction from airborne LiDAR<br>o Enhancement of the technology for mobile laser scanning data processing |