Implementation of a SAR GeoCoding Module based on component

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Abstract: This paper describes the SAR geocoding module, which is the sub-module of a IRHIS ("Integrated RS s/w for High resolution satellite ImageS"): package of "Development of High Resolution Satellite Image Processing Technique" project in Electronics and Telecommunications Research Institute (ETRI).

The function of this module is following.

1) Orbit Type : ERS1/ERS2, RADARSAT

2) Data Format : SAR CEOS Format(Single Look Complex)

3) Function:

 - Geocode : Generate a map projected SAR image based on only orbit information

 - Orthorectify: Generate a rigorous geocoded SAR image with a DEM information

In this paper, we briefly describe the algorithm that is adopted to the functions, and component architecture.

Keywords : SAR GeoCode, Componet

1. Introduction

In SAR Image, it is very sensitive to be changed to the image location by the change of satellite attitude.

In addition, because the SAR image is range direction image, that image has much distortion error, if not geometric correction. So, geocoding step is very important to correct the much distortion error, and combine other in-situ data or information of other sensor image.

In this paper, we will describe the SAR geocoding module, which is the sub-module of a IRHIS("Integrated RS s/w for High resolution satellite ImageS"): package of "Development of High Resolution Satellite Image Processing Technique" project in Electronics and Telecommunications Research Institute (ETRI).

2. System

1) SAR Geocoding Algorithm

To geocode SAR image is following.

Step 1. 3D point of DEM

　Select a 3D point of DEM.

Step 2. Covert to geocentric Coordinate

　Convert the coordinate values to geocentric coordinate value of SAR satellite

　For example, ERS satellite uses the GEM6 datum, RADARSAT International datum

Step 3. Calculate orbit position

　Perform the SAR orbit modeling with the satellite ephemeris parameter, and using that parameter, calculate the orbit position corresponding to point.

Step 4. Calculate SAR Plane coordinate

　Using the orbit position data and the point, calculate range-doppler plane coordinate of SAR image

Step 5. Height correction

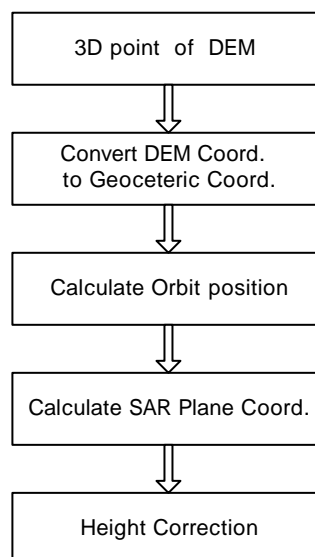　Correct the height with the height information of the point.

Fig. 1.　SAR GeoCode

2) Component Architecture

1. IRegionInfo

This interface has information of target region and DEM, returns the 3D coordinate value that is converted from input-coordinate value

2. SARHdrImporter

This interface imports the SAR header information from the SAR CEOS format file, and returns that parameter value to other object

3. SAROrbitCOM

This interface implements the SAR orbit modeling using the SAR orbit ephemeris data.

4. SAROrtho

This Interface provides geocoding / ortho image generation method that inputs the SAR Image, Orbit information, and DEM

3) Function

- Orbit Type : ERS1/ERS2, RADARSAT
- Data Format : SAR CEOS Format(Single Look Complex)
- Function:
  - Geocode : Generate a map projected SAR image based on only orbit information
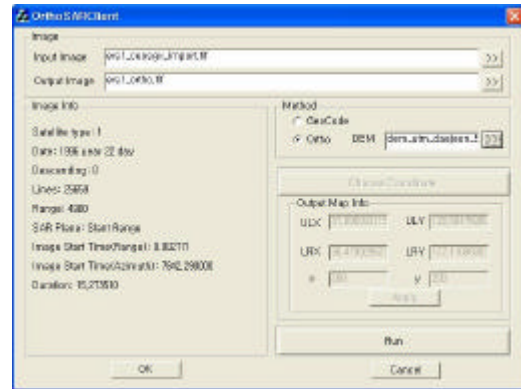 - Orthorectify: Generate a rigorous geocoded SAR image with a DEM information
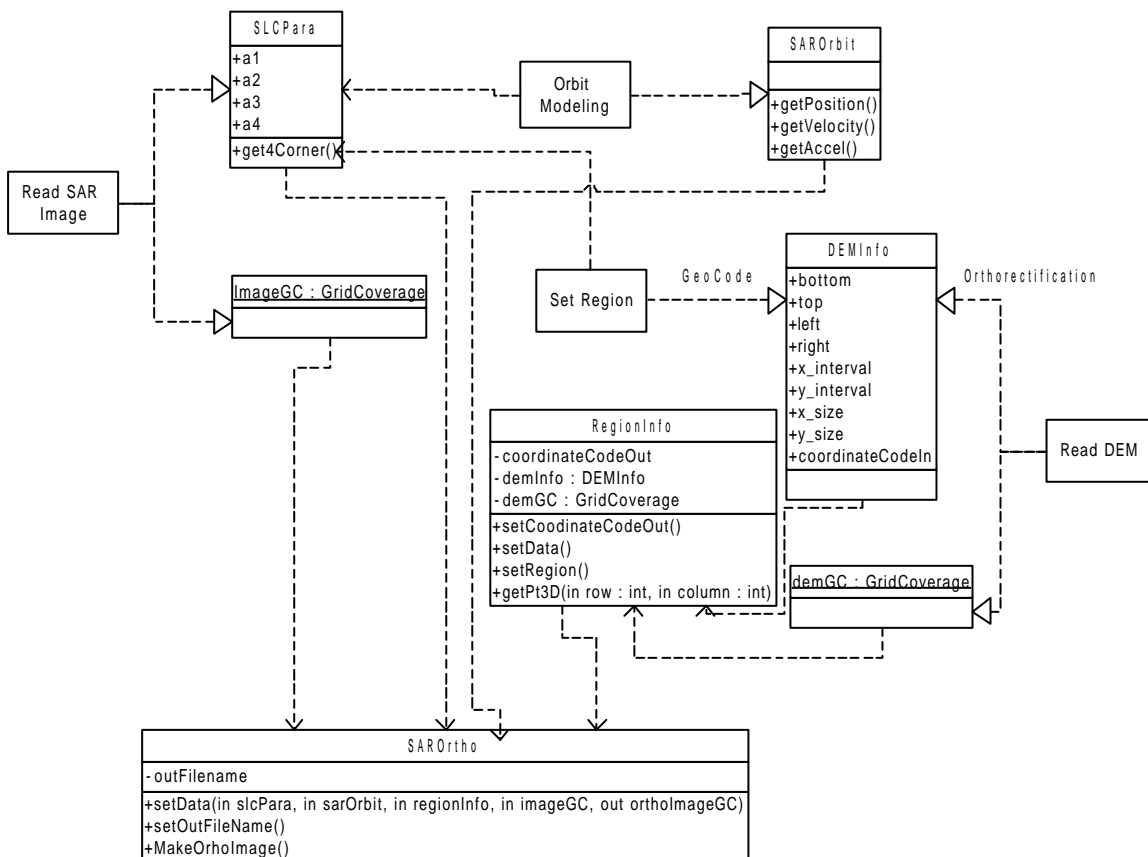

Fig.2. The pilot client Program

Fig. 3.   Component Architecture.

3. Conclusions

In this paper, we described the SAR geocoding module, which is the sub-module of a IRHIS("Integrated RS s/w for High resolution satellite ImageS"). This module is composed of region-info setting module, SAR Orbit Modeling module, Image Import module, and Ortho Image Generation module, and each module has been developed based on OLE (Object Linking and Embedding) / COM (Component Object Model). In Future, through distributing the core component, we hope to aid to develop many other applications.
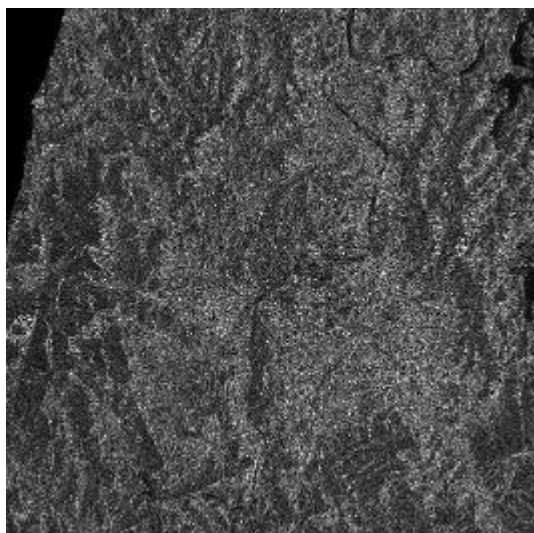
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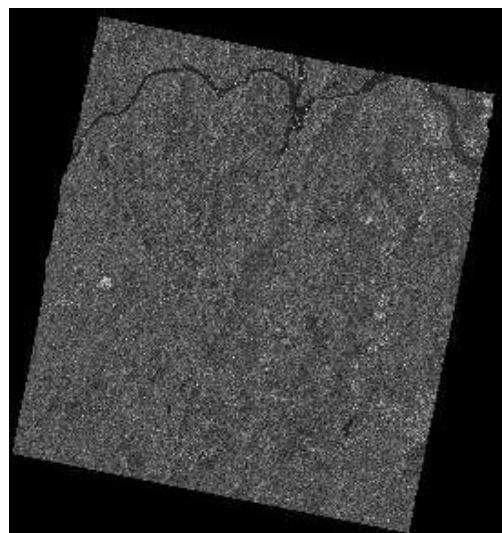[2]   Schreire, G. 1993. SAR Geocoding: Data and Systems, Wichmann.
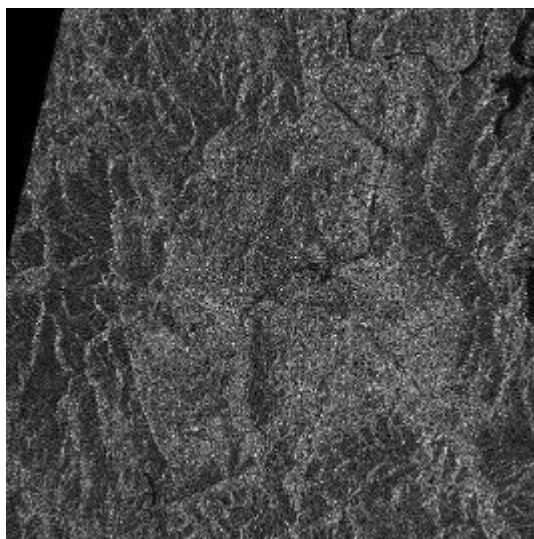
(a)
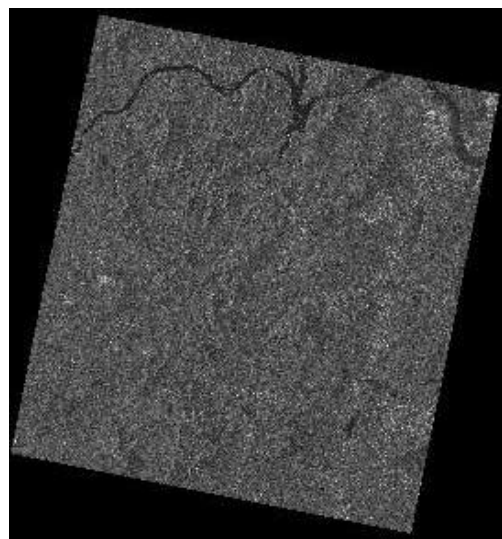
(b)

(c)

(d)

Fig. 4. Result Image : (a) ERS1 Geocoded Image, (b) RADARSAT Geocoded Image,
(c) ERS1 Ortho Image,   and (d) RADARSAT Ortho Image.