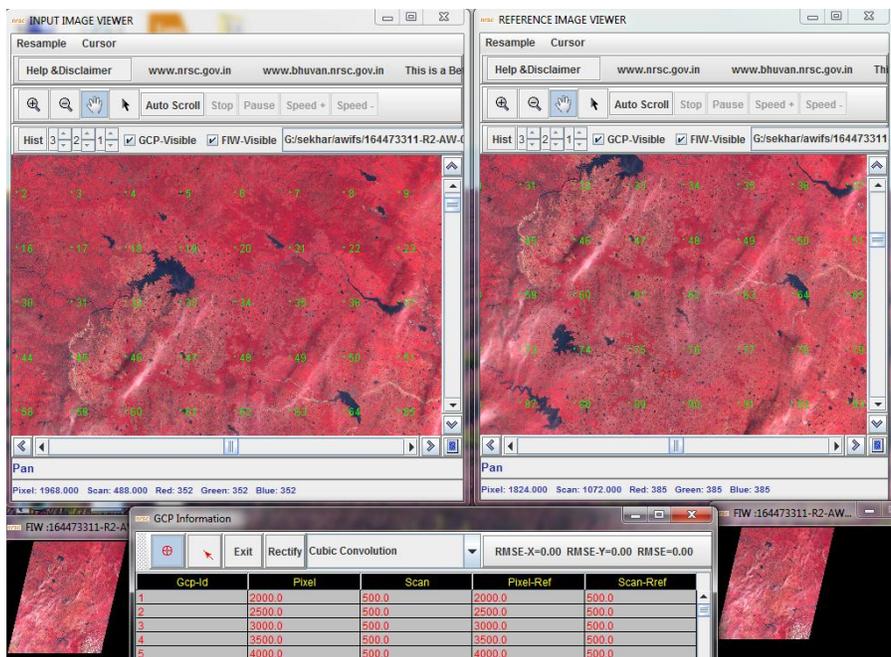


Semi Automatic Registration Tool for Resourcesat Imagery



Contents

1. Introduction
2. Prerequisites
3. Installation and Getting Started
4. Viewer
5. Functionalities of different components in viewer
6. GCP information table
7. Disclaimer

1. Introduction:

Semi-Automatic registration tool is developed to rectify the Resourcesat imagery using polynomial transformation. This utility is designed using the object-oriented approach with an objective of high performance and with user-friendly functionalities for generating the registered images with respect to reference images. It has capability of using multiple processors for efficient image processing.

This module is developed on JAVA and generates automatic tie points and also provides display viewer for delete, modify and adding the control points. This module provides basic image viewing options like panning, zooming, scrolling. The module supports various re-sampling techniques viz., Nearest Neighborhood, bilinear and cubic convolution.

This module is designed for geometric rectification of the satellite imagery with respect its reference for by automatically identifying the Ground Control Points using cross correlation technique. User has to select source and reference IRS-RS2/RS1 images then two windows of equal and each is of half the width of screen size will be pop up and table for showing the statistics. The image will be displayed in the left window and the right window is for the reference image. The second image will be displayed in the in a new window which will be used to view the image but no operations are allowed in view window.

Initially the reference image and the downloaded image was displayed in decimated mode (compressed) by right click on the decimated image will give a full resolution image .The GCP identification is provided with navigation and drag and drop of GCPs to change the identified position. The display shows the image information like gray count, cursor click position in pixel, latitude and longitude. The down loaded image initially displayed in decimated form and with click on decimated image a full resolution. The same facility is provided for reference image.

2. Prerequisites: Pre-installed GDAL 2.0 libraries and JDK 1.7 or above versions.

3. Installation and Getting Started

Download the Semi-automatic registration software from:

http://www.nrsc.gov.in/Satellite_Data_Products_Overview?q=Download_Softwares_1,

Un-compress the zipped file to a local folder. By unzipping Registration.jar and icons folder is seen. Keep the “icons” folder in the “C:\” folder. Do the following steps

- a) Double click on the Registration.bat to run the program .This program will pop up a file chooser
- b) Select the input RS-2/RS-1 GeoTiff file and click on open as shown in figure -1

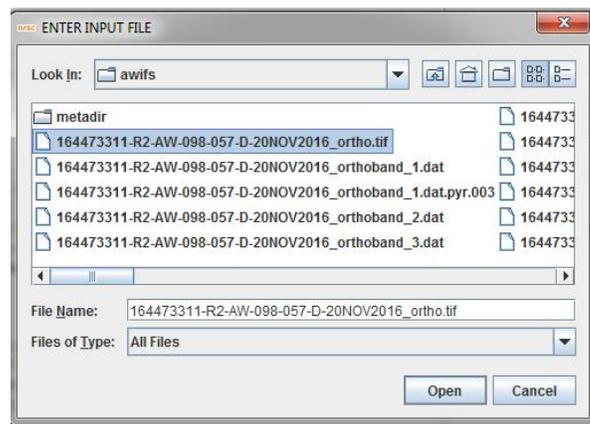


Figure-1 Input file selection window.

- c) After Opening the input file one more file chooser will appear to select the reference file click on the file to open it as shown in figure -2

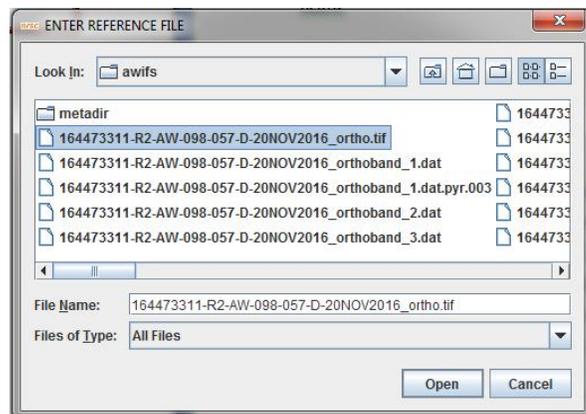


Figure-2 Reference file selection window

d) This will take few seconds to calculate the statistics and generating pyramid layers to optimize the visualization. **Pyramid Layer**, which is the most common and efficient approach for multi-resolution or hierarchical management systems. It is a reduced resolution representation of the dataset as shown in figure-4 that are used to improve display performance. The interface diagram shown in the Figure-3 gives the flow and the parameters used to generation of the pyramid layers. These pyramid layers are takes additional disk space of one fourth of the image for 16-bit and half size for the 8-bit images approximately.

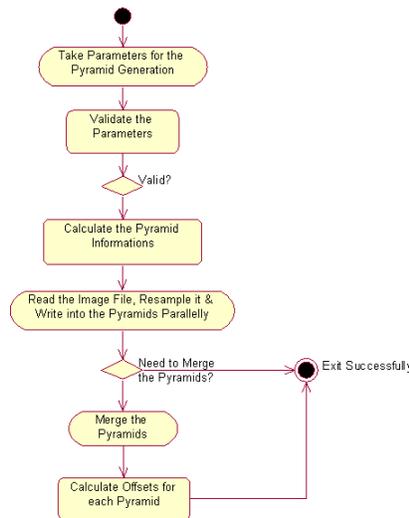


Figure –3 Interface diagram of pyramid layer generation

In each higher level has pixels that are exactly twice as wide as the previous (and thus cover four times the area), this is called a quad-tree pyramidal structure. The base layer of the pyramid is always the highest resolution. Pyramids can speed up display of raster data by fetching only the data at a specified resolution that is required for the display.

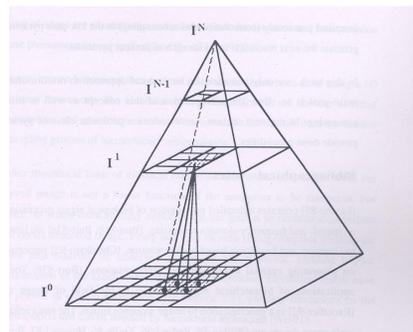


Figure -4 Pyramid Layer Structure

4. Viewer

After the pyramid layers generated images will be displayed. The display module provides **auto scrolling** (roaming) facility to view the entire image before identifying the Ground Control Points (GCPS) and also it is very much helpful in identifying the line losses and pixel drop-outs. The display is provided with buffer technique while displaying image which will scroll the image in an efficient way. The figure-3 shows the flow of buffer technique used while reading the image. The image is panned using the tiled technique, which will be faster than the previous versions in which painting the component consumes the less time. Various connectivity's of image handlers like scrollbars and component action listeners, which will help in manipulating the displayed image according to user convenience. The flexible window size is provide first in the display which can give better understanding of neighbourhood and also helps in the identifying the features in better way, which can be extended up to the full screen size.

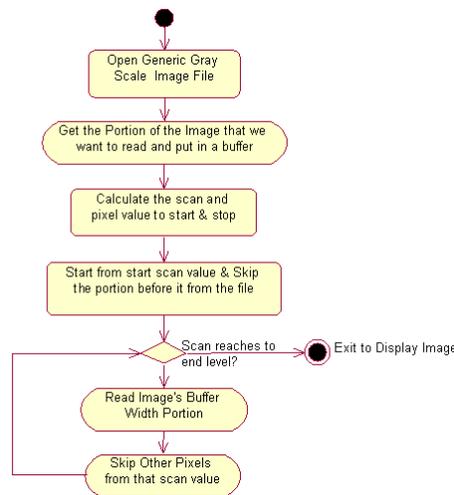


Figure –5 Interface diagram of image Reading

5. Functionalities of different components in viewer

- **Auto Scroll:** This button is for the auto roaming of the image and it roam in pixel direction
- **Stop:** This button is to stop the auto Scrolling
- **Pause:** This button is to pause the auto Scrolling
- **Speed +:** This button will increase speed of the auto scrolling.
- **Speed -:** This button will reduce the speed of the auto scrolling.
- **Hist:** This button is for the histogram enhancement of the image.

-  This button gives the zooming of the image up to four levels
-  This button gives the zoom-out of the image up to six levels
-  This button is to panning the image from one point to the other point to follow the features
-  This button is to unselect the pan and zoom functions.
-  This button is having a functionality of moving the image to top most position
-  This button is having a functionality of moving the image to bottom most position
-  This button is having a functionality of moving the image to left most position
-  This button is having a functionality of moving the image to right most position
-  This button is having a functionality of displaying lowest resolution of the image.
- **GCP Visible:** This option is given to the user for switching on and off the GCP ID and GCP marking to select the target point exactly.
- **Cursor:** This menu is having different types and colors of cursors for selecting the GCPS precisely.
- **Visible:** This option is given to the user for switching on and off the GCP ID and GCP marking to select the target point exactly.
- **Re-sample:** This menu bar give sub-menu bars shown below, it allows the user to use the Cubic Convolution, Bilinear, Nearest Neighbourhood techniques

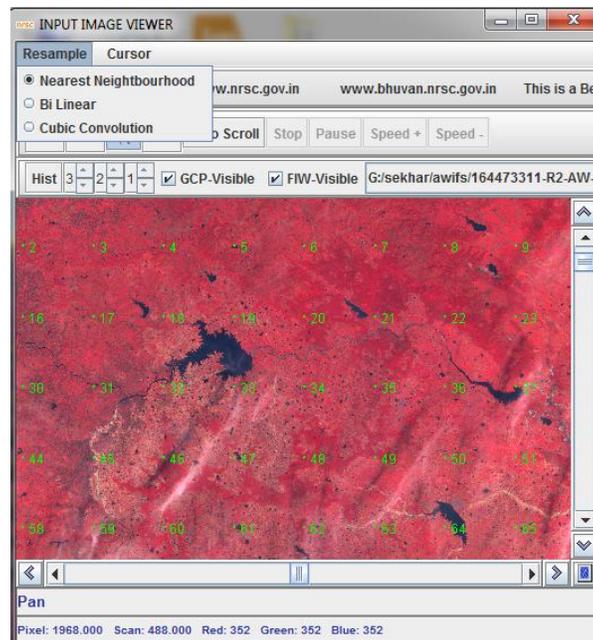


Figure 6: Re-sampling method selection menu

The different **re-sampling** techniques for the zooming are given for easy and precise identification geometric features.

- Various Cursor shapes and colors is given to the user to select the GCP and move .following figure shows where to select the cursor shapes and colors for these selected cursors.

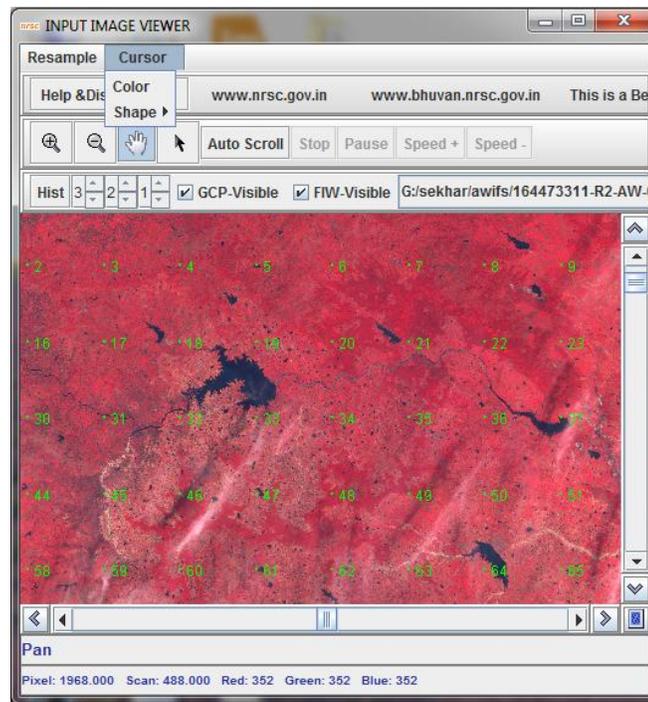


Figure –7 Cursor shapes and color selection menu

6. GCP Information Table

- This GUI provides tools to add, delete and move GCPS to facilitate the user in case automatic tie points fails. This GUI also shows the RMSE error. The rectification of the image with reference image using polynomial second order done by selecting the button rectify. Selection of Ground Control Points done by the user by selecting the GCP. Adjust the GCP positions using MOVE GCP option by drag and drop the poison of marked GCP. Delete facility is provided to delete the points, which is having high error. The GCP table is shown in Figure-8



This option is given to mark new the GCPs.



This option is given to drag and drop the GCP for changing the position.



Rectify: The option is given to rectify the image with reference image using Polynomial second order.



: Re-sampling used to rectify the source image with Reference image

- **Delete GCP:** Select the GCP by clicking on the GCP table. The Same GCP can be deleted using right mouse click.
- **Exit:** This is the push button for the user to exit the module.

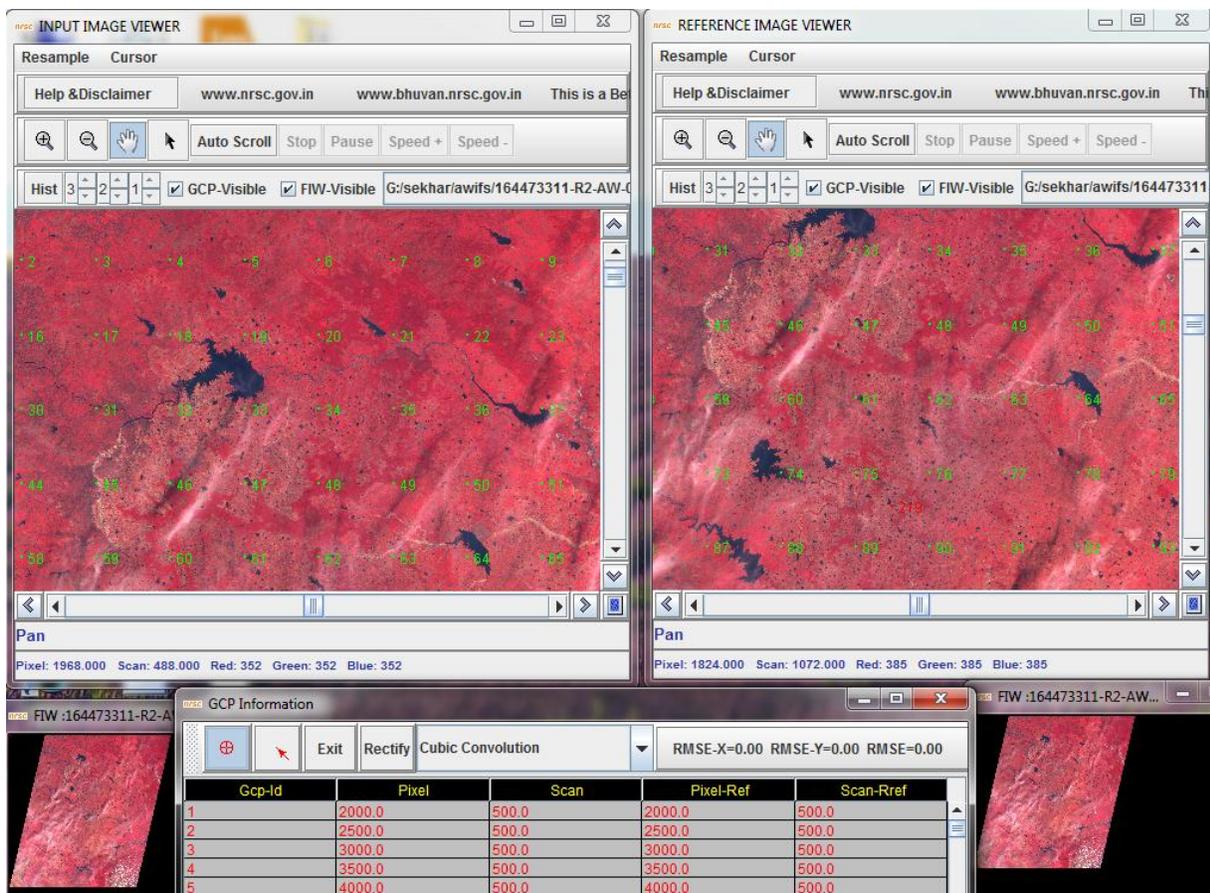


Figure-8 Visualization module

7. Disclaimer

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