LISS-3 ORTHO RECTIFIED TILES
FOR BHUVAN NOEDA

SDAPSA

National Remote Sensing Centre

Introduction

This document briefly describes Resourcesat-1 & LISS-3 sensor, Orthorectified tiles covering Indian region, generation methodology and its accuracies.

Tiles Specification

Tile related

- Tile Size : 15' x 15'
- Collar : 40 pixels
- Naming Convention : As per SOI OSM

Projection related

- Projection : Geographic Lat/Long
- Datum : WGS-84
- Resolution : 0.000225 (~25m).

Image Related

- Image File Format : GeoTIFF
- Number of Bands : 4 (BAND 2, 3, 4, 5)
- Radiometric Resolution : 8 bits
- Correction level : Orthorectified

Naming Convention

Image File naming convention contains the following information

- Sensor
- SOI OSM 1deg x 1deg area
- Path & Row
- Date of Acquisition
- Band Information

FileName: **SS-TTTTTTT-PPP-RRR-DDMMMYY-BANDN.tif**

SS	-	LISS-3 Sensor (L3)
TTTTTTT	-	SOI OSM 15' x 15' tile
PPP	-	Path
RRR	-	Row
DDMMMYY	-	Date of Acquisition
N	-	Band number (2, 3, 4, 5)

Ex: L3-NF42D09-090-055-17Oct08-BAND2.tif

ResourceSat-1

The RESOURCESAT-1 (IRS-P6) is envisaged as the continuity mission to IRS-1C/1D, with enhanced capabilities both in the payload and the platform, to meet the increasing demands of the user community. The objectives of the mission are:

* To provide continued remote sensing data services on an operational basis for integrated land and water resources management at micro level, with enhanced spectral and spatial coverage and stereo imaging.

* To further carry out studies in advanced areas of user applications like improved crop discrimination, crop yield, crop stress, pest/disease surveillance, disaster management etc.,.

The life of the mission is planned to be five years. The satellite was launched by the indigenously built Polar Satellite Launch Vehicle on October 17, 2003. The orbit parameters of IRS-P6 are same as IRS-1C.

Orbits/cycle	341
Semi major axis	7195.11 km
Altitude	817 km

Inclination	98.69 deg
Eccentricity	0.001
Number of orbits/day	14
Orbital period	101.35 minutes
Repetivity	24 days
Distance between adjacent paths	117.5 km
Distance between successive ground tracks	2820 km
Ground trace velocity	6.65 km/sec
Equatorial crossing time	10.30 A.M (at descending node)

The payload system of IRS-P6 consists of three solid state cameras:

1. A high resolution multispectral sensor - **LISS-IV**
2. A medium resolution multispectral sensor - **LISS-III**
3. An Advanced Wide Field Sensor – **AWiFS**

LISS-3 Sensor

The LISS-III camera is identical to the LISS-III flown in IRS-1C/1D spacecraft except that the spatial resolution of SWIR band (B5) is also 23.5 m (same as that of B2, B3, B4).

LISS-III covers a swath of 141 Km in all the 4 bands.The LISS-III is a multi-spectral camera operating in four spectral bands, three in the visible and near infrared and one in the SWIR region, as in the case of IRS-1C/1D.

The new feature in IRS-P6 LISS-III camera is the SWIR band (1.55 to 1.7 microns), which provides data with a

spatial resolution of 23.5m unlike in IRS-1C/1D (where the spatial resolution is 70.5 m).

The LISS-III Camera operates in four spectral bands in the VNIR and SWIR range. Each band consists of a separate lens assembly and a linear array CCD. Each lens assembly is realised with 8 refractive lens elements (a combination of convex and concave lenses), an interference filter and a neutral density filter.

The VNIR bands (B2, B3, B4) use 6,000 element CCDs each with pixel size of 10 microns x 7 microns. The SWIR band (B5) uses a 6,000 element Indium Gallium Arsenide CCD with pixel size of 13 micron x 13 micron. This SWIR CCD is a new device employing CMOS readout technique for each pixel, thereby improving noise performance. The major specifications of LISS-III camera are given in Table

IGFOV	**23.5 m**
Spectral Bands	**B2 0.52 - 0.59(Microns)** **B3 0.62 - 0.68** **B4 0.77 - 0.86** **B5 1.55 - 1.70**
Swath	**141 Km**
Average Saturation	**B2 27.8 radiance** **B3 28.4 (mw/cm2/sr/micron)** **B4 32.0** **B5 7.64**
Integration time	**3.32 msec**
Quantization	**7 bits** **SWIR band has 10 bit quantisation, selected 7 bits out of 10 bits will be transmitted by the data handling system**
No. of gains	**4 (for visible and NIR bands)**

Ortho-rectification process

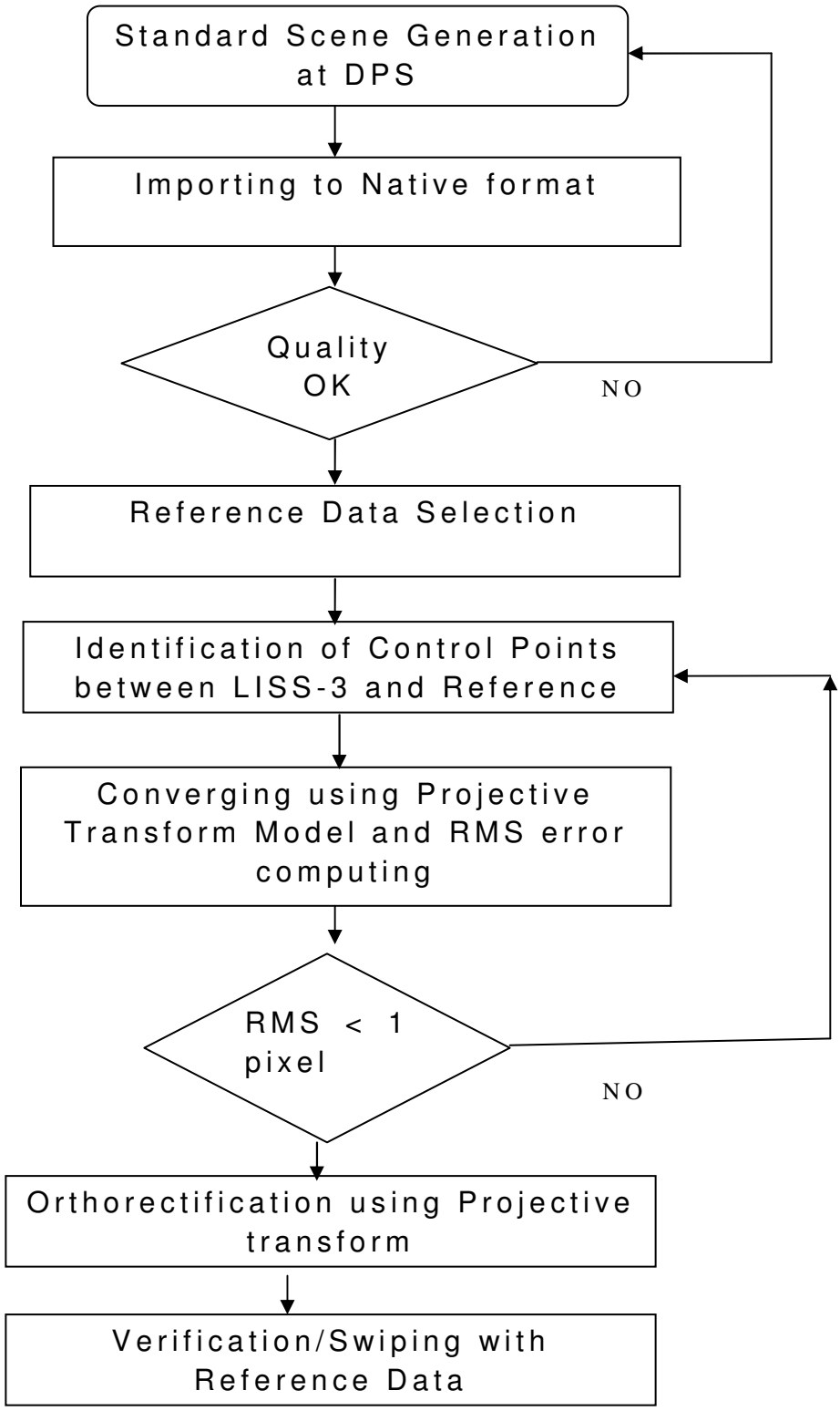
The ortho-rectification process is carried out for correcting the following errors associated with satellite images

- Terrain relief error
- Scale variation
- Sensor attitude / orientation
- Internal errors.

The following steps were followed broadly to correct the image data

1. Control points were identified between Input LISS-3 scenes and Reference data.
2. Height was obtained from Reference DEM.
3. Around 20-30 points were identified in such way that these are distributed across all corners of image.
4. Projective transform is used for correcting LISS-3 image.

Flow Chart


Standard Scene Generation at DPS
Importing to Native format
Quality OK
NO
Reference Data Selection
Identification of Control Points between LISS-3 and Reference
Converging using Projective Transform Model and RMS error computing
RMS < 1 pixel
NO
Orthorectification using Projective transform
Verification/Swiping with Reference Data

Procedure:

1. Importing to LISS-3 scenes
2. Image Analysis package is being used for ortho-rectification.
3. From Path/Row scheme identify the required reference data in which LISS-3 scene is covered.
4. Projective transform is used as a registration model.
5. Carto DEM & other reference DEMs were given as a elevation source.
6. Around 20-30 GCPs are identified and distributed across the scene.
7. Repeat the process till reached RMS error is less than 1 pixel.
8. Ortho-rectification was carried out.
9. Registered image is verified with reference data using the swipe option.

Accuracy

The plannimetric accuracy of ortho-rectified data is 100m in CE90.