

A Geomatics of the Image Processing: Image Georefransing

Sainath P. Aher
P.G. Dept of Geography,
Sangamner College,
Sangamner: 422605

Amol N. Parande
C-DAC (Centre for advance
Computing), ACTS, Aundh,
Pune-411007

Pragati P. Deshmukh
P.G. Dept.of Geography,
Sangamner College,
Sangamner-422605

ABSTRACT

In the recent era the spatial information is studied or analysis with the help of Satellite Images, Aerial Photographs which is captured by the Remote Sensing (RS) process with the aid of satellite and Aircrafts. The spatial information is scan by the various satellite is most of the time not geometrically correct (Raw Image) because of Remote Sensing type (Digital camera, along tracks scanner, across track scanner), platform (airborne versus satellites) and total field view. This type of raw image is not useful for the further application related to spatial science i. e. spatial information recording, land mapping, planning and management etc.

These Remote Sensing data has been need to correct geometrically for reduce the distortion in the image and also in the practical field. In the 'Image Processing' it can be possible by the 'Digital Image Georefransing' techniques. This image processing (pre-processing) involves the correcting the distortion in the image with aid of computer (GIS software) for the accurate matching with world coordinates (x-row, y-column) and real world. These corrected images have the highest geometric integrity in the image and practical field.

Keywords:

Image Processing, Remote Sensing, Satellite, distortion.

1. INTRODUCTION

Spatial surface is the undulating owing to the physical diversity over the earth surface and its shape (Elliptical). The representation of the spatial information is shown by the plain map which is based on its specific geometrical characteristic (Latitude, Longitude). The accurate high resolution data of earth surface is available today which is captured by Satellite Remote Sensing. This data of the earth surface is scan by the Remote Sensing (RS) techniques without the physical contact with the surface objects (Feature). In spite of this data has a good resolution as well as coverage it has geometrically not corrected or not useful for the consisting application. Thus, it has needed to correct geometrically throughout the process of 'Georefransing' which correct the systematic and nonsystematic distortion of Image. These corrected images have widely applications in the field of engineering resources management, administration, revenue, and land management.

2. OBJECTIVES

In the given study further objectives are taken to the consideration during the research work. To infer the 'Georefransing' techniques along with the practicing in the Selected Satellite Image. Discuss about corrected geometrically corrected image and its various application. To transform the Remotely sensed image into a map with a scale and projection accuracy properties. Present the role of RS and GIS techniques in the Image Processing. Acqision of the GCPs (Ground Control Point) and its transformation in the raw image is possible by the Georefransing processing. The mapping of some regions can be possible by using Georefransing image (Geometrically Corrected) for the base map preparations.

3. GEOMETRIC DISTORTION & CORRECTION

Due to the geometric errors in the image, it does not faithfully reproduce the image of a grid on the earth. Similarly, the distortion of scale is generating in the image which cannot match the correct with any corresponding distances on the actual ground (Map Scale). This scale variation produces owing to opto-mechanical scanner, the major cause of distortion is due to geometry of scanning viz. scan skew, mirror scan velocity, non-linearity's, satellite velocity vector (ground track), panoramic distortion, earth rotation, optics distortion etc. are the 'systematic' errors and can be corrected by sensor characteristic data, ephemeris and imaging geometry by using suitable algorithms. However, the geometric errors produced by platform characteristic such as altitude variation, attitude distortion and orbit drift all produce various distortion random in nature and cannot be easily modeled to produce images with high degree of geometric precision.

(Fig1: Matrix of geometrically correct output pixels superimposed on matrix of original, distorted input pixels.).

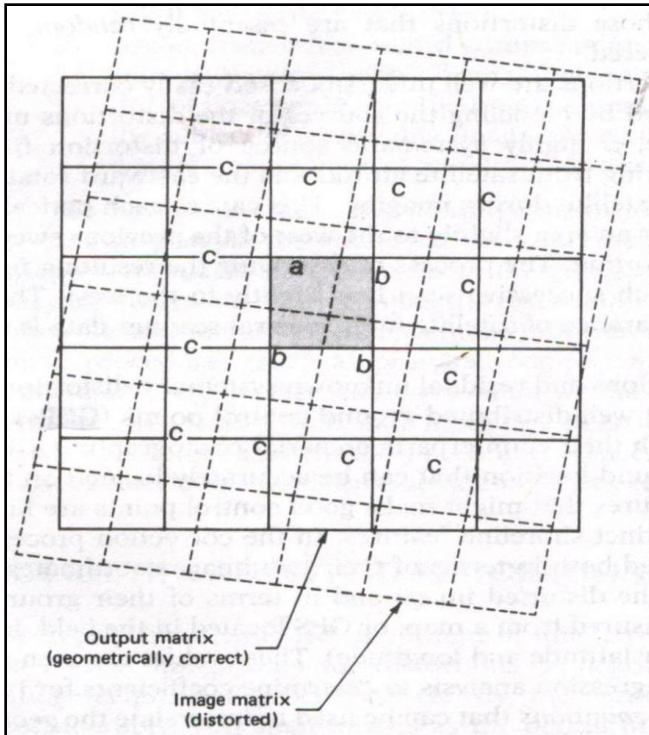


Figure 1: Matrix of geometrically correct output pixels superimposed on matrix of original, distorted input pixels.

The process of Georefrancing is to transfers the distorted image co-ordinates to the specific map projection. This could be thought of as involving recovering the correct geometry and image to map registration i.e. transforming the image coordinates system to a particular map coordinates system. It can be reduce by 'Ground Control Point' (GCP) in order to generate an accurate transformation model (some time referred to as mapping function) to relate the image coordinates to a map coordinate. GCPs are futures which can be uniquely identified in the image and whose map coordinates are known or can be determined. The coordinates (latitude and longitude) of GCPs can be found on the existing maps or from 'GPS Surveys'. It can be collect from the road intersection, airport runway intersection, river confluence, prominent coastline features etc. the coordinate system of the raw image is expressed in terms of pixels and lines (Columns and rows). The map coordinate systems are usually oriented in a "Cartesian" form of x and y coordinates corresponding to a latitude (x) and longitude (y). Thus, we have two 'Cartesian Coordinate System' (CCS), one describing the location of GCPs in the reference map-(x, y) - and the other dining the GCPs in the input image (u, v). These two coordinate system can be related by a pair of mapping functions such that

$$u = f(x, y)$$

$$v = g(x, y)$$

Thus, the geometric correction, we discussed above, is the transformation of the remotely sensed image such that it has the location and scale properties of the desired map projection. The procedure employed for geometric correction has a wider

application in other areas of 'Digital Processing of Remote Sensing Image' (Ref-George Joseph, *fundamental of Remote sensing*)

4. IMAGE GEOREFERENCING

Image processing involves the manipulation and interpretation of digital image with the aid of computer. Image processing that can be mathematical complex. When the satellite image is captured that time it is in the form of raw image because it is distorted image owing to the geometrical distortion (spatial errors) in the image. These types of image cannot use directly as a map base without subsequent processing. The distortion of range from variation in the altitude and velocity of the sensor platform, panoramic distortion, earth curvature, atmospheric refraction, relief displacement. This systematic distortion can be corrected by the GCP (Ground Control Point) occurring in an image. GCPs are futures of known ground location that can be accurately located on the digital imagery (Typically measured from map or GPS). This operation aim to correct distorted image data to create a more faithful representation of original scene which change the geometry of image to the real world. Georeferencing is the process by which the geometry of an image area is made planimetric (Haralik, 1973).

5. APPLICATION OF IMAGE PROCESSING:

The georefranced image can be applied for the micro level land management and spatial planning. It may remove the distortion which is caused by the topographic replacement in images. This is the most precise geometric correction since each pixel can be referred not only by its row and column in a digital image matrix after rectification is completed, but it is also rigorously referenced in degrees, feet or meters in a standard map projection. It is also useful for the accurate data, direction and distance measurements. We can 'Registration' the adjusant image from the Rectified image. It has the wider application in other areas of 'Digital Processing of Remote Sensing Image' for the Digital Image Processing (DIP). Rectified Satellite image can be use for the distance mapping from one place to another at the same time it can use for area and coverage mapping also.

6. RESULTS AND CONCLUSION

An attempt has been made in this research paper, to shows the capabilities of the RS and GIS techniques in the 'Image Processing'. In this attempt completed the one of the practical task with the 'Pragraten am Grobvenediger, Austria' satellite image (which captured by Quick Bird Satellite, 60cm). Here, we are Georefranced this image and obtained the cleared geometry for the further application. This task completed here with help of GIS software (Global Mapper11) and shows the few further application of Georefrancing image.



Figure 2: Input Satellite Image of Pragraten am Grobenedig, Austria.

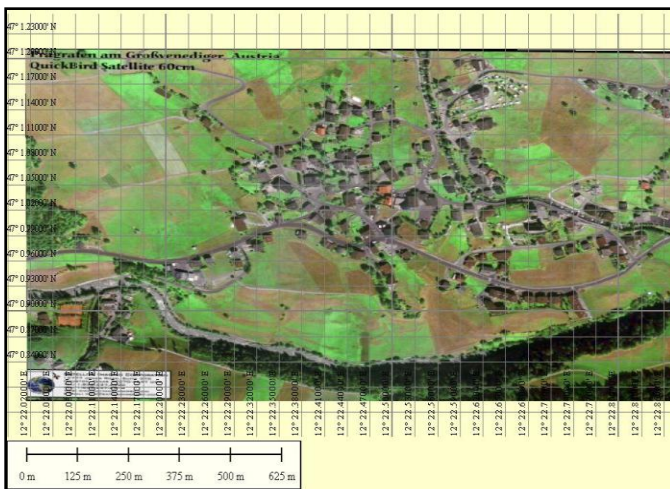


Figure 3: Output Satellite images of Pragraten am Grobenedig, Austria (After Georefrancing).

In this the further attempt done the Procedure on the Satellite Image of India, it has Georefranced in the 'Global Mapper 11' software. The base image is downloading from the internet while the aquation of the GCPs (x, y coordinate) of the same image is from Google Earth Software. The two state mapping i.e. Kerala and Maharashtra has completed here for the shows the area mapping capabilities of Image after the correction of geometry in the GIS software (Georeferencing). The base map is shown here, along with x, y coordinates which indicating the global position of this particular region.

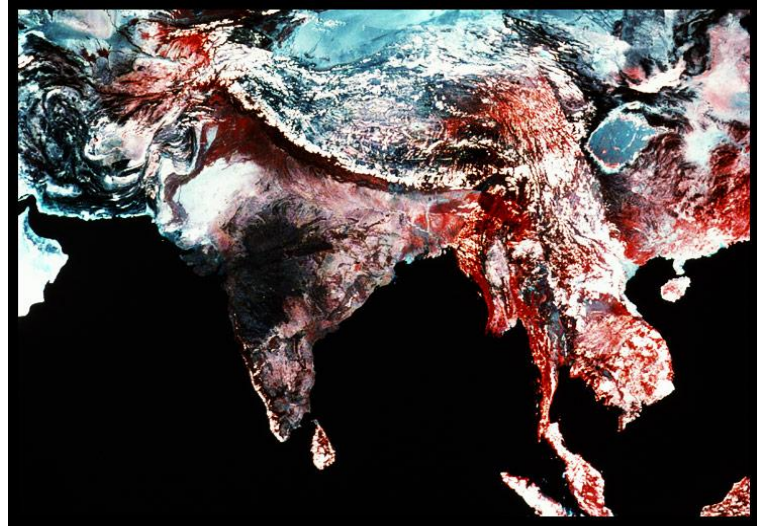


Figure 4: Input Satellite Image of India and surrounded Part

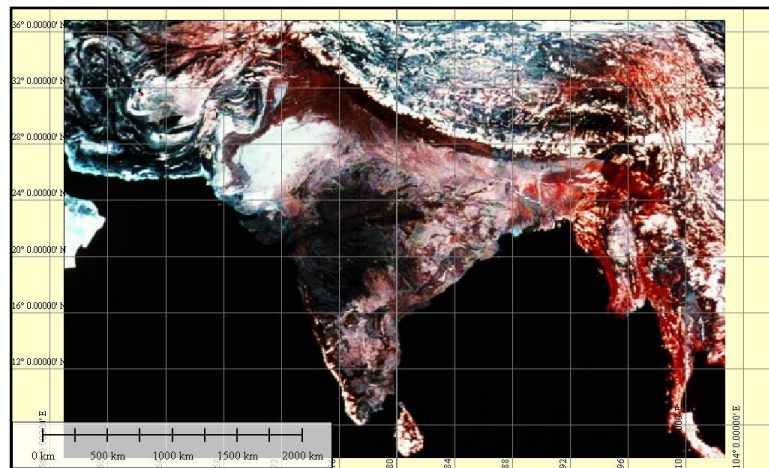


Figure 5: Geometrically Corrected Satellite Image of India and surrounded Part (After Georefrancing)

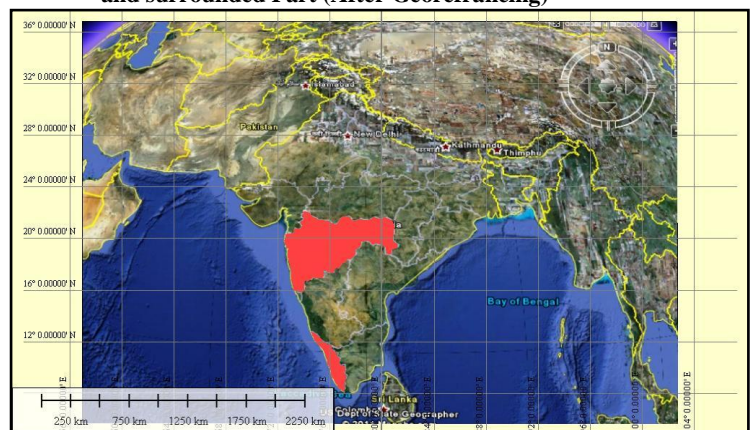


Figure 6: Area mapped over satellite image after Georefrancing of Maharashtra and Kerala state (India).

(Ref. All images- www.satelliteimage.com. Quick Bird, Pragraten am Grobvenediger, Austria and satellite Image of India, Google Image from Google Earth software)

7. ACKNOWLEDGMENTS

We are very thankful to our respected Chairman Dr. Sanjay Malpani, Principal Dr. K. K. Deshmukh, and HOD Prof. Bairagi S. I. of Geography Department, Sangamner College, Sangamner for always positive approach concerning new innovation. We would also thanks to Department staff Mr. Ravindra D. Gaikwad, Mr. Navale Sanjay, Mr. Sandip Deshmukh, Mr. Kiran Wakole and Mr. Bhagvat Mama for providing the necessary facilities, surveying equipments for the data collection and surveying in the field. Last but not the least we especially appreciative to our parents as far as our inspiration Pritam and Dilip for their support and encouragement during the preparation of this research work. We also thanks to our Departmental Students of M.A./M.Sc Geoinformatics University of Pune and C DAC Pune as well as our friends Amol Ghule, Prafful Garad, Amol Parande, Ramdas Aher for timely helps. We would like to express our thanks to all respected teachers and students of Sangamner Collages for their timely help during this research study.

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