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Research Article

# Various types of design technique and their importance for improving performance in digital enhancement application

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## Abstract

In imaging science, image processing is processing of images using mathematical operations by using any form of signal processing for which the input is an image, such as a photograph or video frame; the output of image processing may be either an image or a set of characteristics or parameters related to the image.[1] Most image-processing techniques involve treating the image as a two-dimensional signal and applying standard signal-processing techniques to it. This paper describes the basic technological aspects of Digital Image Processing with special reference to satellite image processing. Basically, all satellite image-processing operations can be grouped into three categories: Image Rectification and Restoration, Enhancement and Information Extraction. The former deals with initial processing of raw image data to correct for geometric distortion, to calibrate the data radio metrically and to eliminate noise present in the data. The enhancement procedures are applied to image data in order to effectively display the data for subsequent visual interpretation. It involves techniques for increasing the visual distinction between features in a scene. The objective of the information extraction operations is to replace visual analysis of the image data with quantitative techniques for automating the identification of features in a scene. This involves the analysis of multispectral image data and the application of statistically based decision rules for determining the land cover identity of each pixel in an image. The intent of classification process is to categorize all pixels in a digital image into one of several land cover classes or themes. This classified data may be used to produce thematic maps of the land cover present in an image..

## Introduction

Image processing usually refers to digital image processing, but optical and analog image processing also are possible. This article is about general techniques that apply to all of them. The acquisition of images (producing the input image in the first place) is referred to as imaging.

Pictures are the most common and convenient means of conveying or transmitting information. A picture is worth a thousand words. Pictures concisely convey information about positions, sizes and inter-relationships between objects. They portray spatial information that we can recognize as objects. Human beings are good at deriving information from such images, because of our innate visual and mental abilities. About 75% of the information received by human is in pictorial form.

In the present context, the analysis of pictures that employ an overhead perspective, including the radiation not visible to human eye are considered Thus our discussion will be focussing on analysis of remotely sensed images. These images are represented in digital form. When represented as numbers, brightness can be added, subtracted, multiplied, divided and, in general, subjected to statistical manipulations that are not possible if an image is presented only as a photograph. Although digital analysis of remotely sensed data dates from the early days of remote sensing, the launch of the first Land sat earth observation satellite in 1972 began an era of increasing interest in machine processing (Campbell, 1996 and Jensen, 1996). Previously, digital remote sensing data could be analyzed only at specialized remote sensing laboratories. Specialized equipment and trained personnel necessary to conduct routine machine analysis of data were not widely available, in part because of limited availability of digital remote sensing data and a lack of appreciation of their qualities.

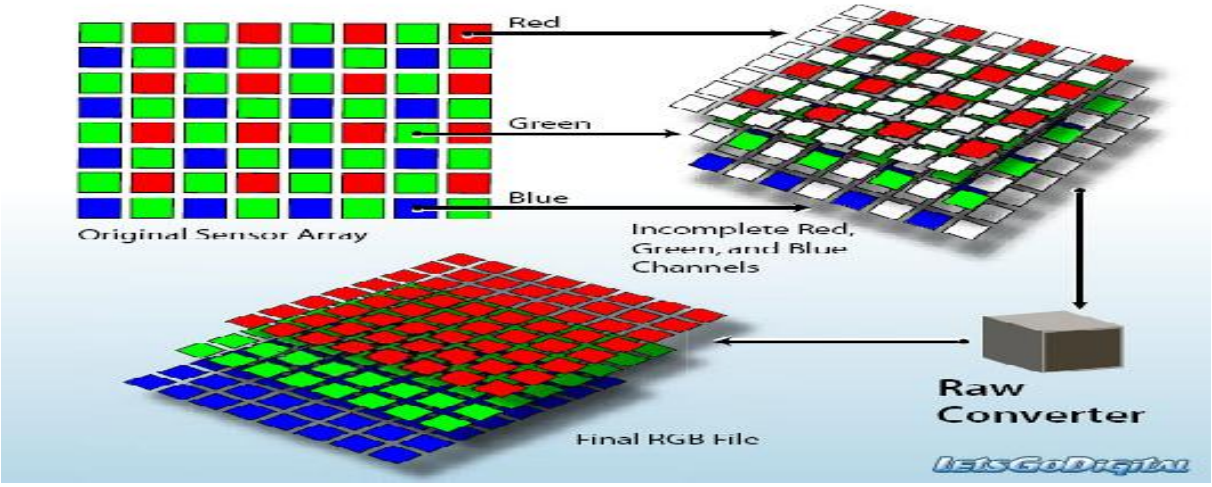


**Figure 1:- spatial information**

## Digital image:-

Closely related to image processing are computer graphics and computer vision. In computer graphics, images are manually made from physical models of objects, environments, and lighting, instead of being acquired (via imaging devices such as cameras) from natural scenes, as in most animated movies. Computer vision, on the other hand, is often considered high-level image processing out of which a machine/computer/software intends to decipher the physical contents of an image or a sequence of images (e.g., videos or 3D full-body magnetic resonance scans).A digital remotely sensed image is typically composed of picture elements (pixels) located at the intersection of each row i and column j in each K bands of imagery. Associated with each pixel is a number known as Digital Number (DN) or Brightness Value (BV), that depicts the average radiance of a relatively small area within a scene (Fig. 1). A smaller number indicates low average radiance from the area and the high number is an indicator of high radiant properties of the area.The size of this area effects the reproduction of details within the scene. As pixel size is reduced more scene detail is presented in digital representation While displaying the different bands of a multispectral data set, images obtained in different bands is displayed in image planes (other than their own) the colours composite is regarded as False Colour Composite (FCC). High spectral resolution is important when producing cooler components. For a true collar composite an image data used in red, green and blue spectral region must be assigned bits of red, green and blue image processor frame buffer memory. A colours infrared composite 'standard false colours composite' is displayed by placing the infrared, red, green in the red, green and blue frame buffer memory (Fig. 2). In this healthy vegetation shows up in shades of red because vegetation absorbs most of green and red energy but reflects approximately half of incident Infrared energy. Urban areas reflect equal portions

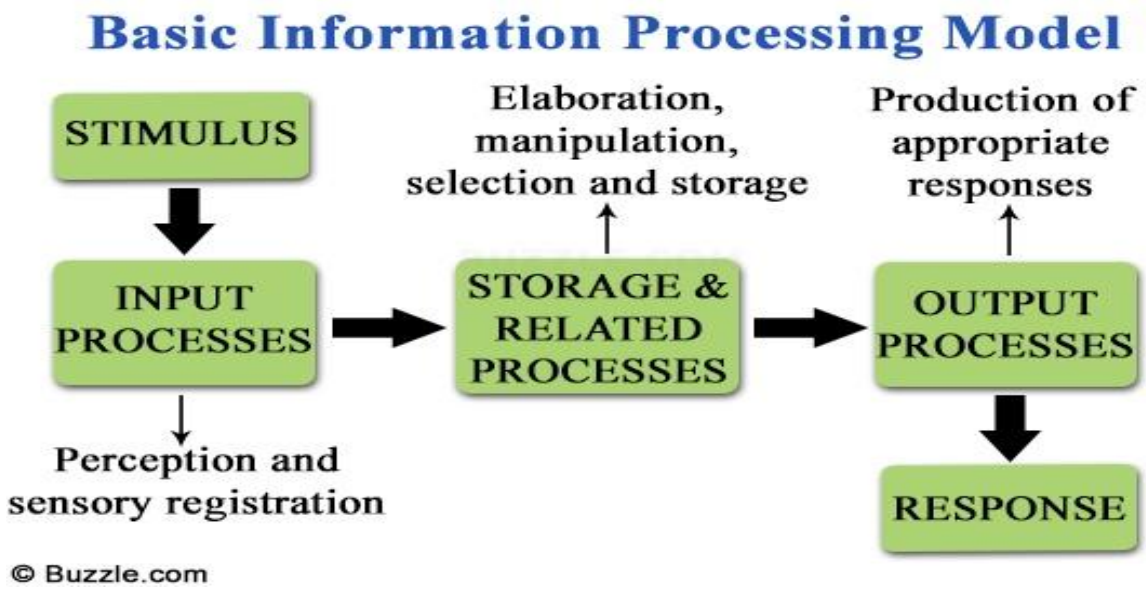


**Figure 2. Information process model**

## Image Rectification:

Geometric distortions manifest themselves as errors in the position of a pixel relative to other pixels in the scene and with respect to their absolute position within some defined map projection. If left uncorrected, these geometric distortions render any data extracted from the image useless. This is particularly so if the information is to be compared to other data sets, be it from another image or a GIS data set. Distortions occur for many reason The various Image Processing techniques are:

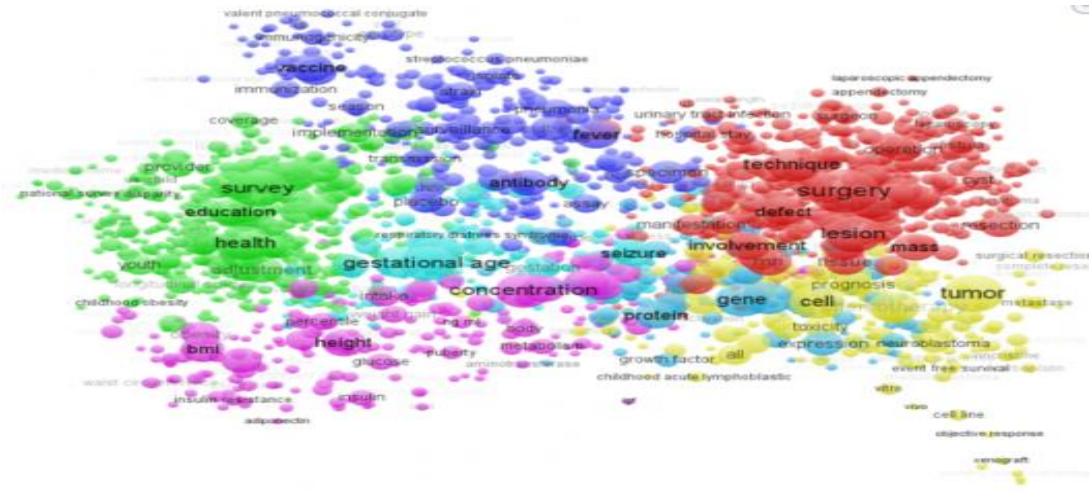


**Figure 3:-Image testore technique**

- Image representation
- Image pre-processing
- Image enhancement
- Image restoration
- Image analysis
- Image reconstruction
- Image data compression

## Image pre-processing

## Scaling:

The theme of the technique of magnification is to have a closer view by magnifying or zooming the interested part in the imagery. By reduction, we can bring the unmanageable size of data to a manageable limit. For re sampling an image Nearest Neighbourhood, Linear, or cubic convolution techniques

## Magnification:

This is usually done to improve the scale of display for visual interpretation or sometimes to match the scale of one image to another. To magnify an image by a factor of 2, each pixel of the original image is replaced by a block of 2x2 pixels, all with the same brightness value as the original pixel.

## Image enhancement technique

Image editing encompasses the processes of altering images, whether they are digital photographs, traditional photochemical photographs, or illustrations. Traditional analog image editing is known as photo retouching, using tools such as an airbrush to modify photographs, or editing illustrations with any traditional art medium. Graphic software programs, which can be broadly grouped into vector graphics editors, raster graphics editors, and 3D modelers, are the primary tools with which a user may manipulate, enhance, and transform images. Many image editing programs are also used to render or create computer art from scratch. Image enhancement techniques improve the quality of an image as perceived by a human. These techniques are most useful because many satellite images when examined on a colour display give inadequate information for image interpretation. There is no conscious effort to improve the fidelity of the image with regard to some ideal form of the image. There exists a wide variety of techniques for improving image quality. The contrast stretch, density slicing, edge enhancement, and spatial filtering are the more commonly used techniques. Image enhancement is attempted after the image is corrected for geometric and radiometric distortions. Image enhancement methods are applied separately to each band of a multispectral image. Digital technique have been found to be most satisfactory than the photographic technique for image enhancement, because of the precision and wide variety of digital processes. The satellites cover different portions of the electromagnetic spectrum and record the incoming radiations at different spatial, temporal, and spectral resolutions. Most of these sensors operate in two modes: multispectral mode and the panchromatic mode.The panchromatic mode corresponds to the observation over a broad spectral band (similar to a typical black and white photograph) and the multispectral (color) mode corresponds to the observation in a number of relatively narrower bands. For example in the IRS – 1D, LISS III operates in the multispectral mode. It records energy in the green (0.52 – 0.59 µm), red (0.62-0.68 µm), near infrared (0.77- 0.86 µm) and mid-infrared (1.55 – 1.70 µm).

In the same satellite PAN operates in the panchromatic mode. SPOT is another satellite, which has a combination of sensor operating in the multispectral and panchromatic mode. Above information is also expressed by saying that the multispectral mode has a better spectral resolution than the panchromatic mode. Now coming to the spatial resolution, most of the satellites are such that the panchromatic mode has a better spatial resolution than the multispectral mode, for e.g. in IRS -1C, PAN has a spatial resolution of 5.8 m whereas in the case of LISS it is 23.5 m. Better is the spatial resolution, more detailed information about a land use is present in the imagery, hence usually PAN data is used for Observing and separating various features. Both theses type of sensors have their particular utility as per the need of user. If the need of the user is to separate two different kind of land uses, LISS III is used, whereas for a detailed map preparation of any area, PAN imagery is extremely useful.

Image Fusion is the combination of two or more different images to form a new image (by using a certain algorithm). The commonly applied Image Fusion Techniques are

1. IHS Transformation
2. PCA
3. Bravely Transform
4. Band Substitution

## Conclusion

Digital image processing does of satellite data can be primarily grouped into three Categories: Image Rectification and Restoration, Enhancement and Information extraction. Image rectification is the pre-processing of satellite data for geometric and radiometric connections. Enhancement is applied to image data in order to effectively display data for subsequent visual interpretation. Information extraction is based on digital classification and is used for generating digital thematic map.

## References

1. Campbell, J.B. 1996. Introduction to Remote Sensing. Taylor & Francis, London
2. Jensen, J.R. 1996. Introduction to Digital Image Processing: A Remote Sensing Perspective. Practice Hall, New Jersey.
3. Lillis and, T.M. and Kiefer, R. 1993. remote Sensing. Image Interpretation. John Wiley, New York