A Review paper on geographical data based image fusion techniques application in location finding

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Abstract— *In remote sensing applications, the increasing availability of space borne sensors gives a motivation for different image fusion algorithms. Several situations in image processing require high spatial and high spectral resolution in a single image. Most of the available equipment is not capable of providing such data convincingly. Image fusion techniques allow the integration of different information sources. The fused image can have complementary spatial and spectral resolution characteristics. However, the standard image fusion techniques can distort the spectral information of the multispectral data while merging. In satellite imaging, two types of images are available. The panchromatic image acquired by satellites is transmitted with the maximum resolution available and the multispectral data are transmitted with coarser resolution. This will usually be two or four times lower. At the receiver station, the panchromatic image is merged with the multispectral data to convey more information.*

Keywords— geographical, location finding,

I. INTRODUCTION

Image processing is gaining more importance in the areas of science and technology. It constitutes a promising area of research due to ever growing importance of scientific visualization in various applications. The need of better performance in the image processing increased the demands on computational efficiencies. Various alternatives are available to improve the performance of image processing using specialized architectures. Image fusion is a process of merging the relevant information from several input images into a single image. It is extensively used in image processing applications like management of natural resources, remote sensing, defense and medical imaging. Various fusion techniques are available to improve the quality of fused image. In remote sensing applications; satellites provide the information of the large areas of the planet. To meet the needs of several remote sensing applications such as weather, meteorological and environmental, the remote sensing system offers spatial, spectral, radiometric and temporal resolutions. Generally, satellites take various images from different frequencies in the visual and non-visual ranges called as monochrome images. Based on the frequency range each monochrome image contains various information's about the object. Each monochrome image is represented as a band and a collection of these bands of the same scene obtained by a sensor is called multispectral image (MS). In general, an MS image contains three bands (Red, Green and Blue). The combination of these three bands produces a color image. Satellites usually provide a panchromatic (PAN) image along with MS image. A PAN image refers refers to a gray scale image that contains the data with a wide range of wavelengths from the visible to the thermal infrared.

II. IMAGE FUSION

The main reason for the increased importance of image fusion in remote sensing is that remote sensing is currently moving towards many important social and scientific applications. These applications include the management of natural disasters and natural resources, assessment of climate changes and the preservation of the environment. Furthermore, there is an increasing availability of images with different characteristics, increased flexibility of time, shorter revisiting time of satellite and the evolution of sensor technologies. Therefore, a growing need emerges to simultaneously process different data from the remote sensing images for information extraction and data fusion. In the remote sensing, most of the sensors operate either in panchromatic mode or multispectral mode. A panchromatic mode sensor gives high spatial resolution image, which does not contain any color information, whereas a multispectral mode sensor gives color image with low spatial resolution. Either of these images separately, will not provide complete information of the object. The better idea to overcome this limitation is image fusion. The main objective of image fusion in remote sensing is merging the grey-level high-resolution panchromatic image and the colored low-resolution multispectral image. When the input images are taken from different satellites, fusing of these images can be called multi-sensor image fusion otherwise it is said to be single-sensor image fusion. A multi-sensor image fusion overcomes the constraints of a single-sensor image fusion by combining the several sensor images to form a composite image. The multi-sensor image fusion includes various benefits viz., robust system performance, improved reliability, compact representation of information, extended range of operation and reduced uncertainty. Image fusion is generally done at one of the three different processing levels depending on the stage at which fusion takes place viz., pixel, feature and decision. In pixel level fusion combination mechanism is directly on the pixels obtained at the different sensors. Feature level fusion works on image features extracted from the source images and decision level fusion works at higher level and merges the interpretations of different images obtained after image understanding. Based on domain of operation, pixel level image fusion methods are classified into two types which are spatial domain fusion and transform domain fusion methods.

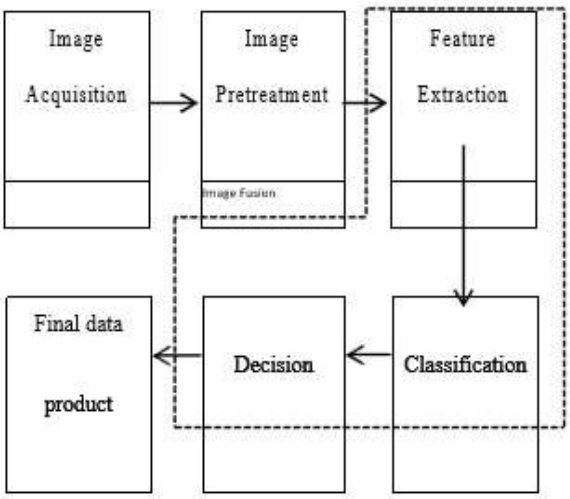

Fig. 1: Remote sensing image fusion application.

III. LITERATURE REVIEW & PROBLEM IDENTIFICATION

Owing to the importance of multi-sensor data in many fields such as remote sensing, medical and military imaging applications, image fusion has become prominent in the area of research. In remote sensing applications, satellite MS image bands give color information and PAN image gives the details of the target respectively. But, either of these individual images does not provide the required information of the target. The aim of image fusion is to produce new images that contain both low spatial resolution multispectral data (color information) and high spatial resolution panchromatic data (details). In principle, multi-sensor fusion provides significant benefits when compared to single-sensor fusion. The use of different types of sensors may improve the quality of the target information.

Wu Wenbo, Yao Jing and Kang Tingjun , obtained good quality information in satellite image fusion by making multispectral images matching with thematic mapper panchromatic image, with an error control of 0.3 pixels. They used Smoothing Filter-based Intensity Modulation (SFIM), Modified Brovey, High Pass Filter (HPF), Multiplication, Principle Component Analysis (PCA) Transform and IHS methods for the image fusion. They evaluated the quality of fused images by using mean, entropy, standard deviation, correlation coefficient with MS image and PAN image as parameters. The results revealed out of six methods, HPF and SFIM are the best methods in preserving the spectral information of original images.

Yun Zhang and Ruisheng Wang, explained an approachfor object extraction from high-resolution satellite images. This approach integrates multi-spectral classification, image fusion, feature segmentation and feature extraction into the object extraction. Both spatial information from Panchromatic (PAN) and spectral information from Multispectral (MS) images are utilized for the extraction to improve accuracy. They mainly concentrated on road extraction from Quick Bird MS and Pan Images using the proposed approach and concluded that the proposed approach was very effective with correctness of road network extraction to 0.95 which is significantly higher than that of other existing road extraction methods like multispectral classification, PAN based feature extraction and MS & PAN integrated classification.

Jiang Dong, Dafang Zhuang, Yaohuan Huang and Jingying Fu , presented briefly an overview of recent advances in multi-sensor satellite image fusion. Initially, they explained the most useful existing image fusion algorithms in remote sensing applications that include object identification and classification, targets tracking and change detection. They addressed some recommendations on development and improvement of fusion algorithms for establishing automatic quality assessment scheme.

David L. Hall and James Llinas], discussed themultisensor data fusion. They introduced the multi sensor data fusion, also mentioned that fused data from multiple sensors provides several advantages like good observability and determining the accurate position of an object, than from a single sensor. They explained the need of multi-sensor image fusion in military and non military applications. In their view, co-registration is the key challenge in multi-image data fusion. In the co-registration process, the alignment of two or more images is overlaid so that each image represents the same location on earth.

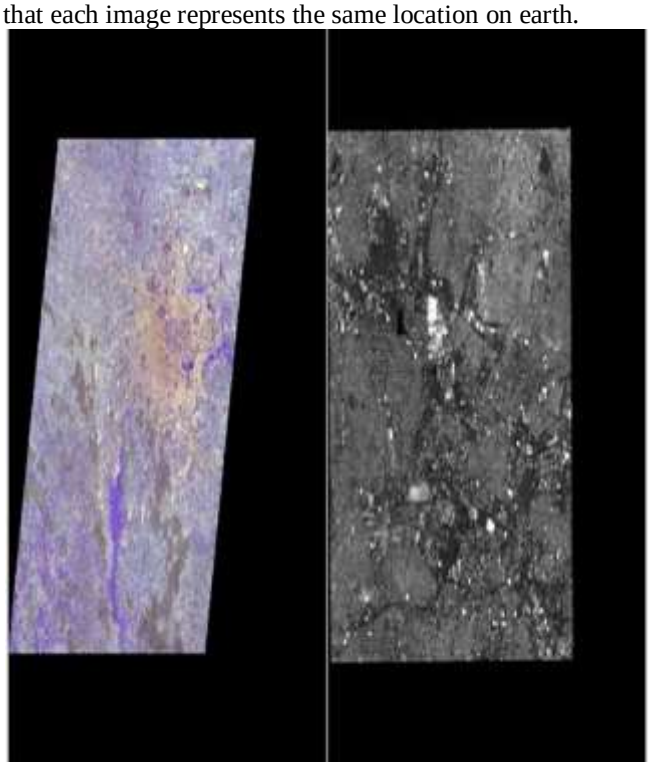
Fig. 2: (a) MS image (b) PAN image

IV. METHODLOGY

In remote sensing, images are characterized by their different resolutions. Spectral resolution refers to bandwidth. Smallest feature separation in the scene referred by spatial resolution. Remote sensing images are either a high spatial resolution and low spectral resolution or low spatial and high spectral resolution due to limitations of satellite sensor. Large Instantaneous Field Of View (IFOV) reduces the spatial resolution. While collecting with a larger bandwidth reduces spectral resolution. There are several situations that simultaneously require high spatial and high spectral resolution in a single image. This is particularly very important in remote sensing applications like different objects are distinguish in a same scene, enhancing visual interpretation, mapping of land use and extracting urban

features like buildings and roads. Also, image fusion is the effective tool for urban mapping.

V. EXPECTED OUTCOME

A single level DWT based software co-simulation algorithm has been developed for multisensory images. The image fusion is used for multisensory images .The simulation give out the clear picture at different angle and level. The outcome is improved version of privous one

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