AN APPROACH TOWARDS RECONSTRUCTION OF SATELLITE CLOUD-CONTAMINATED MULTITEMPORAL IMAGES

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ABSTRACT

When we take an image from satellite of different areas present on earth, Cloud covers which are generally present in optical remote sensing images, limit the usage of acquired images and increase the difficulty in data analysis. Thus, information reconstruction of cloud-contaminated images generally plays an important role in image analysis. This paper proposes a novel method to reconstruct cloud-contaminated information in multitemporal remote sensing images. Based on the concept of utilizing temporal correlation of multitemporal images, we propose a patch-based information reconstruction algorithm that spatiotemporally segments a sequence of images into clusters containing several spatially connected components called patches and then clones information from cloud-free and high-similarity patches to their corresponding cloud-contaminated patches. At last we used fuzzy logic method to remove clouds from satellite image.

Index Terms— patch, multitemporal remote sensing images, fuzzy logic.

INTRODUCTION

The limitation of passive remote sensing sensors is their sensitivity to weather conditions during data acquisition from earth. Land scenes approximately 35% are cloud covered globally, significantly reducing the availability of cloud-free surface observations.

Clouds present in remote sensing images can be regarded as information for measuring liquid water or as contaminations that partially obstruct observation of landscapes. This paper gives the latter issue in which clouds obstruct land covers, thereby resulting in missing data for image sensors. For data analysis, such as classification of land covers, generally requires a cloud-free image composed of patches that are acquired at different times and at different conditions, such as atmospheric conditions, soil moisture, and vegetation phenology.

The above conditions cause the relations between land cover classes and pixel intensities to vary over a data acquisition period. Thus, the method of replacing the cloud-contaminated pixels with their corresponding cloud-free pixels and then linearly adjusting the intensity values of the replaced pixels has been proven inappropriate when the conditions of data acquisition significantly change. In addition, instead of reconstructing information pixel by pixel , which may contain radiometric inconsistency, they proposed a patch-based scheme to cover this inconsistency problem. Here we are also applying fuzzy logic to remove clouds. The image in which cloud is removed from normal removal is passed to the fuzzy removal. The fuzzy logic makes the image more fine.

EXISTING SYSTEM

Existing system consist of eight steps . Fig. 1 shows the workflow of the proposed information reconstruction scheme, which consists of six main steps, namely, cloud detection, image intensity normalization, multitemporal image segmentation, image quality assessment, seam determination, and information reconstruction.

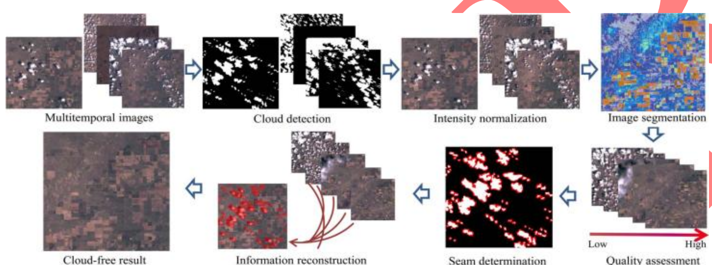
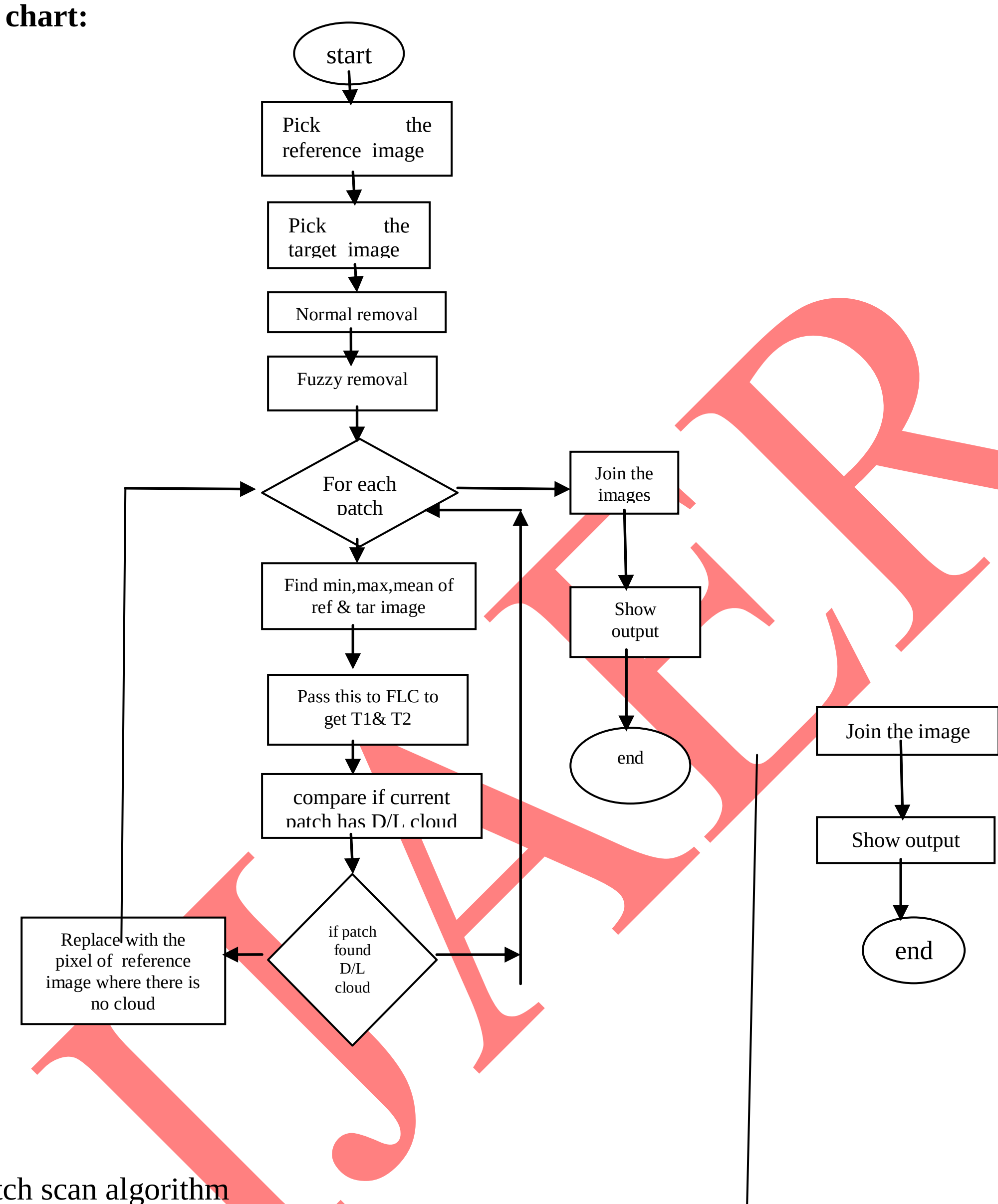


Fig. 1. Workflow of the proposed information reconstruction method.

OUR SYSTEM

The noise present in the image can be removed by various methods .In this system the noise is removed using normal removal and fuzzy logic method. Here patch scan algorithm is used to detect noise.

Flow chart:



Patch scan algorithm

- Image can be of any size so bring that image into proper size such as 256*256. divide that image into patches of size 8*8 to 32*32. We choose 16*16 size. After that we perform patch scan on each patch. we perform patch scan so that we should get the noisy image.
- If we take patch size 16 ,then 256*256/16*16=256 patches will be there.

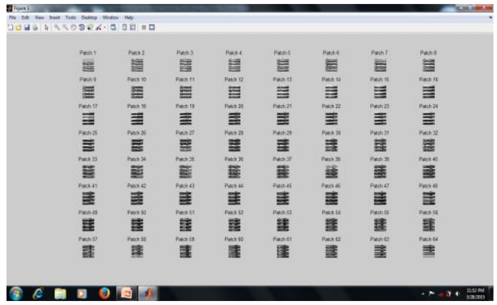


Figure: patches

NORMAL REMOVAL

In normal removal we compare each patch of reference and target image. The value of each row and column is checked, if value of row and column is found less than 5 or greater than 200 then black or white cloud is present resp. Then those pixels found cloudy are replaced by the pixels from reference image.

FUZZY REMOVAL

The cloud removed from patches are then passed to fuzzy logic controller. In fuzzy removal method the min, max and mean value of each pixels is found out. then accordingly we remove the cloud contaminated pixels. In this the pixel intensity of each patch is found and then replaced by the cloud free pixels

PARAMETERS

Here different parameters such as minimum mean square error, root mean square error ,peak signal to noise ratio are found out. the value of those parameters are compared and analysed to predict that how much cloud is present in that image. Those parameters are found by following way

MMSE

MMSE is minimum mean square error root and it is given by

$$MMSE=\sqrt{\sum(\text{original img}-\text{Input img})^2/N}$$

where N is size of image and Oimg and Rimg are gray values at particular point of reference and target image respectively.

PEAK SIGNAL-TO-NOISE RATIO

Peak signal-to-noise ratio(PSNR), is an term for the ratio between the maximum possible power of a signal and the power of corrupting noise that affects the quality of its representation. Because many signals have a very wide dynamic range, PSNR is usually expressed in terms of the logarithmic decibel scale. a higher PSNR generally indicates that the reconstruction is of higher quality .

PSNR=20log10(255)/MMSE

RMSE

The root mean square error (RMSE) is used to estimate patch quality and to select a cloning patch from the reference images. The RMSE is defined

$\sqrt{\sum(\text{Oimg-Rimg})^2}$

Where, Oimg and Rimg are gray values at particular point og reference and target image respectively.

ADVANTAGES

1.Satellites provide meteorologists with the ability to see weather on a global scale, so this project can be used for meterological studies.

2.This method can help the satellites for study of phenomena like volcanic eruptions and burning gas and oil fields, to the development of large systems like hurricanes.

3.satellites also provide the information for ocean temperatures so without any disturbances the information can be gathered.

4.for study of forest fires, oil spills this project can be used.

CONCLUSION

After the studying the various research papers and study of existing method it is concluded that so many problems observe in Existing method, so using normal removal and the fuzzy removal the clouds can be removed so that further observations can be done so nicely.

REFERENCES

1.F. Melgani, "Contextual reconstruction of cloud-contaminated multitemporal multispectral images," IEEE Trans. Geosci. Remote Sens., vol. 44, no. 2, pp. 442–455, 2006.

2.C. Lin, P. Tsai, K. Lai, and J. Chen, "Cloud removal from multitemporal satellite images using information cloning," IEEE Trans. Geosci. Remote Sens., vol. 51, no. 1, pp. 232–241, Jan. 2013.

3. A. Maalouf, P. Carre, B. Augereau, and C Fernandez-Maloigne, "A bandelet-based inpainting technique for clouds removal from remotely sensed images," IEEE Trans. Geosci. Remote Sens., vol. 47, no. 7,pp.2363– 2371, 2009.

4. J. Ju and D. P. Roy,"The availability of cloud-free Landsat ETM+ dataover the conterminous United States and globally." Remote Sens.Environ.,vol. 112, no. 3,pp.1196-1211,Mar.2008.

5. F. Melgani, "Contextual reconstruction of cloud-contaminated multitemporal multispectral images," IEEE Trans. Geosci. Remote Sens., vol. 44, no. 2, pp. 442–455, 2006.

6. P.Chatterjee and P. Milanfar, "Clustering-based denoising with locally learned dictionaries," IEEE Trans. Image Process., vol. 18, no. 7, pp. 1438-1451, Jul. 2009.

7. C. Huang, N. Thomas, S. N. Goward, J G. Masek, Z. Zhu, J. R. G.Townshend, and J.E. Vogelmann, "Automated masking of cloud and cloud shadow for forest change analysis using Landsat images," Int. J.Remote Sens.,vol. 31, no. 20, pp. 5449–5464, Jun. 2010.

8. S. P. Awate and R. T. Whitaker. Unsupervised, information-theoretic, adaptive image filtering For imag restoration. IEEE Trans. Pattern Anal. Mach. Intell., 28(3):364–376, 2006.