AN IMPROVEMENT OF IMAGE REGISTRATION BASED ON SIFT ALGORITHM ALONG WITH NON LINEAR DIFFUSION

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***Abstract*—*In general, registration methods can be divided into two categories: 1) area – based methods and 2) features based methods. The multiplicative speckle noise, SIFT has a limited performance when directly applied to synthetic aperture radar (SAR) image. In this proposed SAR image registration approach is introduce to generate the scale space [i.e., nonlinear diffusion scale space (NDSS)], which has an advantage of preserving edges and details over the linear GSS. Meanwhile the ratio of exponential average weighted average (ROEWA) operator is used to compute the gradient information during the construction of NDSS. In this proposed method is to improve the registration accuracy, feature points are extracted using a variable block size with SIFT.*

Keywords*— *Area-based method, image registration, feature-based method, registration accuracy

1. INTRODUCTION

Image registration is a process of aligning two images of the same taken at different times, from different viewpoints, and/or different sensors (references and sense images) into a common coordinate system. The present differences between images are introduced due to different image conditions. Image registration is a crucial step in all image analysis tasks in which the final information is gained from the combination of various data sources like in change detection, image fusion, and multichannel image registration.

Change detection on synthetic aperture radar (SAR) images is a process that utilizes the SAR images acquired over the same geographical area at different times to identify the differences between the two acquisitions. In unsupervised algorithms, the log-ratio image, which is computed from the two SAR images, is generally considered as the observable data. With the development of the statistical theory, modeling and analyzing the observable data is becoming an effective way to achieve automatic change detection.

Most of the methods related to only consider the information of a single pixel. Further improvement is achieved by employing a feature vector to describe the neighborhood of the pixel in the ratio image instead of a single pixel. The feature vector is modeled as the Gaussian mixture model, and the Bayesian inferencing is employed to segment the observable data into two classes. Furthermore, the contextual information in the observable data is

Considered to enhance the performance, but the prior distribution of each class is still molded from each pixel separately, and the correlation of neighboring pixels in change detection is not employed. Consequently, in order to achieve contextual change detection, the Markov random field (MRF) model is employed in the construction of the prior distribution. The MRF model is fuse these detections to achieve reliable detection. In they are different five change –detection results are individually obtained by different methods. An effective way can achieve automatic change detection. In sliding window is applied with the Markov chain model to take the non-stationary of the ratio image into consideration to better exhibit non-stationary changes. Despite the flexible and powerful usage of the MRF to integrate contextual information, the non-stationary property of the SAR images is still omitted.

2. RELATED WORK

Main objective for automatic image registration of satellite images is to obtain accurate set of tie points and then apply the transformation function which is most suitable to pair of images to be registered. There are two methods are used to register the cloud images in k-means clustering which compare to conventional methods. They have improve the registration accuracy in 95.65% using SAR image registration along with SIFT algorithm, nonlinear diffusion and phase congruency.

There are many methods that have been used for feature detection for different methods. In S.Govindarajulu and K.Nihar Kumar Reddy mentioned a robust and efficient method for automatic image registration (AIR) is mentioned which combines image segmentation and SIFT. The performance of this method is evaluated through some measures.

In Hernani Goncalves, Luis Corte-Real, and Jose A. Goncalves illustrated a new AIR method completed by a robust procedure of outlier removal. The Landsat and Hyperion images had been used for performance evolution of the mentioned method. The combination of different techniques in this paper provides a precise method for AIR. The main benefit of this method is that accurate segmentation of the objects present in the image is not needed.

In Rachna P. Gajre and Leena Ragha have compared work done by various authors on image registration of satellite images. These methods including SIFT are time consuming and depend on the size and resolution of the image, which can be overcome further.

In Bin Fan, Chunlei Huo, Chunhong Pan, and Qingqm Kong mentioned an improved version of the scale-invariant feature transform for optical and SAR(synthetic aperture radar) images. One disadvantage of this method is that the utilized low distortion constraint restricts its direct use for registering images with large distortion.

3. PROPOSED WORK

3.1 SCALE INVARIANT FEATURE TRANSFORM (SIFT) ALGORITHM

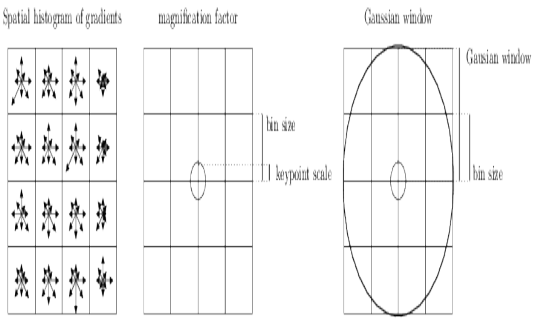
A SIFT feature is a selected image region (also called as key points) with an associated descriptor. It is also common to use independently the SIFT detector (i.e. computing the key points without descriptors) or the SIFT descriptor (i.e. computing descriptors of custom key points).

3.1.1 MOTIVATION

- Image Matching
  1. Correspondence Problem
- Desirable Feature characteristics
  1. Scale invariance
  2. Rotation invariance
  3. Illumination invariance
  4. Viewpoint invariance

3.1.2 SIFT DESCRIPTOR

A SIFT descriptor is a 3-D spatial histogram of the image gradients in characterizing the appearance of a key point. The gradient in each pixel is regarded as a sample of a three-dimensional elementary feature vector, formed by the pixel location and the gradient orientation. Orientations are quantized in to eight bins and the spatial coordination in to four each, as follows:



The SIFT descriptor is a spatial histogram of the image gradient.

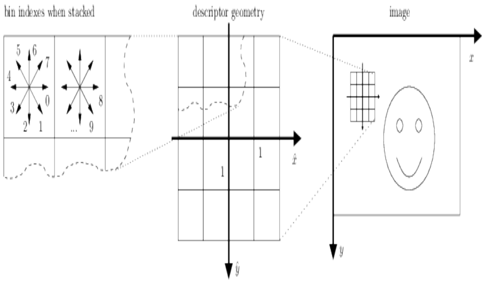
SIFT descriptors are computed either calling vl_sift_calc_keypoint_descriptor or vl_sift_calc_raw_descriptor. The following parameters influence the descriptor calculation:

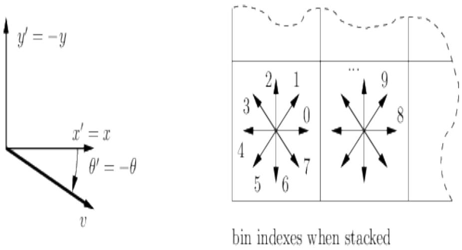
- Magnification factor

The descriptor size is determined by multiplying the key point scale by this factor. It is set by vl_sift_set_magnif.

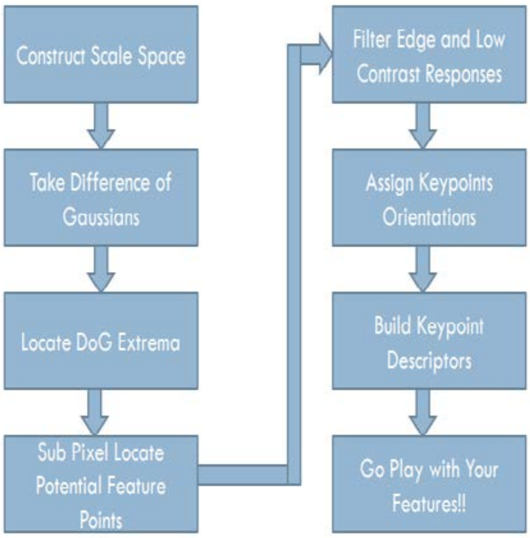
- Gaussian window size

This is illustrated by the following the standard deviation of this window is set by vl_sift_set_window_size and expressed in unit if bins. The 3-D histogram (consisting of 8x4x4=1288x4x4=128 bins) is stacked as a single 128-deminsional vector. The fastest varying dimension is the orientation and the slowest the y spatial coordinate figure.





3.1.3OVERVIEW OF ALGORITHM

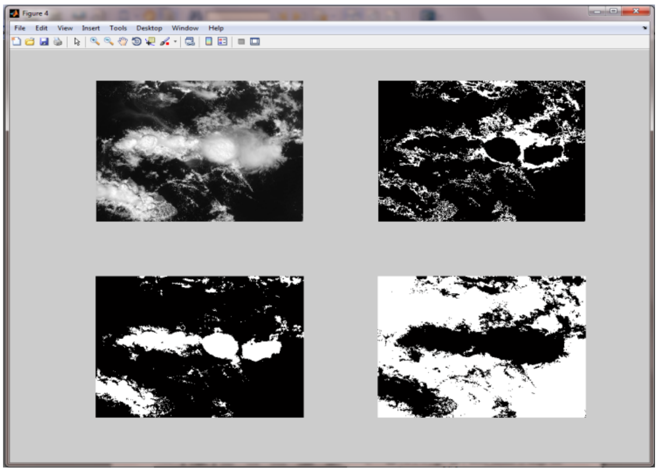


3.1.4 ADVANTAGES OF SIFT & SAR ALGORITHM

The synthetic aperture radar (SAR) is a coherent imaging system, which can produce high-resolution images and work under all time and all weather conditions. The SIFT algorithm has been widely applied to optical image registration. They are occur multiplicative speckle noise, to overcome this problem we are applied SAR has directly applied with the SIFT, nonlinear diffusion, and phase congruency methods. It is provide 76.36% registration accuracy compared with conventional methods.

FEATURE EXTRACTION

Feature extraction starts from an initial set of measured data and builds derived values intended to be informative and non redundant, the extract features are expected to contain the relevant information from the input data. We propose here the determination of an appropriate block size based on a geostatistical analysis, based on the semi-variance.



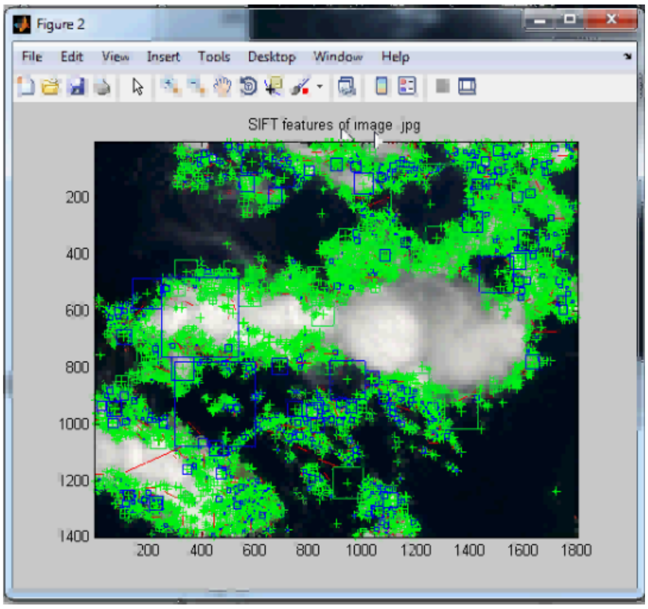
Feature extraction

FEATURE MATCHING

Feature matching is the common feature between previous step the reference image and the sensed image are matched. Registration accuracy depends upon the correctness of feature matching. To improve the matching quality, outlier removal techniques are normally integrated.

OUTLIER REMOVAL

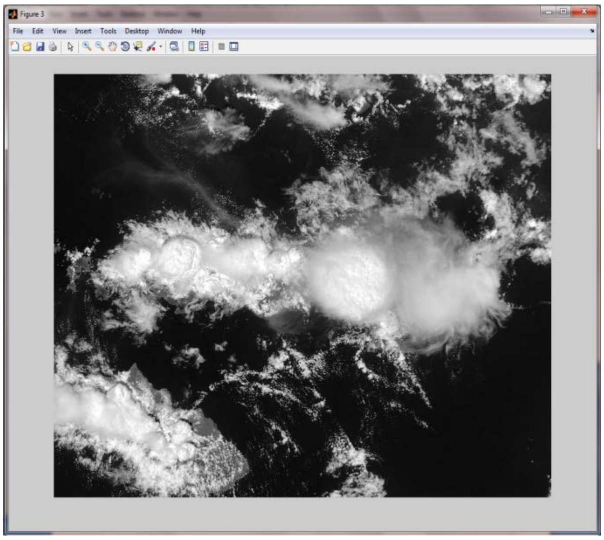
The large number of unreliable key points appear within the initial key-points detected by our approach, due to the existence of multiplicative speckle noise. These unreliable matches will lead to inaccurate correspondences and further affect the correct calculation of the transformation parameters. The phase congruency is introduce if they are invariant to illumination and contrast condition. The phase congruency information in the image is obtained by analyzing the logarithmic Gabor filter responses over different orientations and scales.



Outlier removal

RESAMPLING

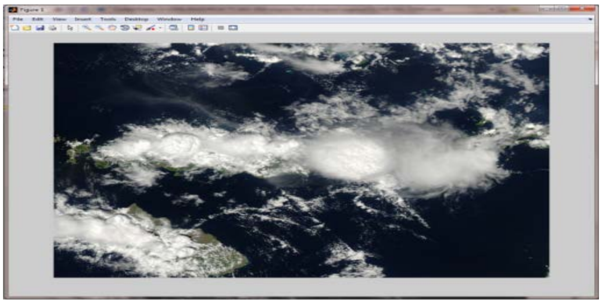
The process of transforming a sampled image from one coordinate system to another. The two coordinate systems are related to each other by the mapping function is applied to the output sampling grids projecting result into the output. The output of the resampling grid is specifying the location at which the input to be resampled.

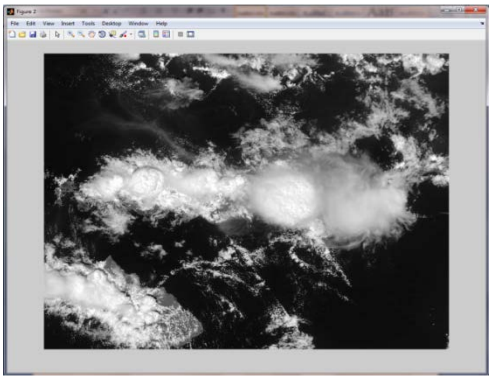


Resampling

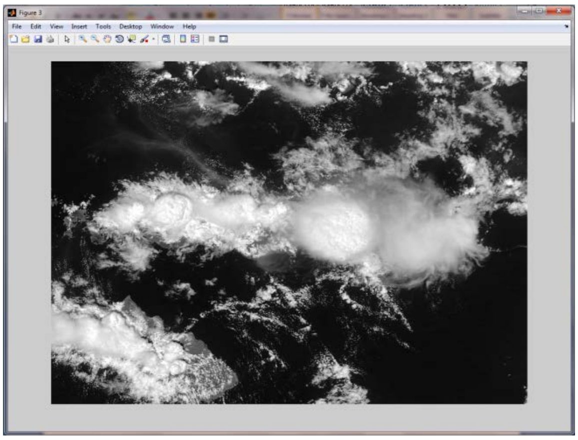
4. SIMULATION RESULTS

Original image

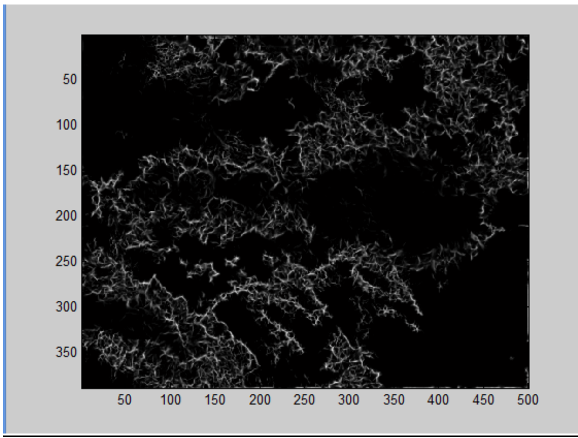




Color image



Filtered image



Phase congruency

5. CONCLUSION

Image registration method is a fundamental image processing technique
and its very useful in integrating information from different sensors, finding changes in images taken in different time and different location, infering three dimensional information from strero images, and recognizing model based objects.The performance of the proposed algorithm, we experimentally validate it on several pairs of real SAR images, and the corresponding prior information of SAR images.

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