

A Survey on Image Registration Techniques

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Abstract- Main aim of this paper is to provide information on Image registration methods. Image Registration is the process of aligning two images which can be taken at different time, view point and sensors. It aligns the two images of same scene (reference image and sense image) into a common coordinate system. We have to align them in order to monitor subtle changes between the two. We can further divide the image registration in four parts: feature detection, feature mapping, mapping function, transformation and resampling. The image registration can be of two types. One is area based and other is feature based. The purpose of this paper is to provide a comprehensive review of the existing literature available on Image registration methods so that it can be helpful to further study the new things in image registration. This can be helpful to the new researchers to implement such methods. We can apply this methods into real life.

Index Terms- Image Registration, Transformation, Feature detection, feature matching

I. INTRODUCTION

Image registration is the process of aligning two or more images of the same scene taken from different views, at different times and from different sensors. In this method it aligns two images 1) source image and 2) reference image. We can apply image registration methods in remote sensing (image mosaicking), medical imaging, and change detection. Image registration methods can be used to align the images with different methods like geometric transformation, point based methods. Image registration is a spatial transform.

II. METHODOLOGY

The reference and the referred image could be different because of:

- A. Different viewpoints
- B. Different times
- C. Different Sensor
- D. Scene to model registration

Each of them can be described as follows:

- A. Different Viewpoints : The images which is to be registered are acquired from different angles and viewpoints
- B. Different times: the Images which is to be registered can be acquired from the different times and in various conditions.

- C. Different sensors: The images which is to be registered are acquired from different sensor devices.
- D. Scene to model registration: images of one scene are taken and the model of the scene both are registered. The model can be anything from a digitized image or computer representation of a picture or scene.

III. REGISTRATION PROCESS

The images are available in various forms and with different anomalies, so due to which it is not very possible to determine the global method for the image registration process. Various methods are available for image registration and every method must account geometric deformation, noise corruption etc. to improve the registration accuracy [6]. To simply the image registration process we did not go into the details of particular algorithm and not show the results of comparative experiments. Instead of it we summarize the useful approaches and point out interesting part of image registration.

The Image Registration Process is in 4 steps as described by Sombir Singh Bisht, Bhumika Gupta, Parvez Rahi ^[1].

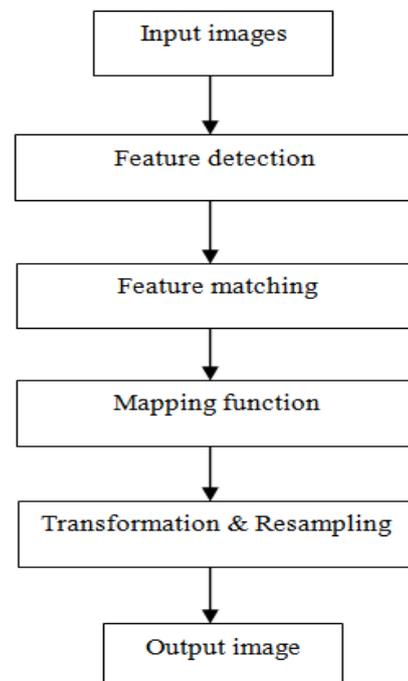


Fig. 1. Image Registration Process

- A. Feature detection: In this step the salient and distinctive objects are detected. The detection of objects can be manually or automatic. E.g. Edge, contour, line etc.
- B. Feature matching: In this step the correspondence between the features of sensed image and reference image is established.
- C. Mapping function : The type and the parameters between the images are mapped, so called as mapping function, the alignment of the images are estimated
- D. Transformation and resampling: The sensed image is than transformed with the mapping functions.

IV. RELATED WORK

Image registration is useful and very important in terms of computer imaging and computer vision. The brief detail on the research papers reviewed and studied is described in this section. This papers help in understanding the techniques and the methods with their merits and demerits.

According to Manjusha Deshmukh, Udhav Bhosle ^[3], different registration methods are used in different kind of images. In natural images the correlation method is used, in correlation method match between multiple points is found. In feature based methods it uses the features like point, line, corner, edge with the reference image. This method is better than the intensity based methods. To increase the accuracy the Fourier based methods are used.

According to Zitova and Flusser ^[7], various methods the approach of image registration methods are retained and they are classified into subcategories based on their matching methods. The four basic steps of image registration methods are also mentioned. The major advantages and disadvantage are also discussed.

According to Lisa Gottesfeld ^[8], to register two images we need to remove the distortions. Distortion lead to mis-registration. First we need to optimally realign the images. Paper represents various methods including correlation, sequential, Fourier, point mapping and elastic model methods.

Nagham E. Mekky, F.E-Z Abou-chadi, S.Kishk ^[4]. Has introduce d wavelet based image registration technique. Different wavelet based methods are compared namely Mutual information (MI), scale invariant feature transform (SIFT) and hybrid method based of MI and SIFT. To remove the outliers in this methods RANSAC methods is used. It shows the hybrid methods have same impact as MI and SIFT

Siddharth Saxena and Rajeev Kumar Singh ^[2] has introduced the classification based on image registration techniques. The classification has done on nine dimensional scheme is explained. Various feature detection methods like area based methods, feature based methods are explained.

Medha V. Wyawahare, Dr. Pradeep M. Patil, and Hemant K. Abhyankar ^[5] has classified the whole image registration techniques based on dimensionality, nature of registration, nature of transformation, domain of transformation, interaction. Various approaches and methods on image registration also discussed.

V. CONCLUSION

Image registration is very important aspect in the area of medical imaging, computer vision. It is an important task while merging two images or improving the quality or finding the features from an image. The main purpose of this paper is to give an idea on image registration techniques and their methods in different condition and their usefulness in different kind of images. The choice of different methods are based on their characteristics. This review helps in making the registration technique more efficient and fast.

REFERENCES

- [1]. Sombir Singh Bisht, Bhumika Gupta, Parvez Rahi, Image Registration Concept and Techniques: A Review, ISSN: 2248-9622, Vol. 4, Issue 4(Version 7), April 2014, pp.30-35
- [2]. Siddharth Saxena and Rajeev Kumar Singh, A Survey of Recent and Classical Image Registration Methods, International Journal of Signal Processing, Vol.7, No.4 (2014), pp.167-176
- [3]. Manjusha Deshmukh, Udhav Bhosle, A SURVEY OF IMAGE REGISTRATION, International Journal of Image Processing (IJIP), Volume (5) : Issue (3) , 2011
- [4]. Nagham E. Mekky, F.E-Z Abou-chadi, S.Kishk Wavelet based image registration techniques: A study of performance, International journal of computer science and network security Vol. 11 No. 2, February 2011”.
- [5]. Medha V. Wyawahare, Dr. Pradeep M. Patil, and Hemant K. Abhyankar , Image Registration Techniques: An overview, International Journal of Signal Processing, Vol. 2, No.3, September 2009
- [6]. Barbara Zitova, Jan Flusser, Image registration methods: a survey, Image and Vision Computing 21 (2003) 977–1000.
- [7]. Barbara Zitova, Jan Flusser “A survey on image Registration methods”, “Image and vision computing 21(2003) 977-1000”.
- [8]. Lisa Gottesfeld brown “A survey of image registration techniques” “ACM computer surveys, 24, 4, 1992, 325-376”.