RESEARCH ARTICLE

STUDY OF IMAGE REGISTRATION APPROACHES ON POINT CLOUD DATASETS

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A R T I C L E I N F O	A B S T R A C T
	To identify the object in any view, Image Registration process plays an important role. Image Registration process is an alignment process of two images, which is called 'Reference images' and 'Input images' that images can be taken of same scene but from different viewpoints, different sensors or from different times. In image processing, there are different types of approaches for image registration, and that approaches also categorized in different-different parts accordingly their features. [1] Image Registration itself includes methods of registration which are useful to detect or match the image with the reference image. Nowadays, Image registration strategies are applied mostly in medical, satellites, weather-forecasting, remote sensing, signal processing field. In this Review paper we study on the structure of image registration methods as well as the techniques which going to be used. We believe that Image registration will be useful research area for the researchers to implement alternate approaches of image registration.

INTRODUCTION

Image registration between image data corresponding to an optimal geometric transformation method. It has applications in many fields, one that is addressed in this research is the medical image registration. Medical image registration is a wide range of potential applications, but the emphasis is on radiological imaging.[2]

The optimal goal is to change the image registration method that best align structures of interest in getting input images. Image registration of more than one image in image analysis in which valuable information is conveyed is an important step; Ie, different time, different perspectives or different than the images acquired by the sensor can be supplemented. Therefore, accurate and useful information on the integration of two or more images (or fusion) is very important. [3]
The work of review on this topic is essential to classify the best method for image registration which is useful in future to make efficient 3-D models.

This paper is classified in different parts that are as follows. In Section II we focus on the processing steps of image registration. In Section III we will look forward about image registration methods and the classification based on different scenarios . Section IV, This section will be based on some approaches which will be beneficial for future research work.

In Section V, we will discuss about the conclusion and future scopes.

Image Registration Processing Steps

In section II, we are going to show the processing steps that are included in Image Registration as per Zitova and Flusser :

Feature Detection- Feature detection is an essential component of image processing. It detect the different and salient objects from the image manually or automatically.[2] It is classified in two different types. First one is Area-Based Methods, in this method it focus on only feature matching instead of feature detection. And the second part is Feature-Based Methods, This method is used to extract the salient features of the image.
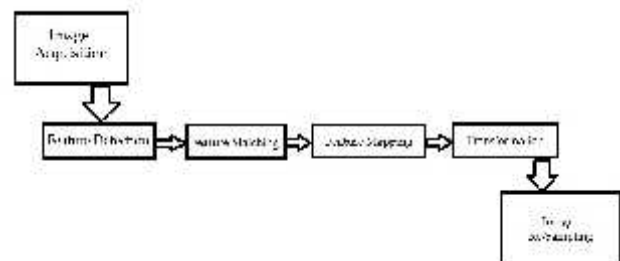

Figure 1 Step of Image Registration Processing

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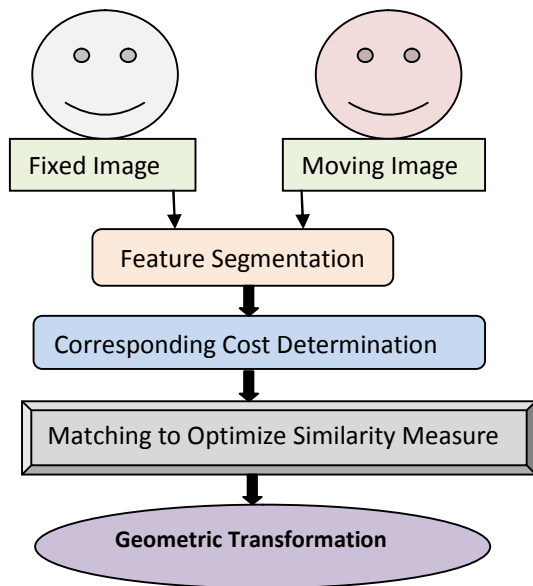
Figure 2 Feature Based Image Registration

Feature Matching- This sensed matching features of image that detected by the feature detection. In the feature matching step first we need to match the matching portion of the image, after that we need to match the regions using local features. Then we can create the Panorama.[4] Feature Matching also classified into two parts, one is Area-Based Method and Second one is Feature-Based Method.

Feature Mapping- Feature Mapping is an interactive process of classification that poor quality video any aerial or satellite imagery applied to multiband can be, is the high quality hyper spectral. Using interactive tools Feature Mapping can band identifying marks, and feature classes to analyze any number of measuring.[5]

Transformation- it is a process through that it established the mapped and detected features of the sensed image with reference image.

Image Re-sampling- Re-sampling is a technique or can say it is a process which is used to create a new image with different size, mean to say it changed the width and height or pixels of that particular image and produce a new image as a outcome.
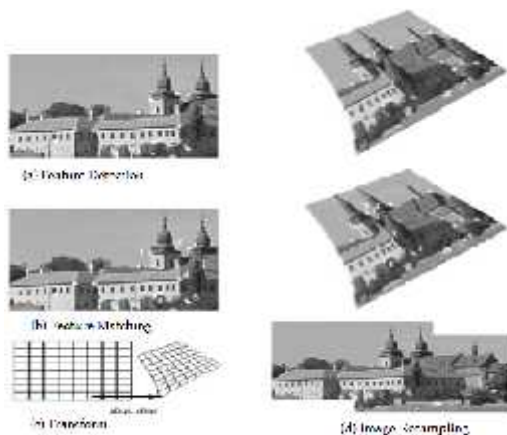

Figure 3 Example of Image Registration Processing. [2]

In image re-sampling required to check the mapping function. Models of mapping function are of two different types- Global Models and Local Models. Global model use s all matching points to calculate one mapping function which is applied on the whole image which is called the rigid transformation. As well as Local Model, it divide the whole image into different regions and calculate mapping function separately that is called elastic transformation.[2]

Classification of Image Registration Methods

Image equitation and then processing requires and internal essential task of registering images. There are several types of image registration techniques are available in which some specific are use for researching purpose.[1] These are as follows-

- **Based on Crucial Requirements** – It is classifying based on essential needs of the registering process. It has two types- Area based and feature based methods.
- **Based on Applicable Area**- According to the image application the concerning registration process classified which has categories as different viewpoints, different times, different sensors and different scene
- **Based on Scheme on 9D**- Maintz proposed gave an nine dimensional (9d) scheme to categorized and image registration. The approach is used in medical image processing, where as popularly critical sections of 9d's are: dimensionality, registration, transformation, domain, interaction degree, optimization, modalities, subject and objects.[1]

Image Registration Approaches

There are mainly two most common approaches of image registration. The First one approach is to make direct use of the original image data. Secondly the other one approach is based on matching discrete geometric feature points. Both approaches have their relative merits and demerits. This paper focuses on methods based on matching feature points. Features may be extracted by a number of methods.

- *Point-based methods:* The some set of corresponding points can be identified by apriori for a given pair of views , After then registration can be effected by selecting a transformation that is use to set alignment of points. if the determination of the fiducial points associate with it can be generate a fiducial localization error (FLE). These kind of errors will come in both the kind of image spaces. The fiducial localization process rely on the junction of two linear structures with surface. In this method marker based registration has the more advantageous as compare to landmark based registration. The aim of point based methods is to develop a small variance. There are many types of function included in point based method such as point in rigid transformation, point in scaling transformation, points in perspective projections and points in curve transformation.
- *Surface-Based methods:* In image registration, surface-based image registration decides the respective surface of different images and transforms it. Both rigid-body and non-rigid registration used the basic features of surface-based

method. The physical space of the points of the skin top easily laser range finder, solid video system, using techniques. [3]

It has been stated that most of the surface-based the number on a list algorithms in many ways, in this part we are irritable with mainly stiff body number on a list. There are some of algorithms in surface-based method which are using in image registration such as: Head and Hat algorithm, Distance definitions, Distance transform approach, weighted geometrical feature algorithm and Iterative closest point algorithm. Surfaced based image registration technique is most popular and efficient in the entire surface based image registration techniques the famous algorithm of this technique is I.C.P (Iterative closest point) algorithm, which is used for better image registration in industries and companies.[5]

CONCLUSION & FUTURE SCOPE

In image registration Point based image registration technique and surface based image registration techniques are the famous algorithms. In previous research, it is concluded that the I.C.P (Iterative Closet Point) algorithm of Surfaced-Based image registration is the best technique for image registration as compare to all other algorithms of surfaced based image registration, which is used for better image registration in industries. But in image registration there are some more algorithms are present in point-based image registration. Now in future it can be explore for research on the algorithms based on point-based image registration method. The comparative analysis can also be done.

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