A Method of Region Considered Segmentation for Automatic Image Registration

V. Baby Vennila 1, B. Bhuvaneshwari 2, Dr. R. K. Gnanamurthy 3

1 AP/Department of IT, Vivekanandha college of Engg for women, Namakkal, Tamilnadu, India.
2 Department of IT, Vivekanandha college of Engg for women, Namakkal, Tamilnadu, India.
3 Principal, Audisankara Institute of Technology, Chidur, Nellore (AP), India.

Abstract

Automatic image registration is still an actual challenge in several fields. Even though many image registration algorithms have been developed over the years, it is far from the broad use of applications. This paper deals with the problem faced in the area of remote sensing consisting of image registration. Generally remote sensing images may have different gray–level characteristics and multiple features, so simple techniques cannot be applied directly. In this work, a new automatic image registration through region considered segmentation is proposed. This approach performs region considered segmentation for the pair of images to be registered, followed by characteristic of the extracted objects with control point selection and objects matching. It leads to the registration of satellite images (multisensor and multiband) with differences in rotation and translation. The region considered segmentation for automatic image registration leads to a more sub pixel accuracy.

Index Terms – Region considered segmentation; image matching; remote sensing; control point selection.

1. Introduction

Image registration is the process of overlaying two or more images of the same scene taken at different times, from different viewpoints, and/or by different sensors. It is also a classical problems encountered in image processing applications. In which, the final information is gained from the combination of various data sources like in image fusion, change detection, multichannel image restoration and can be applied in the fields of change detection, cartography, medical imaging and photogrammetry. Normally image registration is carried out in four steps.

First step consists of selection of feature on the images. Next, each feature is compared with corresponding features in other one. A pair of points with similarity attributes is accepted as matches and called as control points. Finally parameters of best transformation which models deformation between both images are estimated using obtained control points. In remote sensing applications, generally manual registration used which is not feasible when large number of images need to be registered because of manual selection of control points. So it leads to the need of automatic image registration.

1.1. Current Approaches

Several approaches are available to perform registration. A review of recent as well as classic image registration methods has been surveyed and current image registration techniques are categorized into two types: Area based and Feature based techniques. Image registration with the most developed class of area based techniques works correctly when input images are very similar and have not many prominent details but leads to misregistration when dissimilarities occur in images. In this case, the search for the similarity selection is time consuming since it often requires many function evaluations. Hence, these area based image registration techniques are somewhat slow. Commonly used area based similarity functions include correlation, mean square difference of intensity values and mutual information. Feature based techniques are contrast to the area based techniques because it does not work directly with image intensity values.
It extract and match the salient features from two images and is more suitable for situations when illumination changes are expected or multisensory analysis is performed but it requires two critical procedures that feature detection and feature matching. Feature detection consists of distinctive objects such as closed–boundary regions, edges, contours, line intersections and corners.

A variety of image segmentation have been used for feature extraction and feature matching is one of the most important tasks in automated image registration that correspondence between the feature detected in sensed image and those detected in reference image is established. Satellite image registration with the most recently developed model incorporating multiple feature extraction algorithms promises to be accurate. However, in both images identical features to be detected manually, is time consuming for an operator and also extra time has to be needed for multiple feature extraction.

1.2. Aim of the Paper

The purpose of this paper is to perform the automatic image registration accurately through segmentation that leads to the satisfaction of all the constraints present over the images and thus can efficiently improve the quality of the registered images. The proposed registration method is performed by applying regions considered segmentation on the images with consideration of several attributes such as perimeter, fractal dimension, and structural features. Finally rotation differences will be estimated between the images to be registered. This plays an essential role to reach sub pixel accuracy. The proposed method has the capability to register the images globally and locally and can be applied on satellite images as well as on low-altitude aerial pictures. The rest of the paper is organized as follows. The proposed registration approach is described in detail in section II. Result of experiments on real data sets is reported in Section III. Finally the related conclusions are given in section IV.

2. Proposed Approach

Even though several ways are available for registration such as histogram based segmentation, thresholding techniques, it makes some confusions in identifying valley and peaks with needed help from operators in assigning threshold values. To avoid such difficulties, the proposed registration process is carried out as the following steps given in Fig.1.
It leads to the technique for the extraction of different structures on the considered surface for the alignment of remote sensing images. It is based on the image analysis process and potentially useful for detection of feature points. Different types of features present in the remote sensing images such as their sizes, shapes, positions those are used for the alignment of images. In which, the data sets are considered with a photograph and rotated version of same photograph, also with some added noise and applied with set of satellite images to be registered accurately.

2.1. Preprocessing

Sometimes more details about the pixel domain lead to undesirable results so preprocessing is an essential step in image processing. In which the filtering and enhancement procedures have been carried out for the accurate alignment of images and have taken less content details than original version using wiener filtering is one of the most and best linear image restoration approaches nearest to object correction by human eye and it reduces the statistical errors. Under the preprocessing module, the result of wiener filtering using the below satellite images.

Figure 2. Satellite image with Gaussian noise (left) and after filter satellite images (right).

2.2. Region considered segmentation

Segmentation is a partitioning of image into set of connected regions and here, regions consideration occurred for making effective segmentation of particular area. It only helps to correct alignment of rotated and shifted objects with accurate features extraction. Regions are segmented based on different nature of image, shapes and time constrains.

2.3. Feature Extraction

During the segmentation stage, the extracted objects are characterized by their attributes such as area, perimeters, size, edge connection and dimension values. These described attributes have been used for the later stage of object matching and are searched in corresponding objects. As stated at the aim of paper, the images will be considered with rotation and translation estimation, for that angle between the x-axis and major axis of the segmented part has the same second-moments as object is stored and centroid of each object is also stored.
2.4. Matching

The matching step starts with the evaluation between considered combinations of objects obtained in segmentation stage. Under the scope of automatic registration of satellite images, since several distortion effects may be present in acquired image, it is desirable to have a reference image with as little distortions as possible. In which, effective matching procedure is applied to each object of the image in horizontal axis.

2.5. Rotation Estimation

The rotation and translation are determined for the detection of model class, and restricting the set of possible values for rotation. The angle and scale values have been corrected to obtain the recovered image with the consideration of frequencies of rotation candidate. This procedure leads to robust estimation of rotation. Eventually the both images are registered accurately based on regions segmentation.

3. Experimental Result

The results were obtained on a computer with an Intel Core 2 6400 2.13 GHz processor and 2.0 Gbytes of physical memory, using MATLAB Release 2011a. With the reference image, sensed image with some rotation difference, additive noise have been applied and processed for contributing the automatic registration. Under the paper, the pair of control points is selected using the control point selection tool. The original and recovered is shown here. Figure 3 Original image is the reference (image 1) and is a static, in which the sensed image is to be registered. The sensed image has the rotation difference of 30 degree and scale by value of 0.6.

Figure 3. Reference image and sensed with 30D rotation
4. Conclusion

In this area, so many researches done by found registration. In this paper, we emphasize the necessity of region considered segmentation for automatic image registration effectively and the purpose of the paper obtained successfully. This work has been illustrated for the automatic image registration of satellite images, with rotation of 30 degree and 0.6 scale value with the possible consideration of control points. In future, we would like to introduce the effective way of registration regarding the regions feature extraction.

5. References


