A Review on Self Adaptive Technique For Image Registration Working On Variable Image Parameter

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Abstract— **Registration is a fundamental task in image processing used to match two or more pictures taken, for example, at different times, from different sensors, or from different viewpoints. Virtually all large systems which evaluate images require the registration of images, or a closely related operation, as an intermediate step. Image registration (IR) is a challenging topic in both the computer vision and pattern recognition fields; its main aim is to find the optimal transformation to provide the best overlay or fitting between two or more images. Usually, the success of well-known algorithms, such as iterative closest point, highly depends on several assumptions, e.g., the user should provide an initial near-optimal pose of the images to be registered.**

In the last decade, a new family of registration algorithms based on evolutionary principles has been contributed in order to overcome the latter drawbacks. So proposed technique deals with a new self-adaptive system that solves IR problems consisting of different image parameters such as image rotation, scaling, translation, enhancement, invertion and compression.

Index Terms—:- **Image registration, Image Mapping, Parameter evolution, Self Adaptive System**

I. INTRODUCTION

IMAGE REGISTRATION (IR) [1] is a fundamental task in computer vision aimed at finding either a spatial transformation (e.g., rotation, translation) or a correspondence (matching of similar image features) among two or more images acquired under different conditions. Over the years, IR has been applied to tackle many real-world problems ranging from remote sensing to medical imaging, artificial vision, and computer-aided design (CAD). Image registration (IR) [2] is a challenging topic in both the computer vision and pattern recognition fields; its main aim is to find the optimal transformation to provide the best overlay or fitting between two or more images.

Image registration (IR) is a key processing step in many application domains, where the final information is obtained by combining different data sources, such as in medical imaging, remote sensing and computer vision. It involves the geometric transformation of a source image so it attains physical alignment with a reference target image [3,4]. Subsequently, an optimization is performed with known transformations to maximize a predefined similarity measure between the source and reference images.

Image registration is the process of aligning two or more images of the same scene [5]. This process involves designating one image as the reference (also called the fixed or base image), and applying spatial transformations to the others so that they align with the reference. Images can be misaligned for a variety of reasons. Commonly, the images are captured under variable conditions that can change camera perspective. Misalignment can also be the result of lens and sensor distortions or differences between capture devices.

Image registration methodology

Terms Used :-

- Target (or reference): the image that is kept unchanged and is used as a basis for the warping.
- Source (or sensed): the image that is geometrically transformed to be aligned with the target image.
- Transformation (or warping): the function used to modify the source towards the target image.

In general, its applications can be divided into four main groups according to the manner of the image acquisition:

1. Different viewpoints (multiview analysis):- Images of the same scene are acquired from different viewpoints. The aim is to gain larger a 2D view or a 3D representation of the scanned scene.

2. Different times (multitemporal analysis):- Images of the same scene are acquired at different times, often on regular basis, and possibly under different conditions. The aim is to find and evaluate changes in the scene which appeared between the consecutive image acquisitions.

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3. Different sensors (multimodal analysis):- Images of the same scene are acquired by different sensors. The aim is to integrate the information obtained from different source streams to gain more complex and detailed scene representation.

4. Scene to model registration:- The aim is to localize the acquired image in the scene/model and/or to compare them. Images of a real scene and a virtual model are registered in order to localize the acquired image in the scene/model and compare them.

Due to the diversity of images to be registered and due to various types of degradations it is impossible to design a universal method applicable to all registration tasks. Every method should take into account not only the assumed type of geometric deformation between the images but also radiometric deformations and noise corruption, required registration accuracy and application-dependent data characteristics.

The implementation of each registration step has its typical problems. First, we have to decide what kind of features is appropriate for the given task. The features should be distinctive objects, which are frequently spread over the images and which are easily detectable. Usually, the physical interpretability of the features is demanded. The detected feature sets in the reference and sensed images must have enough common elements, even in situations when the images do not cover exactly the same scene or when there are object occlusions or other unexpected changes.

The detection methods should have good localization accuracy and should not be sensitive to the assumed image degradation. In an ideal case, the algorithm should be able to detect the same features in all projections of the scene regardless of the particular image deformation.

II. LITERATURE REVIEW & RELATED WORK

Several works have been carried out by researchers on the concept of image registration. Jos´e Santamar´ıa researcher [1] suggested about the concept of image registration as the first self-adaptive optimization approach based on for tackling a well-known challenging computer vision task, i.e., the IR problem for range data. However, their performance highly depends on carefully tuning (usually by hand) the control parameters of the algorithm, which is an error-prone and a time consuming task.

Barbara Zitova, Jan Flusser [2] had made research to provide a comprehensive reference source for the researchers involved in image registration, regardless of particular application areas. Also he made research on present a review of recent as well as classic image registration methods.

Morgan McGuire [3] suggested that presents a new method for obtaining a rotation and translation-invariant scale signature of an image, a scale and translation-invariant rotation signature, and a technique for recovering the rotation, translation and scale transformation parameters that relate two images of similar scenes using these signatures.

A comprehensive survey of image registration methods was suggested by Brown [4]. The intention is to present a review of recent as well as classic image registration methods. The registration method geometrically align two images (the reference and sensed images).Main contributions, advantages, and drawbacks of the methods are mentioned. Problematic issues of image registration and outlook for the future research are discussed too. The major goal is to provide a comprehensive reference source for the researchers involved in image registration, regardless of particular application areas.

Jan Flusser, image registration researcher [5] suggested that registration of an image with non linear local distortion. It describes a new approach to the determination of mapping function from the given coordinates of local image.
And a new approach for the determination of mapping function from given coordinates of control points. He faced problem of point by point mapping of an referenced image to the source image.

Anton Bardera , Miquel Feixas [6] had worked on the concept as conjecture that two images are correctly registered when we can maximally compress one image given the information in the other. The contribution of this concept is two fold. First, he show that image registration can be formulated as a compression problem. Second, he demonstrate the good performance of the similarity metric, introduced by Li etal., in image registration[7,8].

George Wolberg and Siavash ZokaiRobust [9] had presented a hierarchical image registration algorithm to register any two digital images misaligned due to rotation, scale, shear, and translation. The algorithm couples the log-polar transform with a nonlinear least squares algorithm to estimate the affine transformation parameters.

Manjusha P. Deshmukh & Udhav Bhosle [11] had made a research on the concept of image registration that method combining image features with correlation method have many advantageous properties of both feature-based and intensity based. It overcomes the limitation of intensity based method. Contour based methods do not use the gray values for matching.

III. ANALYSIS OF PROBLEM

In the previous work following problems were discovered :-

1] During the Image Registration process, the detailed pixel by pixel mapping is not done.

- A geometric transformation that modifies the position of the pixels in the pictures. This transformation results in a dense deformation field between a reference image and a target image. Our contributions related to image registration mainly deal with this kind of transformations, especially with non-rigid ones.

- A photometric transformation that modifies the color of the pixels. This transformation models the illumination changes. This type of transformation is not always used when registering two images. This is especially the case when the images are registered using features which are invariant to illumination changes.

2] Image registration is an area that works specific towards only one technique at a time.

3] Another main drawback is that after completion of image registration the resultant image is not accurately mapped with original image.

IV. PROPOSED WORK AND OBJECTIVES

To our knowledge, this is the first time a self-adaptive approach has been used for technique which will combine work on the various parameters of image. In order to overcome the drawbacks of previous system, following system is proposed. It will not only work on the problem of image registration but also provides one system combining technique as follows:-

1] Scaling
2] Compression
3] Translation
4] Rotation
5] Enhancement
6] Inversion

1] Scaling

It enlarges or reduces the physical size of the image by changing no. of pixel it contains. It changes the size of the contents of the image and resizes the canvas accordingly.

2] Compression

Digital images require huge amounts of space for storage and large bandwidths for transmission. The goal of image compression is to reduce the amount of data required to represent a digital image. The another objective of image compression is to reduce irrelevance and redundancy of the image data in order to be able to store or transmit data in an efficient form.

3] Translation

The translation operation performs a geometric transformation which maps the position of each picture element in an input image into a new position in an output image, where the dimensionality of the two images often is, but need not necessarily be, the same.

4] Rotation

Rotation is a very basic image processing operation. Many applications such as radiology and photographic analysis requires very high quality image rotation. The purpose of image rotation is to perform transformation of change in pixel either by clockwise or anticlockwise direction.

5] Enhancement

The aim of image enhancement is to improve the interpretability or perception of information in images for human viewers, or to provide `better' input for other automated image processing techniques.

6] Inversion

An image that is upside down as compared to the object are known as inverted images. An image in which up and down, as well as left and right, are interchanged; that is, an image that results from rotating the object 180° about a line from the object to the observer; such images are formed by most astronomical telescopes.

Proposed system consisting of a new framework for image registration based on Scaling, Compression, Translation, Rotation, Inversion and Compression. Proposed system consisting of a new method for obtaining a rotation and translation-invariant scale signature of an image. A scale and translation-invariant rotation signature, and a technique for recovering the rotation, translation and scale transformation parameters that relate two images of similar scenes using these signatures.

Proposed system consisting of an algorithm for recovering transformation parameters from two images that differ by a Rotation-Scale-Translation (RST) transformation along with the various parameters in the presence of noise and occlusion from alignment. Any RST transformation may be expressed as a combination of a single translation, single rotation, and single scale factor, and all the other parameters operating in the plane of the image.

Steps involved in the process of Image Registration.

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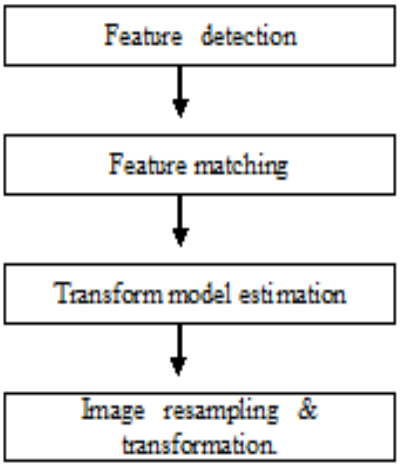

Image Registration process consists of four main steps which are as follows:-

1] Feature Detection:-

Salient and distinctive objects (closed-boundary regions, edges, contours, line intersections, corners, etc.) are manually or, preferably, automatically detected. For further processing, these features can be represented by their points representatives (centers of gravity, line endings, distinctive points), which are called control points (CPs) in the literature.

2] Feature Matching:-

In this step, the correspondence between the features detected in the sensed image and reference image is established. Various features descriptor and similarity measures along with spatial relationship among the features are used for this purpose.

3] Transform model Estimation :-

The type and parameters of the so called mapping function, aligning the sensed image with the referenced image are estimated. The parameters of the mapping function are computed by means of established features correspondence.

4] Image Re sampling and transformation :-

The sensed image is transformed by means of mapping function. Image values in non integer co-ordinates are computed by the appropriate interpolation technique.

The proposed system consisting of an framework which defines steps which will work as follows.

1] First step is to select an input image or source image or sensed image.

2] Next step is to convert a color image into an grayscale image.

3] Then next steps is to evaluate parameter change i.e. select an input image parameter such as scaling of an image, rotation of an image, inversion, compression, enhancement and so on…

4] Then next steps is to search pattern related to the reference image.

5] Then last step is to perform point by point mapping so as to find out the correspondence between the source image with reference image.

V. IMPLICATION

The process of image registration is an automatic or manual procedure which tries to find corresponding points between two images and spatially align them to minimize a desired error", i.e. a consistent distance measure between two images. Proposed system consisting of a new framework for image registration based on Scaling, Compression, Translation, Rotation, Inversion and Compression. As per the analysis done previously, the proposed system is more adaptive and efficient which will minimize the drawbacks of previous system.

VI. APPLICATION

1] Image Registration process is needed in various computer vision applications, such as stereo depth perception, motion analysis, change detection, object localization, object recognition, and image fusion.

2] In the last years the image acquisition technology has been enhanced to obtain higher quality images, so the need of an automatic and reliable process to register multiple images is still increasing, especially in the field of medical imaging and digital cartography.

3] Image registration finds its applications in various fields like remote sensing (multispectral classification), environmental monitoring, change detection, image mosaicing, weather forecasting, creating super-resolution images, integrating information into geographic information systems (GIS)).

4] In medicine (combining data from different modalities e.g. computer tomography (CT) and magnetic resonance imaging (MRI), to obtain more complete information about the patient, monitoring tumor growth, treatment verification, comparison of the patient's data with anatomical atlases ,in cartography (map updating) and in computer vision (target localization, automatic quality control).

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