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TECHNIQUE OF IMAGE REGISTRATION IN DIGITAL IMAGE PROCESSING - A REVIEW

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ABSTRACT: Image registration is a process in which final information is gained from different data sources. It is a technique in which the different sets of data are transformed in to one coordinate system [2]. Using registration we can compare and integrate the data obtained from different measurements. Different measurements mean from different viewpoints, different sensors or at different times. This technique of image registration aligns two images geometrically. These two images are reference image and sensed image. Now image registration is done using corner detection. Corners determine the contours characteristics of the target image and the number of corners is far smaller than the number of image pixels, thus can be a good feature for image registration. Harris corner detection method is used for detecting the corners.

Keywords: wavelets, compression, modality, degradation

1. INTRODUCTION

Digital image processing is the use of computer algorithms to perform image processing on images. There are fundamental steps in digital image processing. These steps are image acquisition, image enhancement, image restoration, color image processing, wavelets and Multi resolution Processing, compression, morphological processing, segmentation, representation and description, object recognition. These all steps are applied on an input image. An image is two dimensional light intensity function $f(x, y)$, where (x, y) are spatial coordinates and the value of f at any point (x, y) is proportional to the brightness of the image at any point.

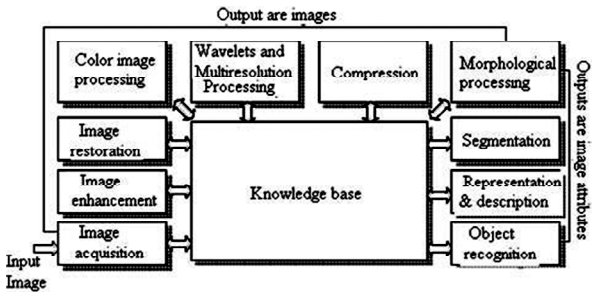

Figure 1: Steps in Digital Image Processing

All the fundamental steps are discussed below-

I. Image acquisition: Image acquisition means to acquire the image. It gives some hints regarding the origin of digital images. Generally image acquisition stage involves some preprocessing such as scaling.

II. Image preprocessing: Image preprocessing means to improve the image that increases the chances for success of other processes.

III. Image enhancement: - Image enhancement is the process of manipulating an image so that the result is more suitable than the original for a specific application.

IV. Image restoration: Image restoration is an area that also deals with improving the appearance of an image. Image restoration is based on mathematical or probabilistic models of image degradation.

V. Color image processing: Color image processing is an area that deals with the concepts of color models and basic color processing in digital domain.

VI. Wavelets: Wavelets are the foundation for representing images in various degree of resolution.

VII. Image segmentation: Image segmentation means to partition an input image into its constituent parts or objects. It deals with various methods to detect points, lines and edges.

VIII. Compression: Compression deals with the techniques for reducing the storage required in saving an image.

IX. Image representation: Image representation means to convert the input data in to a form suitable for computer processing.

X. Image description: Image description means to extract features that results in some quantitative information of interest or features that are basic for differentiating one class of object from another.

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XI. Morphological processing: Morphological processing deals with tools for extracting image components that are useful representation and description of shape.

XII. Object recognition: Object recognition means to assign a label based on the information provided by its descriptors.

XIII. Knowledge base: Knowledge about a problem domain is coded into an image processing system in the form of a knowledge database.

As from above discussion image segmentation is an important step in digital image processing. In image segmentation, there are different models to detect point, line and edge and in image registration these models are applied to detect the point or some other features and this feature detection is an important part of image registration. Thus Image registration is a fundamental task in image processing. It is used to match two or more pictures taken from different source, different sensors or from different viewpoints. Images participating in registration should have all valid pixels. Registration is required in remote sensing (environmental monitoring, change, weather forecasting, creating super-resolution images, integrating information into geographic information systems (GIS), in medicine to obtain the complete information about the patient, monitoring tumor growth, treatment verification [1].

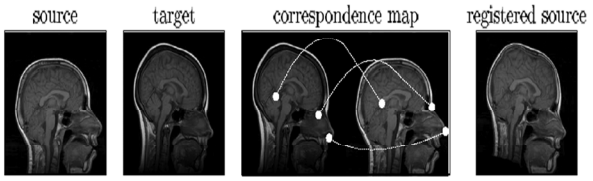

Figure 1.2: Image Registration Process

Algorithm classification: Following is the classification of image registration algorithms

I. On the basis of Intensity: Intensity based methods compare intensity patterns in images via correlation metrics. These methods register entire images or sub images. if sub images are registered, center of corresponding sub images are treated as corresponding feature point.

II. On the basis of features: Feature based methods find correspondence between image features such as points, lines and contours. These methods establish correspondence between a numbers of points in an image. Knowing the correspondence between the numbers of points in an image, a transformation is then determined to map the target image to the referenced image, there by establishing point by point correspondence between the referenced and target image.

III. Single modality method: Single modality methods tend to register images in the same modality acquired by the same scanner or sensor type.

IV. Multi modality method: Multi modality methods tend to register images acquired by different sensors or scanner types.

2. METHODOLOGY

I. Feature detection: In this step, salient and distinctive objects like corners, closed boundary regions, edges, contours, line intersection are manually or preferably automatically detected. These features are used for further processing. These features can be represented by their point representatives (centers of gravity, distinctive points) which are called control points. The detected feature sets in the referenced and sensed image must have enough common elements.

II. Feature matching: In this step, the correspondence between the features detected in sensed image and those detected in referenced image is established. Various feature descriptors and similarity measures along with spatial relationships among the features are used for that purpose. The feature descriptors should be distrainable enough to be distrainable enough to be distinguished among different features.

III. Transform model estimation: The type and parameters of the so-called mapping functions, aligning the sensed image and referenced image are estimated. The parameters of the mapping function are computed by means of the established feature correspondence. The type of mapping functions should be chosen according to prior knowledge about the acquisition process and expected image degradation. If no prior information is available then the model should be flexible and general enough to handle all possible degradation which might appear.

IV. Image re-sampling and transformation: The image is transformed by means of the mapping functions. Image values in non integer coordinates are computed by the appropriate interpolation technique. The choice of re-sampling technique depends upon the trade-off between the demanded accuracy of the computational complexity.

REFERENCES

[1] Barbara Zitova and Jan Flusser ?Image registration methods: a survey Received 9 November 2001.

[2] Christensen G.E. and Johnson H.J., "Consistent Image Registration", *In IEEE Transactions on Medical Imaging*, **20(7)**, 2001.

[3] G. Borgefors, "Distance Transformations in Arbitrary Dimensions", *In the Proceedings of Computer Vision, Graph Image Processing*, **27**, pp. 321-345, 1984.

[4] Hui Lin, Peijun Du, Weichang Zhao, Lianpeng Zhang, Huasheng Sun, "Image Registration Based on Corner Detection and Affine Transformation", *In the Proceedings of 3rd International Congress on Image and Signal Processing (CISP2010)*, 2010.

[5] J.C. Gee, D.R. Haynor, M. Reivich, and R. Bajcsy. "Finite Element Approach to Warping of Brain Images", *In the Proceedings of SPIE Medical Imaging 1994: Image Processing*, **2167**, pp. 18-27, Newport Beach, USA, February 1994.

6. J. B. Antoine Maintz, and Max A. Viergever, "A Survey of Medical Image Registration", *In the Proceedings of Medical Image Analysis*, **2(1)**, pp. 1-36, 1998.