

Process of Image Registration

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Abstract

Image registration is the process of overlapping images (two or more) of the same scene taken at different time

From different viewpoints, and /or by different sensors. The registration geometrically aligns two images (the reference and sensed images). The reviewed approaches are classified according to their nature and four basic steps of image registration procedure. Feature detection, feature matching mapping function design and image transformation and resampling.

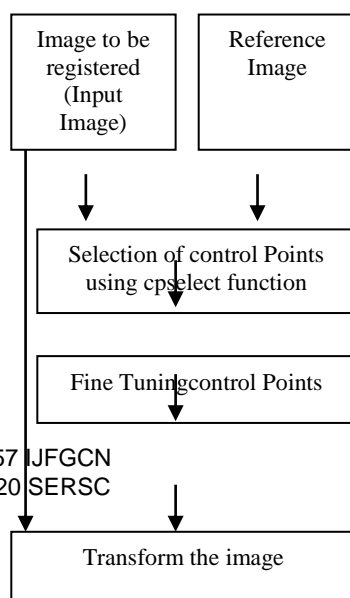
Keywords—Image Registration, Cpselect , Feature matching, mapping function

1. Introduction: Registering an image

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

Image registration is often used as a preliminary step in other image processing applications. For example, you can use image registration to align satellite images of the earth's surface or medical images caught by different medical diagnostic modalities, like MRI and SPECT. Once Image is done, you can then compare collective features in various images. Such as, how a river has migrated, how an area became flooded, or whether a tumor is visible in an MRI or SPECT image.

A general approach of registration method is to pick up number of points depending upon transformation to be depending upon transformation to be applied on images that identify the same feature or landmark in the images that identify the same feature or landmark in the images. Then, a spatial mapping is inferred from the positions of these control points. The following figure: 1 provides a graphical representation of this process.



Transform Model estimation

Figure 1: overview of Image Registration

Following are the four basic steps of image registration

Selection of Control points:

: The significant and unique control points (Closed boundary regions, Edges, Contours, Line intersections, Corners, etc) in both input image and reference image are identified automatically or manually.

Fine Tuning of control points:

The association between the features in the input and reference image is established. This step is based on image content or on the symbolic description of control point-set.

Transform model estimation:

: The parameters and the mapping functions, aligning the input image with the reference image, are estimated

Transform the image:

By means of the mapping function the sensed image is transformed



Figure 2: orthoPhotoImage (reference image)



Figure 3: Arial Photo Image (input image)

In this example, the reference image as shown in Figure :2 is georegistered orthophoto. It is a grayscale image,. The image has been orthorectified to remove camera, perception, and break distortion through a specific image transformation process. The image is also georegistered and geocoded, the columns and rows of the digital orthophotoimage are aligned to the axes of the Plane coordinate system. Each pixel center corresponds to a definite geographic location, and every pixel is 1 meter square in map units.

The moving image is a digital aerial photograph as shown in figure 3 . It is a RGB image. The image is geometrically uncorrected: it includes camera perspective, ground and building, lens distortions, and it does not have any particular alignment with the earth.

The example reads both images into the workspace. The `cpselect` function accepts images from the workspace or character vectors specifying the file path for the images.

Select pairs of corresponding control points in both images, using the Control Point Selection tool. Control points are landmarks that you can find in both images, like a road intersection, or a natural feature. To use this tool, enter `cpselect`, specifying as arguments the moving and fixed images.

```
cpselect(unregistered, orthophoto)
```

Select pairs of matching control points in both images, using the Control Point Selection tool. Control points are landmarks that you can find in both images, like a road intersection, or any natural feature. To use this tool, enter `cpselect`, specifying as arguments the moving and fixed images.

Fine-tune the control point pair using the correlation function. To use cross-correlation, features in the two images must be at the same scale and have the same orientation. They cannot be rotated relative to each other.

Transform the input image as the final step in image registration. Specify the type transformation and infer its parameters. Transform the input image to bring it into alignment with the reference image.

Final registered image is shown in the figure 4:



Figure 4: Registered Image

2. Image Registration Methods :

a) Correlation Method

- b) Fourier Method
- c) Point Mapping
- d) Elastic Method Base Matching

3.Characterstics of Registration methods:

The task of determining the best spatial trasformation for the images can be devided into following Componats :

- a) Feature space
- b) Similarity Matric
- c) Search Space
- d) Search Strategy

Every registration technique can be thought of as a selection for each of these four componants

4 Conclusion

A technique for image registration has been proposed. Thetechnique is based on three main steps: extracting featurepoints in the reference and the input images, obtaining thecorrespondence between the feature points of the images,and estimating the transformation parameters which map the input image to the reference image.

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