



Modified Alignment Technique Using Matched Important Features

Ikhlas Watan Ghindawi, Sally Ali Abdulateef, Amaal Kadum Dawood & Intisar Abd yousif

Computer Science Department, University of Al Mustansirihya

Iraq

ABSTRACT

In image processing the exact alignment of the two images takes great and wide attention, and achieving the perfect results is very important because of the importance of that process in many scientific applications. In this work, a strategy has been presented that blends pixel-based alignment techniques with those that focus on the important features or characteristics of the image, and the work on this technique has been tested and proven to be effective in terms of high accuracy and fast delivery. The working principle of the proposed method is divided into four non-overlapping phases: the important features extraction, the discovery of the matching features, the creation of the perfect conversion coefficients for the image, the implementation of the alignment process. The extraction step of the features is considered important or essential, which greatly improves the alignment procedure. The fundamental step is the extraction of the main key points in each image with the use of a SIFT detector. The matching features between the two images are then searched using a method based on the principle of grouping adjacent pixels for each important feature. The alignment process uses the Iterative Closest Point algorithm to perform a rigid transform with the use of the matched key points. The results show that the alignment process using the suggested method has yielded quite efficient results and it is highly important finding the interesting features and the strong correspondence point.

Key-words: Image alignment, Matched pixels, Feature extraction, Feature alignment.

1. INTRODUCTION

Image alignment is the procedure of the overlay of the images of same scene under various conditions, such as from various view-points, with different illumination, using a variety of the sensors, or at various times. Image alignment is transforming a source image to the coordinate system of the reference image. Images may be taken either at different times, from different views, under different lighting, or with different sensors. Researchers have been working on the image alignment problem for decades to solve alignment problems in various fields such as medical imaging, remote sensing, image fusion, panorama, change detection, recognition etc. [1,2]. There are numerous different procedures that execute the image alignment undertaking, yet there is no calculation is sure work with 100% precision, conventional algorithm of image alignment centres around pixel-to – pixel processing, which are moderate and utilize blunder criteria in this way[3]. The on-going systems in image alignment utilized element put together treatment that depends with respect to feature obtained from images instead of pixels[4]. features based methods provide increasingly strong against scene movement and are in principle quicker. The open element indicates are utilized make the relationship between the images which makes them appropriate for automated alignment [4,5] . The techniques that adopt the principle of features in the alignment of images mainly focus on how to extract those features and how to take advantage of them, as it is the method of extracting features of images differ in its performance from one image to another or from pixel to pixel [6]. In the work presented here, the advantages of two branches or two methods of alignment process have been used to obtain strong and effective results. The benefits of the method of extracting features from the feature extractor, the rigid transformation parameters using the ICP algorithm will be obtained, and applied to each point or feature in image to complete the alignment process [7]. In this study, an approach for the automated Alignment of images through the extraction of feature points

with the use of the iterative alignment fashion has been suggested, allowing for a more detailed pixel based correspondences pixel principles, instead of conventional approaches, and as a result, to a precise Alignment of the images. This method is capable of the estimation of the translation and/or rotation between two images.

2. THE PROPOSED SYSTEM

The objective of the current study is to automate the alignment procedure between 2 images. The basic idea at work is to find the correct and ideal transformation coefficients that can be used on both images to make the alignment process accurate. To find these parameters, it has been chosen to work on the ICP algorithm because it has proven its effectiveness and accuracy at work and it is widely used. This algorithm adopts the principle of repetition and reduction of error as well as works on matching points between two images to be aligned. The key influence of the suggested approach is finding the important characteristics in both images and find the matches between them by grouping their neighbours, as well as finding the accurate parameters of the transformation with the use of an iterative algorithm depending on these correspondences and finally aligning the two images with the giving value or weight for each pixel in each image . This system introduced and enhanced approach for aligning 2 images in the same location and with identical dimensions with the use of the feature – based approach for the extraction of the important features and the use of the pixel– to – pixel approach for aligning those images.

3. PROPOSEED SYSTEM OUTLINES

In order to perform the proposed alignment process, the work has been divided into four phases :at first we extract the vital features from the two images (segment 3.1), at that point we locate the coordinated features utilizing the grouping strategy(section 3.2) , after that utilized those matches in the ICP algorithm to figure the matrices of the transformation (section 3.3), where utilizing this grids to perform aligning process (segment 3.4) . The data which has been utilized in the present study is 640x640 pixels. Figure1 elineates the diagram of the suggested framework .

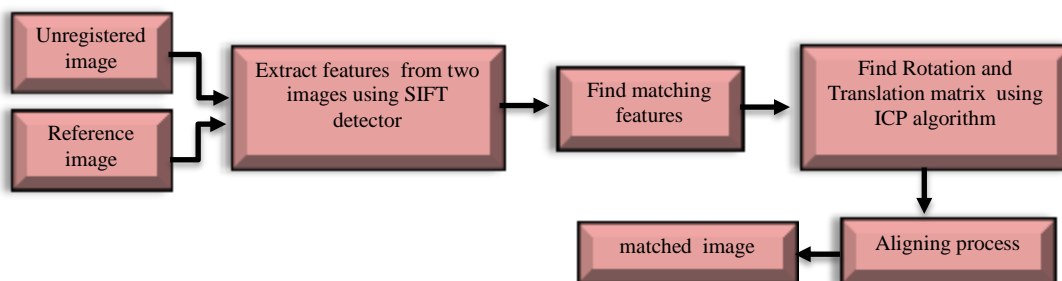


Figure 1. The block diagram of the proposed system

3.1 Feature Extraction

Two images enter this stage to produce a set of important features in the two image, and this is done using the SIFT detector, the SIFT detector detects the areas associated with each other through the affine transformation and the various lighting . It is very important to detect the powerful features in both images in order to find pairs of identical features between the two images. These matches must be of high accurate because the transformation process is supported on it . This process is usually computationally expensive. The SIF detector can provide the features which are local and invariant to the sizing of the image and the position angle, as a result providing them rather strong. Those characteristics are strong as well in the response to the converts in lighting and small variations in the view-points. Figure 2 shows the detected SIFT features from sample of images.



Figure2. SIFT detector features

3.2 Features Matches

Rather than the use of all of the characteristics that have been obtained from the 2 images, only the corresponding features will be used between the two images in alignment process. In this step, the matching features or correspondence between the two images are detected, which gives the accuracy and speed of the work. At this stage, a technique has been used to find correspondence between the two images with high reliability, by combining 3 features together, and test if these matches have no equivalent in current image as in reference image . The likelihood of finding perfect matches is even greater if we use a cluster of features, not a single feature. In this procedure a vector is used from the extracted features of each image in the previous stage (SIFT detector) and the result of the action is the centroids (centre of each cluster) that are used as input for the following step. This stage tries providing a technique to find correspondence between any 2 images with high reliability. Accurate correspondence in the work of matching images greatly helps the accuracy of performance and speed at work by reducing the number of features as well as reducing the complexity of the whole method. This additionally causes the outcomes better to translate. After neighbourhood groups are indicated in two images, after select the local features in two images, the implementation of the alignment system at this stage requires that, detect identical points in 2 images through the creation of clusters. As soon as they have been matched, they're known as the point correspondences. Matches have been recognised through the evaluation of a similarity or distance measures.

Assuming that there are 2 pixels R_1 and dR_2 , the Euclidean distance will be:

$$D(R_1, R_2) = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2} \dots\dots\dots (1)$$

In the case where of a pixel R_1 and a set of the pixels F , Euclidean distance amongst them will be:

$$D(R_1, F) = \min_{i \in 1..n} D(R_1, F_i) \dots\dots\dots (2)$$

The actual implementing of this concept will require the assessment of the similarity or the distance measure for each important feature in the initial image versus every interesting feature in the other image. After examining the best standards of distance and similarity, bad couples are deleted and good couples are kept. Rejected pairs which are ,the distance between their points are greater than a specified threshold .

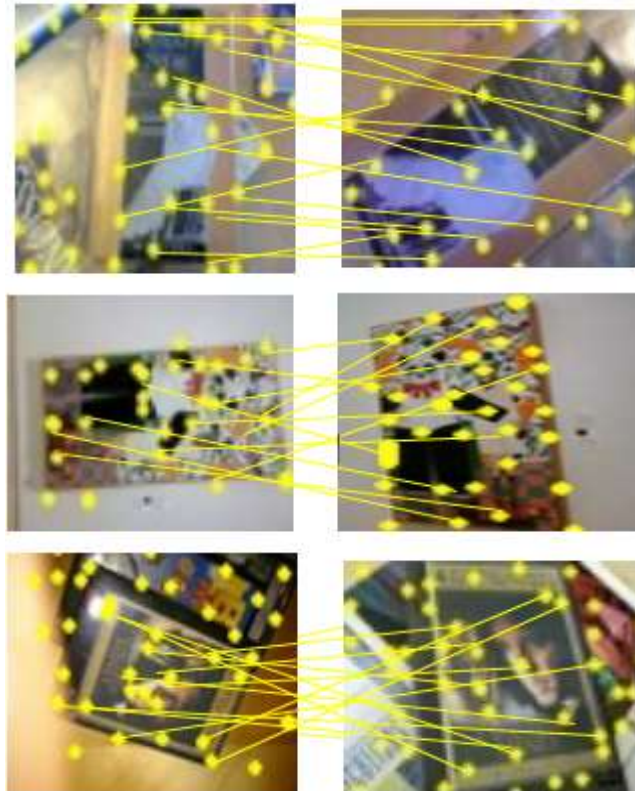


Figure3. Correspondences points between two images

3.3. ICP (Iterative Closest point) Algorithm

The algorithm of the Iterative Closest Point (ICP) is typically utilized in the geometrical alignment of the images in the case where the transformation parameters are known and defined first. This algorithm became a predominant approach for alignment images that focus accurately on the geometry, in some cases the colour. The ICP program begins by 2 images and first imposes the presence of stiff -body transform, and improves transformation parameters repeatedly by repeatedly creating identical pairs of features and lowering the scale of the line. Create a group of seafarers ' pixels frequently using physical transformation and find new transformation parameters that reduce the error scale [8]. We prefer using this approach due to the fact that it is of a high sensitivity to the size and the rotation of the image, it also provides high precision for the alignment of the images, however, has some limitations in time performance in the case where there is a possibility of finding the matched characteristics beforehand, which is capable of speeding up the processing of the algorithm and giving it higher level of the power in a variety of the results. Accordingly, for the aim of speeding up the process of the alignment and attributable to SIFT features' strength, the correspondence of the known points is dependent upon section 3.2 is used. The procedure of the alignment utilizes the algorithm of the ICP for figuring a rigid transform utilizing correspondences of the points.

3.4 Alignment method

This method is dependent upon finding the smallest difference between two image pixels. After extracting the perfect transformation parameters in the previous step, the value of each pixel in the second image is multiplied by those parameters to reduce the difference between the two images. At this stage we adopt the principle that both images must participate the new image configuration. Through the method of selecting the good pixels, that dexecute by choice technique for pixels from two images .If I_1 and I_2 are 2 images need overlapping, we are going to assigns the value of the weight (w) to pixels in those images, in which the two images are going to similarly play a role in the creation of the stitched images . w can either be 1 or 0 . On the off chance that $w=0$, at that case, the pixel does not have any impact on the composite image whereas in the case where $w=1$ infers the pixel will be copied there. Show fig4.

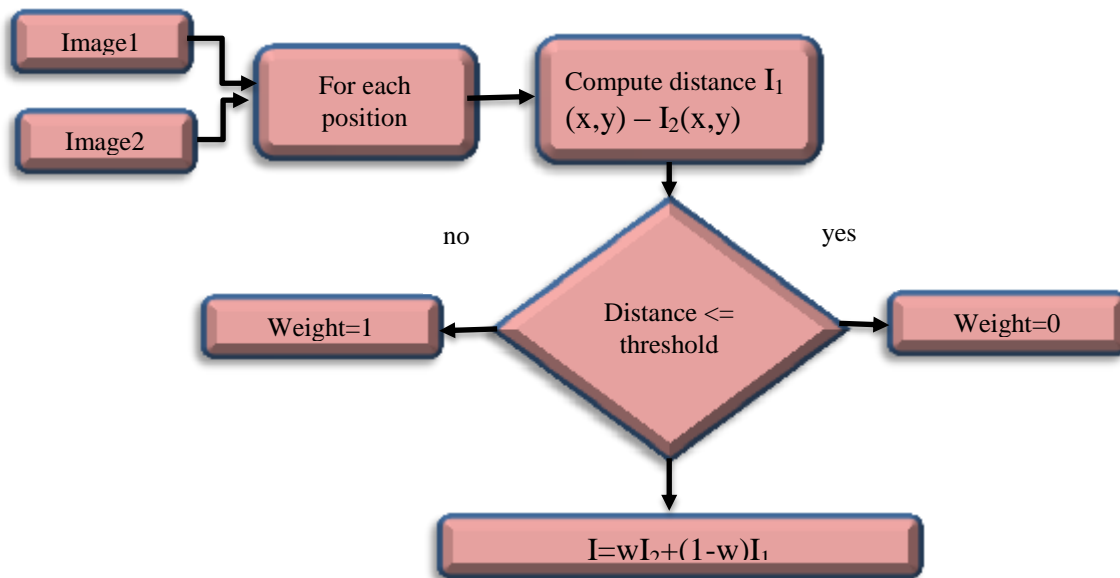


Figure4. Flowchart of alignment process

4. THE DATASET

The Stanford Mobile Visual Search Data-set has been utilized for implementing the proposed technique, which includes the images of the products, books, CDs, business cards, outdoor landmarks, texts, videos, and museum paintings which have been taken by camera-phone.

5. DISCUSSION AND EXPERIMENTAL RESULTS

To executed the proposed strategy , eight distinct sequences has been utilized ,every one of which has 100 images with a value of the resolution equal to (640x640). The majority of the alignment systems utilizing TRE (i.e. Target Registration Error) for the assessment of those procedures' quality and execution. In this strategy target error and RMSE has been utilizes for the evaluation of precision of it .Table1 explain the outputs for every sequence.

Table1: Experimental results of proposed method

| | TRE | RMSE | TIME/Sc |
|----------|------|------|---------|
| Squence1 | 0.39 | 0.46 | 2.3 |
| Squence2 | 0.37 | 0.39 | 2.5 |
| Squence3 | 0.67 | 0.63 | 2.7 |
| Squence4 | 0.24 | 0.29 | 1.7 |
| Squence5 | 0.38 | 0.54 | 2.5 |
| Squence6 | 0.80 | 0.56 | 2.4 |
| Squence7 | 0.47 | 0.41 | 2.5 |
| Squence8 | 0.37 | 0.41 | 1.8 |

From these outcomes found that the technique reach to best exactness with the sequence4 in whcih the TRE have minimal value, however MSE is minimal in the sequence8 and sequence4 fulfill short enlistment time . each sequence will gain optimal outcomes and exactness proportion is accepted in comparison to other alignment strategies.

6 .CONCLUSION

This research provides image analysis technology that can be used to match any two images that give high accuracy at work as well as high performance speed. Combining images using the feature-based method in the images is of a higher speed and typically has success in reaching precise outcomes instead of the alignment methods that adopt the principle of the pixel, which is of a lower speed and doesn't always obtain precise outcomes. This approach is effective due to its successful removal of the interruptions in the complex images. This approach performs quite efficiently in the detection of the matches that have been found in collections of the characteristics between the images and align those images with low-time performance and high resolution. Exactness to get quicker execution Image align mentation.

REFERENCES

- 1-Wang L.; Traub J.; Weident S.; Heining SM.; Euler E. and Navab N. (2010). Parallax-free intra-operative x-ray image stitching: *Med .Image Anal.* 14(5):674-686.
- 2- K.Shashank, N. G. (MarCh 2014). A Survey and Review over Image Alignment and Stitching Methods. *The International Journal of Electronics & Communication Technology (IJECT)*, ISSN: 2230-7109 (Online)
- 3- TUYTELAARS T., MIKOLAJCZYK K.: Local invariant feature detectors - a survey. *Foundations and Trends in Computer Graphics and Vision* (2008)
- 4- Yoon K. and Kweon I.(2006) . Adaptive support-weight approach for correspondence search. *IEEE Trans. PAMI*, 28(4):650–656
- 5- KHAN N., MCCANE B., WYVILL G.: Sift and surf performance evaluation against various image deformations on benchmark dataset. In *Digital Image Computing Techniques and Applications (DICTA)*, 2011 International Conference on (dec. 2011), pp. 501 –506. 4
- 6- Hsu K. ; Lin Y. and Chuang Y. (2015). Robust Image Alignment with Multiple Feature Descriptors and Alinment-Guided Neighborhoods, *IEEE International Conference on Computer Vision and Pattern Recognition (CVPR)*.
- 7- A.V.Kulkarni1, J. V. (September-2013). Object recognition with ORB and its Implementation on FPGA. *International Journal of Advanced Computer Research*, 2277-7970.
- 8 -Hong, S.; Ko, H.; Kim, J. Vicp: Velocity Updating Iterative Closest Point Algorithm. In *Proceedings of the 2010 IEEE International Conference on Robotics and Automation (ICRA)*, Anchorage, AK, USA, 3–8 May 2010.