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Medical image recognition and analysis using image restoration techniques

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***Abstract*---**The proposed system uses image recognition system that in turn uses the concept of thermal image. The quality of images in dark surroundings is improved using thermal images. The infrared radiations in the image are identified based on the image information that has been created. These images can be captured with the help of infrared cameras and the information is recorded with various temperatures. During this process, image environment are recorded which helps improve the process of matching. The registration of images is done using image registration tools. The images fed as input are divided and image signatures are created. Henceforth, an image model is generated and this helps in the process of matching. The image model is created and stored for any matching process. The proposed system is implemented using image restoration algorithm and experiments authenticate that this work brings efficient result.

***Keywords*---**Image processing, image restoration, filters, thermal image, image recognition, noise removal.

Introduction

Based on the individual and physical characteristic data, the identified systems are used for authenticating and also recognizing persons. Generally, the recognition model works with three basis properties such as attribute, biographic and biometrics [1]. The first two properties can be easily recognized which include the biographical identifier and attribute. From person to person, the biometric identifier differs depending on the behavior of an individual [2][3]. Individual properties are not the same at all times, it depends on the situation and environmental surroundings. It is functional and not always accurate as it differs from time to time. This variation is sometimes due to physical components and surroundings. These issues are overcome when thermal mid waves are used. These images are recorded with the help of electronic scale of impression [4].

Existing System

Multi sensors are used in the existing system and had turned out to be difficult for users. A large image feature set is created by merging all small sub region samples and hence this complex set extraction is difficult.

Disadvantages of existing system

- Detecting facial disguises is difficult.
- Light variability leads to problem in matching.
- Creates a large feature set.
- User finds the system complex.
- Image signature creation is difficult.

Proposed System

Proposed system works by developing an easier procedure for the input, wherein these images are captured using functional information that are taken from mid wave infrared images. This leads to an incorporated approach that consolidates exclusive algorithms at mine thermal imaging features based on which a model is created that helps matching process. The whole process is done in four important steps, (a). Image matriculation (b). Image impression Generation (c). Model creation and (d). Image toning. All the above processes are preformed as individual operations and functions based on the image capturing system and image thermal model signature generated [7].

Advantages

- High accuracy in matching process.
- Effective subject matching.
- The developed technique is simple and fast.

Proposed Architecture

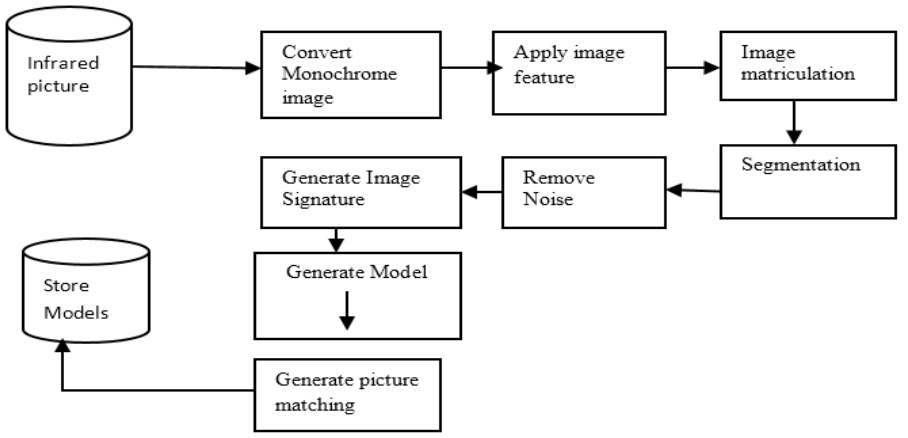

Fig. 1. Proposed image restoration technique

Experimental setup

Image Matriculation Process

The most challenging task in the field of image processing is image registration. There are various techniques available for image registration for medical images and for images in biometric applications. The process of image registration process is achieved using the Rigid Body Image Registration Tool [8][9]. It is the process of overlaying two or more images of the same scene. These are taken at different times, from different viewpoints, and or by different sensors. It geometrically aligns images like, reference and sensed images. The present differences between images are introduced due to different imaging conditions. This registration is a crucial step in all image analysis tasks wherein the final information is gained from the combination of various data sources like in image fusion, change detection, and multichannel image restoration. Typically, registration is required in remote sensing i.e. multispectral classification, environmental monitoring, change detection, image mosaicing, weather forecasting, creating super-resolution images.This process is shown in fig 3.

Image Impression Generation

There are four steps in generating thermal signatures. They are:

- Image Segmentation
- Noise Removal
- Picture Diagnosis
- Post Purification.

Image Segmentation

The input image is segmented from the rest of the image achieved by implementing the technique of localizing region-based active contours. During this process typical region-based active contour energies are localized in order to handle images with heterogeneous foregrounds and backgrounds[5][6] This is obtained by localizing the contouring algorithm to a neighborhood around the point of interest.

Noise Removal

Once the input image is divided, unwanted information's is removed from the image repository. This image data's are used to improve the performance of a retrieval process.[9][10][11]. A regular transmission accelerator is applied on the complete infrared image. This process is removed the unwanted or blurred images from image repository [12].

Picture Diagnosis

This process is constructed and analyzing the given input based on the appearance. For example user need to analysis round shape image, similar type or similar appearance is consider as a input. It will reduce the analyzing time and give the results more quickly. This type of analysis is used to identify the similar structures in medical and engineering applications.

Post purification

After getting the purified images the images are undergone the skeletonization. This process is helps the user to remove the center areas on the input. This process saves more storage this helps the user to store and analysis more images. This process is shown in fig 4.6.

Picture framework construction

Here image signatures framework are added to the infrared image obtained from noise removal process. Obtained images are consist of all the properties of four infrared image extractions, each of this images are identical.

Proposed Algorithm

Step 1: Generate picture repository
Step 2: Collect the segmented pictures.
Step 3: Reduce or modify the size of the pictures.
Step 4: Collect positon and scope of every input picture
Step 5: Based on the position collect theta value
Step 6: Compete this step for all the segmented pictures.
Step 7: Generate infrared picture using step 6.
Step 8: Output of step 7 helps to generated image signature.
Step 9: Repeat step1-step8 until image generation of image model.
Step 10: Stop

Generate picture matching

Finding resemblance among the pictures is the one of most thrusted area in image processing. Based on the users input or user searching in image repository this applications are widely accepted procedure. Here user extracting the similar objects or similar picture based on the input. In the developed model infrared pictures model similar to the query known as infrared signature. This process further shown in the below sequence diagaram.

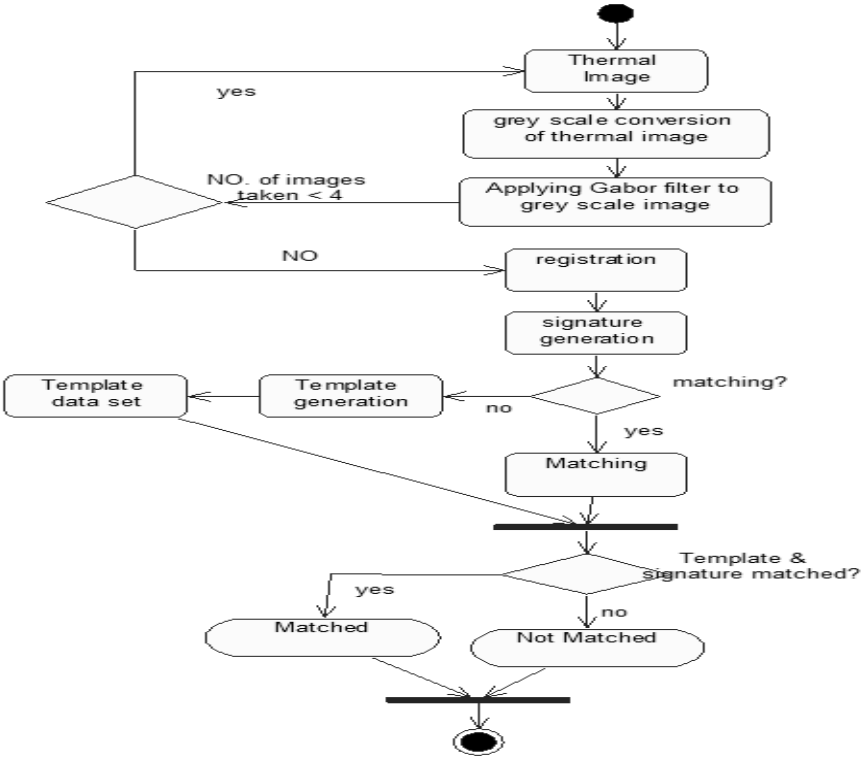

Fig. 2. Sequence diagram for image restoration process.

Experimental outcome

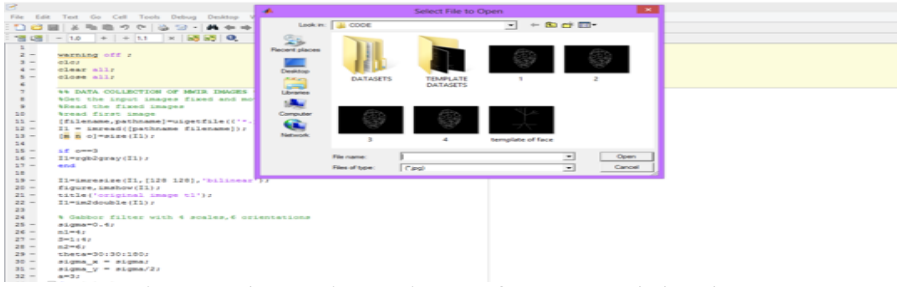

Fig. 3. Choose input image from stored database

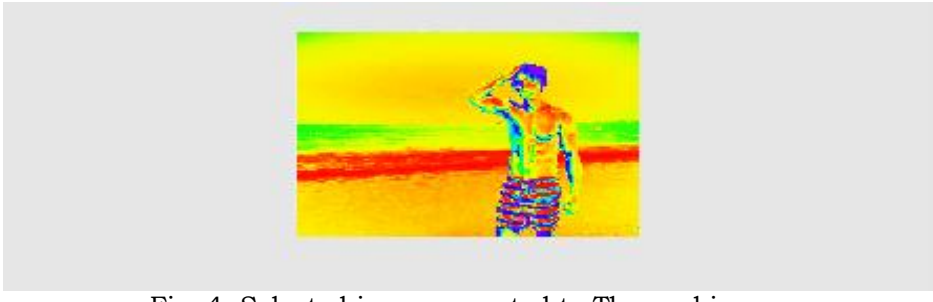

Fig. 4. Selected image coverted to Thermal image

Fig. 5. Using filtering concept obtain four thermal image

Fig. 6. Output of merged image using fig

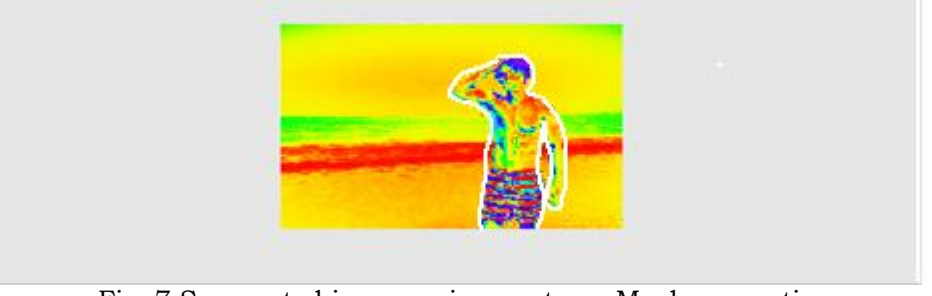

Fig. 7.Segmented image using contour, Mask generation

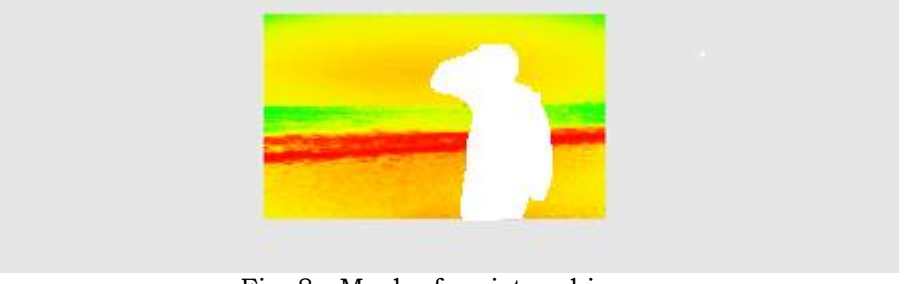

Fig. 8. Mask of registered image

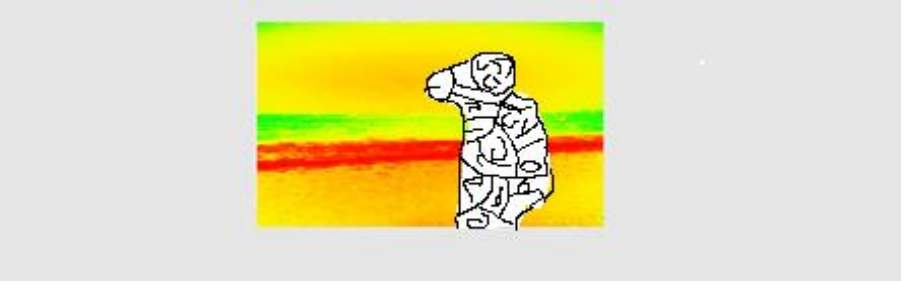

Fig. 9. Output of Thermal signature use of Mask of selected image

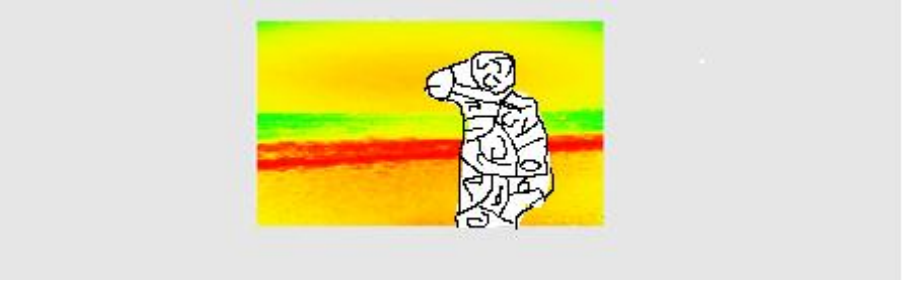

Fig. 10. Four thermal image signature combined image mask

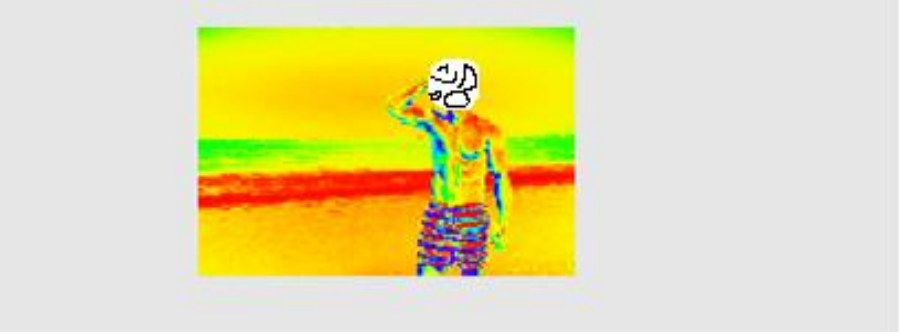

Fig. 11.Signature overlaid on input image

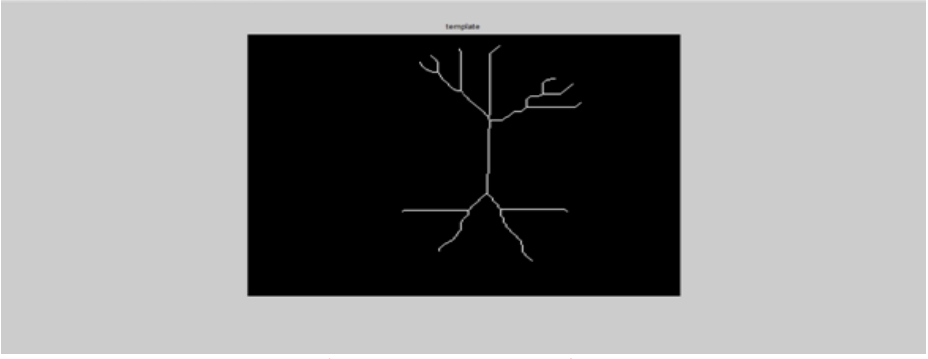

Fig. 12. Image template

Conclusion and future enhancement

The proposed system which is based on thermal image is applicable in recognition systems. It is implemented in order to improve the accuracy in matching. The performance of the system can be improved by adopting advanced techniques. The number of images used to register can also be increased and registration techniques can be adopted based on both feature extraction and sensor-based techniques. Instead of Gabor and Anisotropic filters, other advanced edge identifying filters can be used to improve the accuracy of the system in future.

References

1. Adini Y, Moses Y, and Ullman S, "Face recognition: The problem of compensating for changes in illumination direction," IEEE Trans. Pattern Anal. Mach. Intell., vol. 19, no. 7, pp. 721–732, Jul. 1997.
2. Buddharaju P, Pavlidis I. T, Tsiamyrtzis P, and Bazakos M, "Physiologybased face recognition in the thermal infrared spectrum," IEEE Trans. Pattern Anal., vol. 29, no. 4, pp. 613–626, Apr. 2007.
3. D.Saravanan," Efficient Video indexing and retrieval using hierarchical clustering techniques", Advances in Intelligence systems and computing, Volume 712, Pages 1-8, ISBN:978-981-10-8227-6, Nov-2018.
4. Choi H. C and Kim S.W, "A direction-based vascular pattern extraction algorithm for hand vascular pattern verification," Etri. J., vol. 25, pp. 101–108, 2003.
5. D.Saravanan, S. Vaithyasubaramanian, "Image extraction using image attribute Concept Technique", Advances in Automation , Signal processing, Instrumentation, and Control, Lecture Notes in Electrical Engineering 700, Pages 935-943, March 2021, ISBN: 978-981-15-8220-2.
6. Saravanan, S. Vaithyasubramanian, ", Image encryption using matrix attribute values techniques", Lecture notes in network and systems, 190, Pages 185-194, ISSN 2367-3370, ISBN 978-981-16-0881-0 https://doi.org/10.1007/978-981-16-0882-7_14, July 2021.
7. Javier Ruiz-del-Solar and Julio Quinteros,"Illumination Compensation and Normalization in Eigen space-based Face Recognition: A comparative study of different pre-processing approaches"IEEE Trans. Biomed. Eng., vol. 57, no. 4, pp. 979–987, Apr. 2010.
8. Jenkinson M, Bannister P, Brady M, and Smith S, "Improved optimization for the robust and accurate linear registration and motion correction of brain images," NeuroImage, vol. 17, pp. 825–841, 2002.
9. Khader M and Ben Hamza A, "Nonrigid image registration using an entropic similarity," IEEE Trans. Inf. Technol. Biomed., vol. 15, no. 5, pp. 681–690, Sep. 2011.
10. D.Saravanan, "A proposed Architecture for finding missing thread's in Internet". Bioscience Biotechnology Research communication(BBRC), Special Issue's Volume 13, Number (13), 2020, Pages 366-367, Feb 2021, ISSN:0974-6455
11. D.Saravanan, Multimedia data Retrieval Data mining image pixel comparison technique", Lecture notes on Data Engineering and communications Technology 31,Aug 2019, Pages 483-489, ISBN 978-3-030-24642-6, Chapter 57

12. Miura N, Nagasaka A, and Miyatake T, “Feature extraction of finger vein patterns based on repeated line tracking and its application to personal identification,” Mach. Vision Appl., vol. 15, pp. 194–203, 2004.
13. Pavlidis I, Tsiamyrtzis P, Buddhraju P, and Manohar C, “Biometrics: Face recognition in thermal infrared,” in Biomedical Engineering Handbook, J. Bronzino, Ed. Boca Raton, FL: CRC Press, 2006.