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Application of edge detection technique on dental images to find human identity

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ABSTRACT

This paper will describe a system that will identify a person by comparing his dental photograph with database in form of dental records. Human identification based dental biometric is a part of forensic odontology that deals with victim identification based on dental features. Teeth are parts of human organ that are located inside mouth and thus they are more protected from decaying after human's death. Therefore, teeth based identification is one of reliable tools for post-mortem identification. In this paper we use i edge detection technique as the identification tool. Based on a given post-mortem image, a match will be found in a predefined database of ante-mortem images in order to rehabilitation the closest match concerning some salient features.

KEYWORDS: ***Dental biometric, forensic odontology, human identification, feature extraction, edge detection***

1. INTRODUCTION

Biometric identification systems are mainly based on physical characteristics such as face, fingerprint, palm-print, eyes (iris, retina) and DNA. However, many of those characteristics are only suitable for ante-mortem (AM) identification i.e. a person to be identified is still alive. They cannot be used for post-mortem (PM) identification especially in case of decay or severe body damage caused by fire or collision. In such cases dental biometrics plays an important role in human identification and post-mortem identification. Owing to the evolution of information technology and an urge to investigate more cases by the forensic experts, it is necessary to automate the human identification system.

2. EXISTING SYSTEM

In forensic dentistry, identification of people is done on the basis of unique patterns in the dental radiography images. It makes use of a biological characteristic dental recognition as a form of biometric verification. The existing systems uses algorithms to align the contours and calculates the average distance between all points in the query shape and their closest points in the database shape and uses it to represent the distance between tooth contours.Many authors explored the feature extraction and matching techniques based on dental radiograph in dental biometric Matching part contains tooth-level matching, computation of image distances, and subject identification, Some uses

mathematical morphology for teeth segmentation, classification and numbering of dental radiographs for an automated human identification system is implemented by using binary support vector machine method.

3. PROPOSED SYSTEM

The main objective of forensic dentistry is to identify people based on their dental records, mainly as radiograph images. But in this proposed system identification will be based on normal photograph which can be easily made available. The system has mainly four modules: pre-processing, Feature extraction, feature matching and recognized person identification. Pre-processing is done by resizing and rgb2gray conversion. Feature extraction uses morphological operation and feature extraction algorithms. Matching is done by using feature matching algorithm and finally identified the person from his dental biometric image. Fig.1 shows the block diagram of the proposed human identification system based on teeth feature extraction and matching.

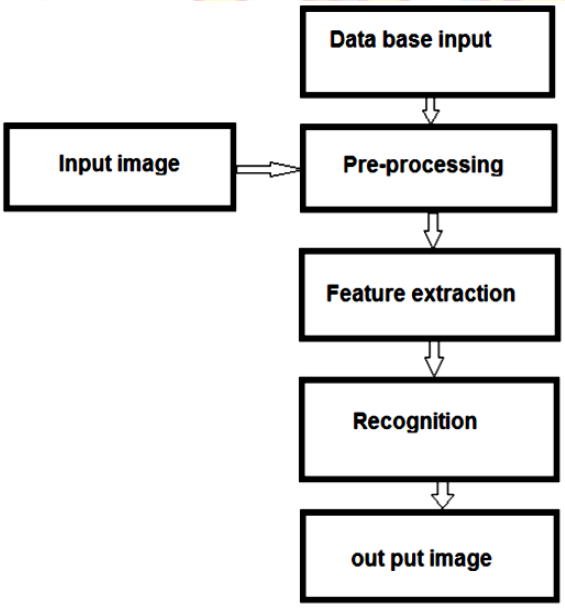

Fig 1: Block diagram of the proposed model

Database Input: A dental database is created by registering dental photograph of different people in JPEG format. It is necessary to have many images in reference to each registered people. It is created by collecting images from different dental clinics and taking photographs of people of different ages through camera.

Input image: The input images are dental photograph in JPEG format. The user needs to provide input image which he wants to identify.

Fig 2: Image whose identity to be searched

4. PREPROCESSING OF THE IMAGES

Image preprocessing refers to formatting of images before they are used for any reference or training. In this paper we have considered the following preprocessing steps-

a) **RGB to gray conversion:** RGB to grey conversion is required for the images because the processing takes place on gray scale image. This conversion is carried out by eliminating hue and saturation information while retaining the luminance information of image.

Fig 3: RGB to gray conversion of the input image

b) **Segmentation:** In teeth segmentation each tooth is segmented in rectangular region using mathematical approach like noise filtering, thresholding to isolate the teeth from background.

Fig 4: Input Image with uniform background

There are four steps as, specify colourrang, intensity and hue map, create binary image from hue intensity map and return binary image. This will give segmented teeth images.

Fig 5: Intensity adjusted for the input image

5. FEATURE EXTRACTION USING EDGE DETECTION

After pre-processing feature extraction is performed. The objective is to implement a system which has biometric identification method based on dental biometric calculation on dental data. For best features extraction and accurate matching results the quality of image should be noticed and evaluated properly to get desired results. In this paper different methods are used for feature extraction for the teeth color images so that by comparing the results the best one can be selected. The best results are observed till now in feature extraction using edge detection.

Edge is a point in the image where intensities are changing rapidly. Edge detection refers to the various mathematical and algorithmic methods by which a computer is able to map out the 'edges' in an image as humans see them. Edge detection is fundamental in processes such as image processing, matching vision and computer vision.

Canny edge detection

We can derive the optimal edge operation to find step edges in the presence of white noise, where "optimal" means-

1. Good detection (minimum the probability of detecting false edges and missing real edge)
2. Good localization (detected edges must be close to the true edges)
3. Single response (return only one point for each true edge point)

Fig 6: canny edge detection on the input image

6. RESULTS AND DISCUSSIONS

In the implementation part, the image database directory is loaded in the program. After that the query image is inserted by the user as input image.

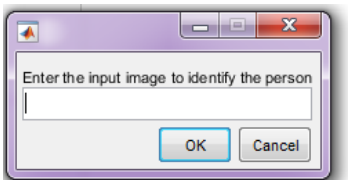

Fig 7: Dialog box asking the user to insert the query image

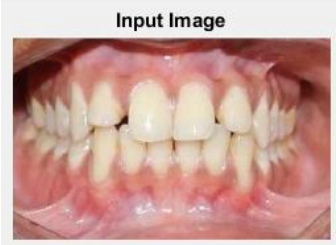

Fig: 8: Image inserted by the user

After performing all the prepossessing steps as mentioned above, edge detection technique using "CANNY" method is applied.

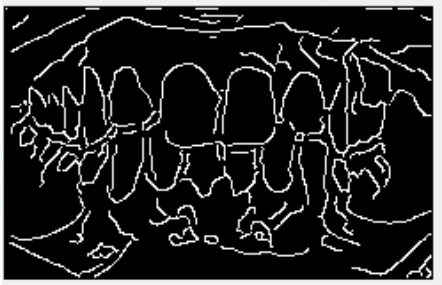

Fig 9: Edge detection of the user's image

Then the input image is compared with the database images one by one. and result is displayed accordingly.

It is observed that the edges are having pixel intensity of 1's and other background values are in the form of 0's. Thus to get the matching image of the input image from the database, the edge detected matrix of the input image is subtracted from each edge detected matrix of the database image. The resultant matrix obtained is again in the form of 0's & 1's.

Here if the result is,

0's means => match pixels

1's means=> mismatch pixels

So, if the resultant matrix of a particular subtraction operation contains all zeros, it can be concluded that the corresponding database image is a matched image of the input image. So in this way this technique can use for human identification.

Fig 10: Matched image from the database

```
images scanned=
   361

Identified person is
akshay kalita.jpg
```

Fig 11: Name of the identified from the database

7. FUTURE SCOPE

Our future work will be developing a method of matching based on distance. In this methodwe will find out distance between teeth. So in case of missing tooth this algorithm can give us perfect analysis of query image.

8. CONCLUSION

Algorithm is developed for the semi-automatic human identification based on dental photograph. The work has been carried out for the database of 361 dental photographs taken in normal environment.In this algorithm the matching of dental photograph is carried out based on edge detection technique. The developed algorithm has given also given some unsatisfactory results for images which were blurred and ROI is not properly within the range.

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

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