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HUMAN IDENTIFICATION BASED ON MORPHOLOGICAL TEETH SEGMENTATION AND BPNN

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ABSTRACT

Law administration agencies accept been base biometric identifiers for decades as key accoutrement in forensic identification. With the development in data innovation and the gigantic volume of cases that should be explored by forensic experts, it has ended up vital to automate human identification system. While, anti mortem (AM) distinguishing proof, that is ID preceding passing, is typically conceivable through examination of numerous biometric identifiers, postmortem (PM) distinguishing proof, that is recognizable proof after death , is unimaginable utilizing behavioral biometrics (e.g. speech, gait). In addition, under serious circumstances, such as those experienced in mass fiascos (e.g. plane crashers) or if ID is being endeavored more than a few weeks after death, under such circumstances, most physiological biometrics may not be utilized for recognizable proof, on account of the rot of soft tissues of the body to unidentifiable states. Subsequently, an after death biometric identifier needs to oppose the early rot that influences body tissues. Since of their survivability and differing qualities, the best possibility for postmortem biometric recognizable proof are the dental elements.

In this paper we exhibit a review around a automated dental identification system for Missing and Unidentified Persons. This automated dental identification system can be utilized by both law implementation and security offices in both forensic and biometric recognizable proof. We will likewise exhibit methods for dental segmentation of X-ray pictures. These strategies address the issue of recognizing every individual tooth.

Keywords—Dental x-ray image,BPNN method.

INTRODUCTION

A biometric system is used to identify individual. A biometric is a measurable physical characteristic which are reliable than a password. Many biometric systems are employed which work on the basis of image analysis. “Biometrics” is a general term used alternatively to describe a characteristic. The biometric systems are divided into two categories as: behavioral biometrics and physiological biometrics. In behavioral biometric systems a person is identified based on how he performs something. Physiological biometric characteristic are making a signature, walking, typing on a keyboard. In physiological biometric system a person is identified based on a unique characteristic of some body organ of that person. The typical examples of physiological biometric system are Iris biometry, face biometry, finger biometry, dental biometry etc.

Dental biometry used in forensic identification. This technique requires ante mortem and postmortem radiographs. In this both radiograph are segmented and matched for identification of undefined victim. In this paper we are presenting dental radiograph segmentation and matching.

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CLASSES OF DENTAL X-RAY

There are two classes of dental radiographs. radiographs acquired after the death, post-mortem (PM) radiographs, and radiographs acquired while the person is alive, ante-mortem (AM) radiographs, see Fig. 1.1.

AM radiographs, labeled with patient names, are collected from the dentist. The method used in dental biometrics is matching unlabeled PM radiographs against a database of labeled AM radiographs. The identity of the PM radiograph is obtained, if the dental features in a PM radiograph sufficiently match with the dental features from the AM radiograph.

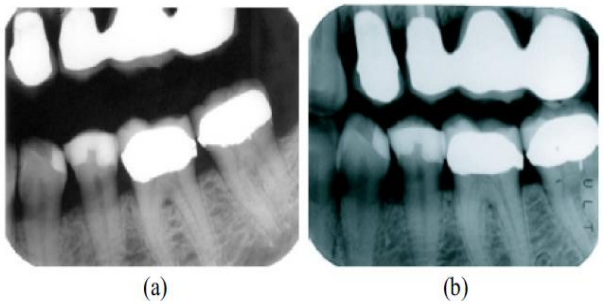

Figure 1.1: (a) Ante-mortem (AM) and (b) Post-mortem (PM) Radiograph of an individual.

DENTAL IMAGE SEGMENTATION

Dental Image segmentation is to recognize and label individual tooth in the X-Ray image or parts of the tooth such as crown and root of the tooth. Each tooth or object extracted from the image represents Region of Interest (ROI) that contains important data used for later steps.

ROI is defined as a rectangular part of the image that focuses on one object of the extracted objects from the image.

The following image represents an X-ray image and the specified object inside the rectangle represents the ROI. Figure 1.2 shows ROI extracted from the dental image.

In most of the segmentation algorithms, the segmentation is done either by extracting region based features, that can identify different objects and regions, or by applying a model and try to adjust its parameters.

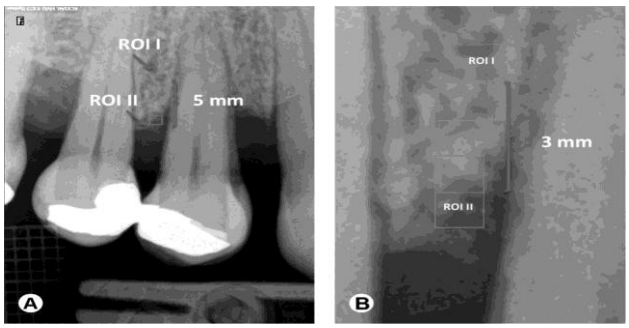

Fig-1.2 Region of interest in dental image segmentation

SYSTEM OVERVIEW

This prototype named DAIS (Dental Automatic Identification System) is seen as collection of components as shown in fig.1.3 .This model can divided into two phases: feature extraction and identification.

In the first phase, we start by entering a dental Pariapical image followed by the extraction of region of interest (ROI) and then we enhance the image contrast. The original image is saved in a database named DRI (Digital Depository of Image).After separating teeth, we will continue with the extraction of high level features, such as number of teeth and dental work. If it is a registration process will continue with the contours and results are finally stored in the database archive. If it is an identification process, check the similarities to the high level features, a list of candidates is then obtained. In case the list is not empty we move to the Comparison of the low level Features in order to obtain a simplified list and consequently one person.

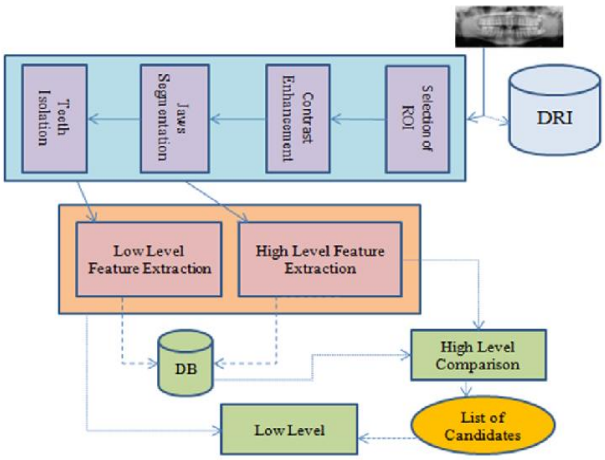

Fig-1.3Dental Automatic identification system (DAIS)

PREVIOUS WORK

Eyad Haj Said, Diaa Eldin M. Nassar, Gamal Famhmy [7].

Proposed a mathematical morphology of binary image technique is using for teeth segmentation , also proposing a grayscale contrast stretching transformation to improve the performance of teeth segmentation .comparing methodology with other methodologies and result shows lowest failure rate among all approaches studied for capability of handling bitewing and periapical dental radiographic views .fuzzy c-means algorithm was proposed for classification.

Chabel Fares and Mireille Feghal[2].

Proposed a new system for dental biometry that consist of three main stages: segmentation, features extraction and matching .the feature extraction stage uses grayscale transformation to enhance the image contrast and a mixture of morphological operations(Hat transform , adaptive and iterative threshold and Integration method of teeth separation) to segment the dental work.

Deven N. Triedi [3].

proposed canny algorithm is using for edge detection in feature Extraction .In this all the images (reference images) and input image(query image) are used in the hole process of human identification the proposed system is implanted with five modules those are : Image classification , pre-processing , segmentation ,feature

Extraction and dental image matching and human

Identification.

Abdolvahab, Mohd Shafry, Alireza [5].

Proposed the segmentation method proposed in order to segment the dental radiograph images. Thresholding method has been applied to simplify the images and to morphologically open binary image technique performed to eliminate the unnecessary regions on images. Furthermore, horizontal and vertical integral projection techniques used to extract the each individual tooth from radiograph images. Segmentation process has been done by applying the level set method on each extracted images. Nevertheless, the experiments results by 90% accuracy demonstrate that proposed method achieves high accuracy and promising result.

PROPOSED METHODOLOGY

The back propagation algorithm is a generalization of the least mean square algorithm that modifies network weights to minimize the mean squared error between the desired and Actual outputs of the network. Back propagation uses supervised learning in which the network is trained using data for which inputs as well as desired outputs are known. Once trained, the network weights are frozen and can be used to compute output values for new input samples.

BACK PROPAGATION NEURAL NETWORK (BPNN) ALGORITHM:

Step1. Design the structure of neural network and input parameters of the network.

Step2. Get initial weights W and initial θ values from randomizing

Step3. Input training data matrix X and output matrix T.

Step4. Compute the output vector of each neural unit.

(a) Compute the output vector H of the hidden layer

$$\text{net } k = \sum W\ i\ k\ X\ i - \theta\ k$$

$$Hk = f(\text{net } k) \quad (3.1)$$

(b) Compute the output vector Y of the output layer

$$\text{net } j = \sum W\,k\,j\,H\,i - \theta\,j$$

$$Yj = f(\text{net } j) \quad (3.2)$$

Step5. Compute the distances d

(a) Compute the distances d of the output layer

$$\delta j = (T\,j - Y\,j) \bullet f'(\text{net } j)$$

(b) Compute the distances d of the hidden layer

$$\delta\,k = (\sum \delta\,j\,W, y) \bullet f'(\text{net } k) \quad (3.3)$$

Step6. Compute the modification of W and θ (η is the learning rate)

(a) Compute the modification of W and θ of the output layer

$$\Delta\,W\,k\,j = \eta\,\delta\,j\,H\,k \quad \Delta\,\theta\,j = -\eta\,\delta\,j \quad (3.4)$$

(b) Compute the modification of W and θ of the hidden layer

$$\Delta\,W\,i\,k = \eta\,\delta\,k\,X\,i \quad \Delta\,\theta\,k = -\eta\,\delta\,k \quad (3.5)$$

Step7. Renew W and θ

(a) Renew W and θ of the output layer

$$Wkj = Wkj + \Delta\,Wkj \quad \theta\,j = \theta\,j + \Delta\,\theta\,j \quad (3.6)$$

(b) Renew W and θ of the hidden layer

$$Wik = Wik + \Delta\,Wik \quad \theta\,k = \theta\,k + \Delta\,\theta\,k \quad (3.7)$$

Step8. Repeat step 3 to step7 until convergence.

ALGORITHM	Haj said,Nassar ,Fahmy and Ammar Algorithm	Jain and chen	Nomir and Abdel Morttaleb	Zhou and Abdel-Mottaleb
Failure rate	2.12%	2.61%	11.18%	3.47%
Average time Complexity (sec)	4.614	5.658	57.251	7.323
Time Complexity Order	0(hw)	0(hw)	0(hw)	0(hw)

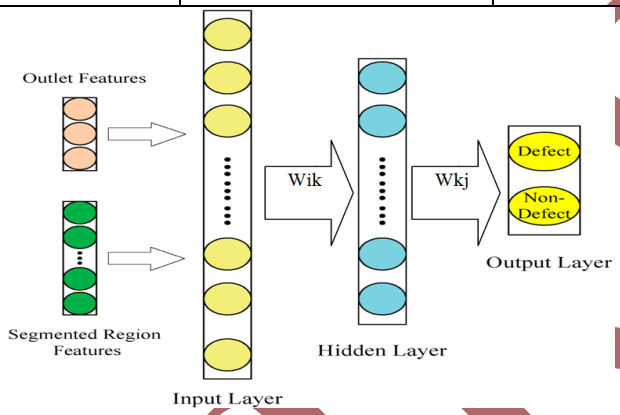

Figure 3.1: The structure of back propagation neural network (BPNN) Classifier.

Back propagation neural network (BPNN) Classifier in fig 3.1 shows three stages of Network 1.Input stage 2.Hidden Stage 3.Output stage .Where segmented region features and outlet features are getting classify.

DISCUSSION

Table 4.1Comparison of the failure rate and time complexity between various segmentation algorithm.

CONCLUSION

Biometrics is a relatively new technology, which is being deployed in public and private sector applications and, thus, has received much attention in the last years. Dental biometrics is used in the forensic medicine to identify individuals based on their dental characteristics by comparing unlabeled post-mortem with labeled ante-mortem radiographs.

We will present an automated dental image segmentation algorithm that handles periapical dental images based on mathematical morphology .the proposed algorithm includes 1)Noise Filtering ,2) thresholding is to isolate the teeth form the background and 3) analysis connect components labeling to determine the qualified ROI based on geometrical properties.

The performance comparison between variants of periapical dental image segmentation .The result will show that 1) The proposed algorithm can show lowest failure rate in the term of segmentation and it can fastest in term of time complexity and it can handle periapical images 2) The algorithm proposing (BPNN) may have highest optimality 3) Time complexity can reduce and rate of failure can lowest.

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