Dental Biometric Approach for Human Identification using Dental X-Ray Images of Maxillary Bone

Krutika P.Khandare, Dr.Ajay A.Gurjar

Student,Department of Electronics and Telecommunication, Sipna College of engineering and technology, Amravati(M.S.),India

Professor and Dean Academics,Department of Electronics and Telecommunication, Sipna College of engineering and technology, Amravati(M.S.),India

--***---

Abstract - *Human identification is becoming one of the major worldwide issues now days. Dental biometrics is the leading biometric technique to identify individuals on the basis of their dental characteristics. Dental Features of persons are naturally unique, one of feature include jaws of a person maxillary jaw (upper jaw) and mandible (lower jaw). Here, most of the similarities are matched so that human being can be exactly identified by its unique feature i.e. maxillary jaw. We will use efficient workable method to authenticate humans correctly and identify them properly, which is based on dental work information extracted out from dental data. This paper is all about a proposed method where it includes some major processing stages that consist of preprocessing, feature extraction, classification etc. This whole part will be implemented in matlab software for easy identification. Matlab software contains a powerful tool to employ all processing stages.*

Key Words: Dental biometric, maxillary jaw, mandible.

1.INTRODUCTION

The field of biometrics has got so much importance from few years because it is an interesting and a different way to identify humans than that of traditional authentication systems previously developed like passwords. Under various circumstances e.g. disasters conventional biometric characteristics like fingerprints etc, may not be able to work because of their incompatibility in such cases .In this case, dental features are considered a useful tool for of human identification. In order to achieve our desired mentioned goal, dental biometrics automatically analyzes dental radiographs, stored in a database through some described processing. In addition to this, forensic human identification is crucial and a big issue world-wide. At present security conditions, biometric identification is the most promising way to authentic humans with highest accuracy rate. A lot of research has been done in the field of different biometric modalities like Finger-print, Iris, Hand-Veins etc to identify humans. Within these various modalities, **Dental Biometric** has leading edge over others. Because of reason a lot of dental biometric characteristics have been associated with maxillary bone. Other modalities e.g. finger print, palm print; they have more complex features in it. They might leads sometimes towards high error rate. And also, there analysis is more complex. Thus dental biometrics gets priority over other in considering features and analysis point of view. Approaching in a different Way, the system of dental biometrics has not as developed as some other modalities. In this sense, it is being an intelligent approach to explore the new fields of research. Human identification has been done in various modalities like finger print, ear, face, hand vein recognition. Various strategies have been proposed and a lot of advancement is required also.

The maxillary jaw is a name for the upper jaw, and it includes several bones stuck (or fused) together, and it is in front of and just below the cranium. Also attached to the cranium and form the cheek, the nose, and the roof of the mouth. The air filled space known as maxillary antrum or sinus that sits just under the cheekbone, and just above the roof of the mouth.There is one on each side of the face, either side of the nose. The anterior nasal spine is a bit of bone which protrudes from the maxilla at the lower end of the nose. The zygomatic process is a curved

piece of bone which extends outwards from the maxilla and forms part of the cheekbone. The palate is the roof of the mouth, it separates the nose and the mouth the hard part is called the *hard palate* and is towards the front of the mouth, and the softer part at the back near the throat is the soft palate.

2. LITERATURE REVIEW

There are many approaches to identify human. Dental profile based biometrics is the most secure biometrics that remains safe and not changed throughout the life and even after many years of death of a person. The dental biometrics may be thought of to be fixed at the age of 7-8 years of age and then it becomes stable.

Anil K. Jain, Hong Chen [1] proposed technique which includes the identification of people based on their dental records, mainly on available dental images. Then goal is to automate this process using image processing and pattern recognition techniques. In order to find out the closest match with respect to some given features, better option is that match a given postmortem image with database ante mortem image. They use the contours of the teeth as the feature for matching. A semi-automatic contour extraction method is used to address the problem of fuzzy tooth contours caused by the poor image quality. The methods include three steps: radiograph segmentation, pixel classification and contour matching. A probabilistic model is used to describe the distribution of object pixels in the image.

Shubhangi Jadhav, Revati Shriram [2] proposed a system which utilizes dental radiographs. Radiographs provide the idea about position of teeth, reative teeth, teeth shape and size, teeth contour. Dental biometrics requires ante-mortem (AM) and postmortem (PM) radiographs for finding unidentified subject. Dental biometrics having three stages Preprocessing and segmentation of radiographs, Contour extraction or dental work extraction, Atlas registration and matching. Segmentation can be carried out by various methods Contour or shape of teeth and dental work can be

extracted by active contour model (ACM) or active shape model (ASM) methods. Atlas registration is the method used for labeling to teeth, which will help in the matching stage. Matching of AM radiograph with PM radiograph can be completed by using algorithms.

Amina Khatra [3] presented pattern recognition and computer vision standpoint, the problem of person identification based on dental records can be viewed as an image matching and retrieval problem. Development of Eigen values/Eigen vector based dental radiographs information data base that can be used as biometric identity of a person. The same may be combined with principal component analysis for further optimizing the feature data base.

Sunita Sood, Ranju Kanwar, Malika Singh [4] presented work shows the dental unique feature set that may be used for claiming of the human personal identity using dental radiograph (x-ray graph). The complete jaw is divided into four parts: left and right upper jaws & left and right lower jaws. Unique feature set includes number of teeth in each portion, maximum and minimum size in each portion, area and perimeter of each tooth in each portion and information regarding missing teeth in any of the portion. Later on, a database of features along with person under scanner Forensic odontologist investigated large number of cases, a move towards computer-aided dental identification systems is necessary**.**

Maja Omanovic and Jeff J.Orchard[5]in the paper proposed an automated scoring and ranking method that can be used to augment other text-based methods such as WinID. Given a postmortem (PM) radiograph with a marked region of interest (ROI), they searched the database of ante mortem (AM) radiographs to retrieve a closest match. To express the degree of similarity/overlap between two radiographs, they used the weighted sum of squared differences (SSD) cost function. In all trials, the correct match was among the top 22%.The method includes sample of 571 radiographs belonging to 41 different individuals. In 90% of the identification

trials, method ranked the correct match in the top 10%. From above discussion it can be concluded that use of SSD cost function is suitable method for person identification.

As technology developed large number cases are investigated by forensic specialist. Ante mortem identification generally takes place prior to death and also known as forensic identification. Postmortem identification is carried out after death. A postmortem biometric identifier has to survive severe conditions and resist early decay that influences body tissues.While behavioral characteristics (e.g. speech) are not appropriate for PM identification, most of the physiological characteristics are not proper for PM identification as well, especially under severe conditions encountered in mass disasters (e.g. airplane crashers) .Dental features are considered the best suitable for PM identification. This is due to their survivability and variety. The morphology of dental restorations (fillings, crowns, etc.)is used in old days to recognize human being by odontolgist .Due to their poor radiographic characteristics, now a days it is becoming important to make identification decisions based on inbuilt dental features like root and crown morphologies, teeth size, rotations, spacing between teeth and sinus patterns. According to experts from the Criminal Justice Information Services Division (CJIS) of the FBI, there are over 100,000 unsolved Missing Person cases in the National Crime Information Center at any given point in time,60 percent of which have remained in the computer system for 90 days or longer.

3. PROPOSED WORK

Dental Radiograph based human bio-metric information is the latest research area in the biometric identifier domain. So in a general block diagram of Human identification system, dental radiograph of patients are collected for dental identification system.

Pre-processing is first step in image processing and this step is very important as far as it concerned with quality of image. If our image is of bad quality then, remove noise in image and make the image proper quality and this can be done by high quality camera or high quality x-ray machine.

For a system main concern is avoiding motion blur, which can be caused. To avoid this, we will develop technique to detectproblem and remove the blur.
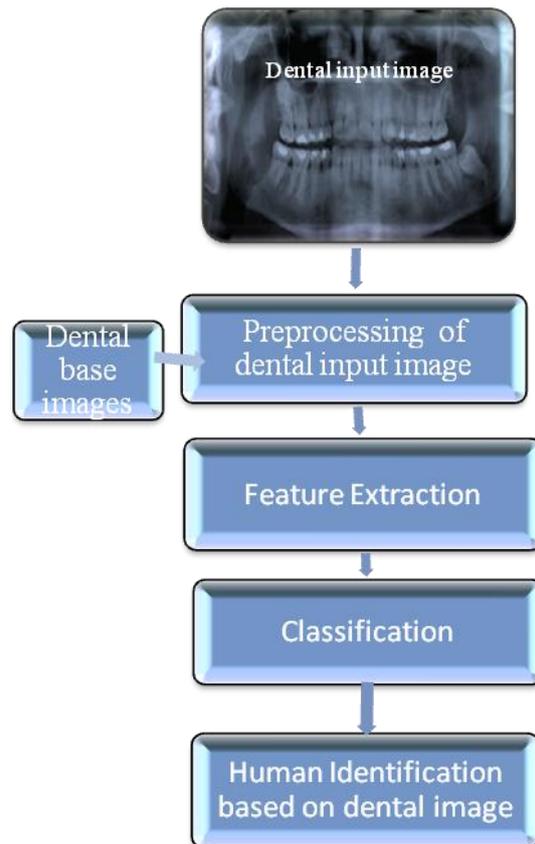

Fig1: Block diagram of Human Identification system

Then next step of preprocessing consist of separation of region of interest associated which is part of the image comprises some desired teeth of the. After preprocessing feature extraction is performed, the objective is to implement a system which has biometric identification method based on dental biometric calculation on dental data. The algorithm designed and then implemented in Matlab software. We can use feature like morphological image processing techniques on grayscale image; the highest intensity portion has been extracted high intensity shown in fig 2.

Here we may use segmentation as shown in fig3 each tooth is separate out from other tooth for further processing. Other approach we may consider pixel based separation, texture analysis. According to feature of images, image is classified by using various types of distance like Euclidian distance, Hamilton distance etc is considered. Radiograph from database selected and this radiograph are preprocessed, segmented and contour extracted from it.

And last stage of this system is matching, in this feature extracted from these two radiograph matched with each other using algorithm and final result is identification of person based on matching distance between radiographs
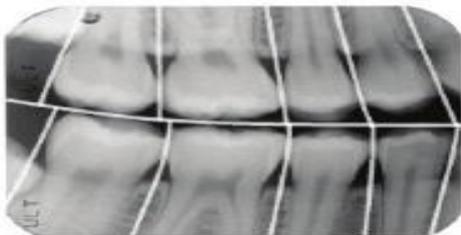

Fig2: Teeth intensity profiles

Fig3: Segmentation

4.CONCLUSION

Dental biometrics should not only be the base of identification of a person but rather it should be treated as a confirmatory tool. For example, if a person's face is completely damaged and its identification is not possible by face, then dental biometrics may used as confirmatory tool along with other like finger print, vein impression etc.

Dental biometrics is used in forensic science for human identification, dental radiographs are attempted to be treated as one of the biometric information of human being.

REFERENCES

[1] Anil K. Jain, Hong Chen, "Matching of dental X-ray images for human identification", USA

[2] Shubhangi Jadhav1,Revati Shriram," dental biometrics used in forensic science", Pune

[3] Faisal rahman, M.usman Akram, Kunwa Faraz, Naveed Riaz, "Dental Biometric Approach for Human Identification using Dental X-Ray Images of Maxillary Bone" Rawalpindi,pakistan2015

[4] "Sunita Sood, Ranju Kanwar, Malika Singh," Dental Bio-metrics as Human Personal Identifier using Pixel Neighborhood Segmentation Techniques", Punjab college of engineering

[5] Maja Omanovic and Jeff J.Orchard, "Exhaustive Matching of Dental X-rays for Human Forensic Identification" University of Waterloo, 200 University Avenue West, Waterloo, Ontario, N2L 3G1. Canada.

[6] Gamal Fahmy, Diaa Nassar, "Towards an Automated Dental Identification System (ADIS)" West Virginia University

[7] A. Jain, R. Bolle, S. Pankanti, Biometrics-Personal Identification in Networked Society, Kluwer Academic Publishers, Dordrecht, 1999.

[8] American Board of Forensic Odontology, Body identification guidelines, J. Am. Dent. Assoc. 125 (1994) 1244–1254.

[9] I.A. Pretty, D. Sweet, A look at forensic dentistry—Part 1: the role of teeth in the determination of human identity, Br. Dent. J. 190 (7) (2001) 359–366.

[10] Abaza, A, Ross, A. & Ammar, H. (2009). Retrieving dental radiographs for postmortem identification, Proc. of IEEE International Conference on Image Processing (ICIP).

[11] Amoedo, O. (1897). The role of the dentists in the identification of the victims of the catastrophe of the 'bazar de la charité', paris, 4th of may,1897, The Dental Cosmos 39: 905–12.

[12] E. H. Said, D. E. M. Nassar, G. Fahmy, and H. H. Ammar. "Teeth segmentation in digitized dental X-ray films using mathematical morphology," IEEE Transactions on Information Forensics and Security, vol.1, no. 2, pp. 178-189, 200

[13] Biometrics - Unique and Diverse Applications in Nature, Science, and Technology Belongie, S., Malik, J.& Puzicha, J. (2000). Shape context: A new descriptor for Shape matching and object recognition, Neural Information Processing Systems Conference (NIPS), pp. 831–837

[14] J. Zhou, and M. Abdel-Mottaleb. "A content-based system for human identification based on bitewing dental X-ray images." Pattern Recognition ,vol. 38, no. 11, pp. 2132-2142, 2005

[15] O. Nomi, and M. Abdel-Mottaleb. "A system for human identification from X-ray dental radiographs," Pattern Recognition, vol. 38, no. 8, pp. 1295-1305, 2004."