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An Efficient 3D Ear Recognition System Hiring Branch Points And Line Points

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ABSTRACT:

Distinguishing people by their ear has latterly experienced substantial care in the literature. However, quick and exact spotting and identification of the ear are very disputing because of its composite geometry. The ear realization technique in image processing become a central effect in ear recognition and analysis for many geometric application. This paper first observe the branch points and line points of different ear images. By utilizing the extracted points, a line graph can be plotted. The received line graph is different for various ear images. On matching the graph, a original ear image is recognized.

Keywords: spotting, image processing, geometric application

I. INTRODUCTION

Biometrics is the analyse of evaluating physical or behavioral features of a person to assert or distinguish his or her individuality. Public safety and national security raise the demands for biometric techniques. Biometric systems are now being integrated in various application placing from personal laptop access to international border control. Recognizing individuals by their ear has recently received important attention within the literature. Many reasons account for this trend. first, ear recognition doesn't suffer from some issues related to alternative noncontact biometrics, like face recognition. Second, it's the foremost promising candidate for combination with the face within the context of multi-post face recognition, and third, the ear is used for human recognition in surveillance videos wherever the face could also be occluded fully or partly. Further, the ear seems to degrade little with age. Despite the fact that current ear detection and recognition systems have reached a precise level of maturity, their success is restricted to controlled indoor conditions.

Research activities have importantly increased, and much advance has been made in recent years. Yet, most current systems perform well only under restrained environments, still requiring that the subjects be highly accommodative. Moreover, it has been discovered that the fluctuation between the images of the same ear due to illumination and viewing direction are often bigger than those caused by alters in ear identity. The innovation of the three-dimensional (3-D) ear modality migrates some of these disputes by inserting a depth dimension that is constant to both lighting conditions and head pose. As a distinctive pattern recognition problem, the functioning of an ear recognition system mainly depends on finding an equal representation of the ear patterns and gaining a classifier by which to analyze a new ear image based on the selected representation. An effective representation should parties such characteristics as small intraclass fluctuation, large interclass fluctuation and hardiness to transformations.

In this paper, a fully reflexive 3D ear recognition system merges both line and branch features in a computationally effective manner. The motivation behind merging branch and line features for 3D ear recognition is to catches information from the total surface without baring any information when identifying the ear. Effective merging renders complementary information describing the 3D ear shape and collectively raises the matching operation.

The proposed method is comprised of 3D ear detection, feature extraction and matching. In the range image, the ear detection factors render a bounding box within which the ear region is comprised. A terminal match score is rendered by merging the match scores from both the line and branch feature matching factors using a weighted summation.

II. RELATED WORK

Chen and Bhanu [1],[2] aimed some of the earliest access in 3-D ear detection and identification based on range profile images. In [3], theoharis et al. continue their 3-D deformable model based face identification approach in [4] by adjusting their annotated face model(AFM) for ear modeling, and formulate a semiautomatic multi-modal 3-D face and ear identification system.

In [5], islam et al. adjust the face identification work in [6] and formulate a coarse-to-fine equalizing algorithm for 3-D ear identification. In [10], Cadavid and Abdel-Mottaleb aimed an access for 3-D ear biometrics utilizing uncalibrated video sequences. A series of frames is evoked from a video clip and the ear region in each frame is independently realized in 3-D using shape from shading(SFS).

III. PROPOSED WORK

Ear recognition mainly contains image binarization, region of index extraction, image thinning, feature marking, false removing and feature matching.

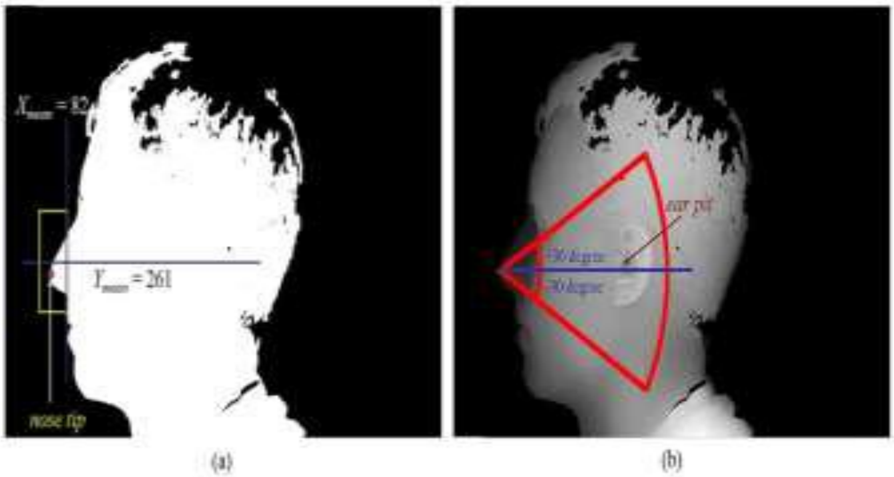


Fig. 1. Ear pit detection scheme (a) The nose tip is first sited in the binary mask (b) The ear pit is located within a sector related to the nose tip.

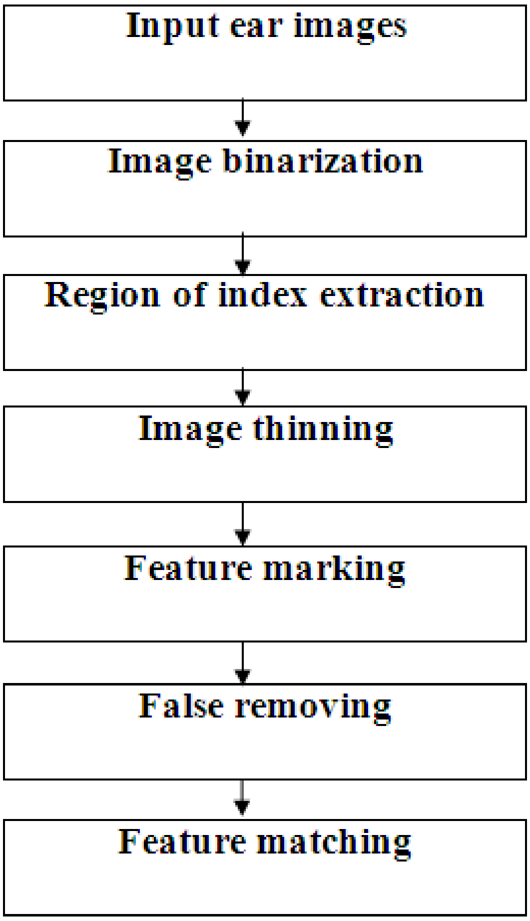


Fig. 2. Flow chart of the proposed method

The acquired ear images are low contrast and noisy with rotational and translational variations resulting from unconstrained imaging, therefore they should be firstly subjected to image binarization. It mainly refers to preprocessing, region of interest (ROI) separation, image normalization, image segmentation and image thinning. In image gray processing the original 24-bit color image is converted into 8-bit gray image for reducing the computational complexity. ROI can be realized confer to the greatest and smallest data of the ear shape after ear feature extraction. Then the ROI region is normalized ROI is 96×64. After size normalization, gray normalization is implemented to realize a uniform gray dissemination. For ear segmentation, a threshold image algorithm based on the concave detection is utilized. First, concave region is extracted by calculating the maximum convolution in eight directions of pixel, then the threshold image is constructed and binary ear network is segmented. To obtain the structure of ear network, an image thinning method is proposed.

Accepting that the 3D profile information are coenrolled with comparing 2D information (which is regularly the case at the point when information is gathered with a reach scanner), the location data of the recognized rectangular ear area in the 2D profile is utilized for 3D ear information extraction. To guarantee that the entire ear is incorporated and to permit the extraction of highlights on and marginally outside the ear area, we extended the recognized ear locales by an advertisement additional 25 pixels in every course. This augmented ear area is then trimmed to be utilized as 3D ear information. Fig. 3 shows the first and extended area of extraction. On the off ears is exhibited. Chance that our ear identification framework shows that a privilege ear is recognized, the 3D ear information is to permit it to be coordinated with the left ear is exhibited.

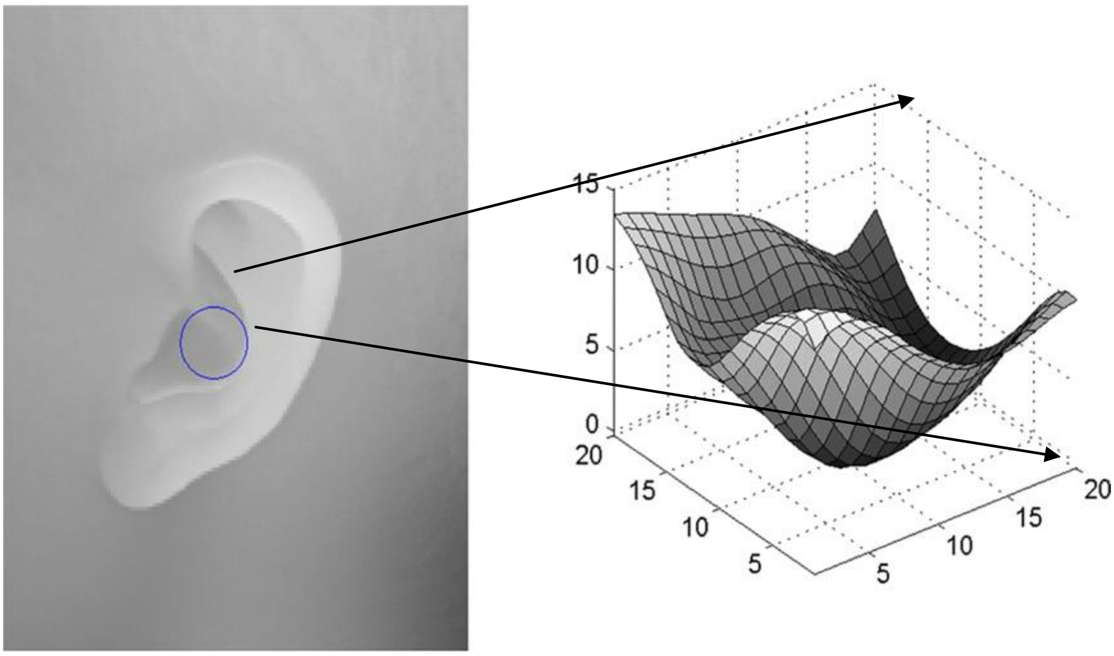
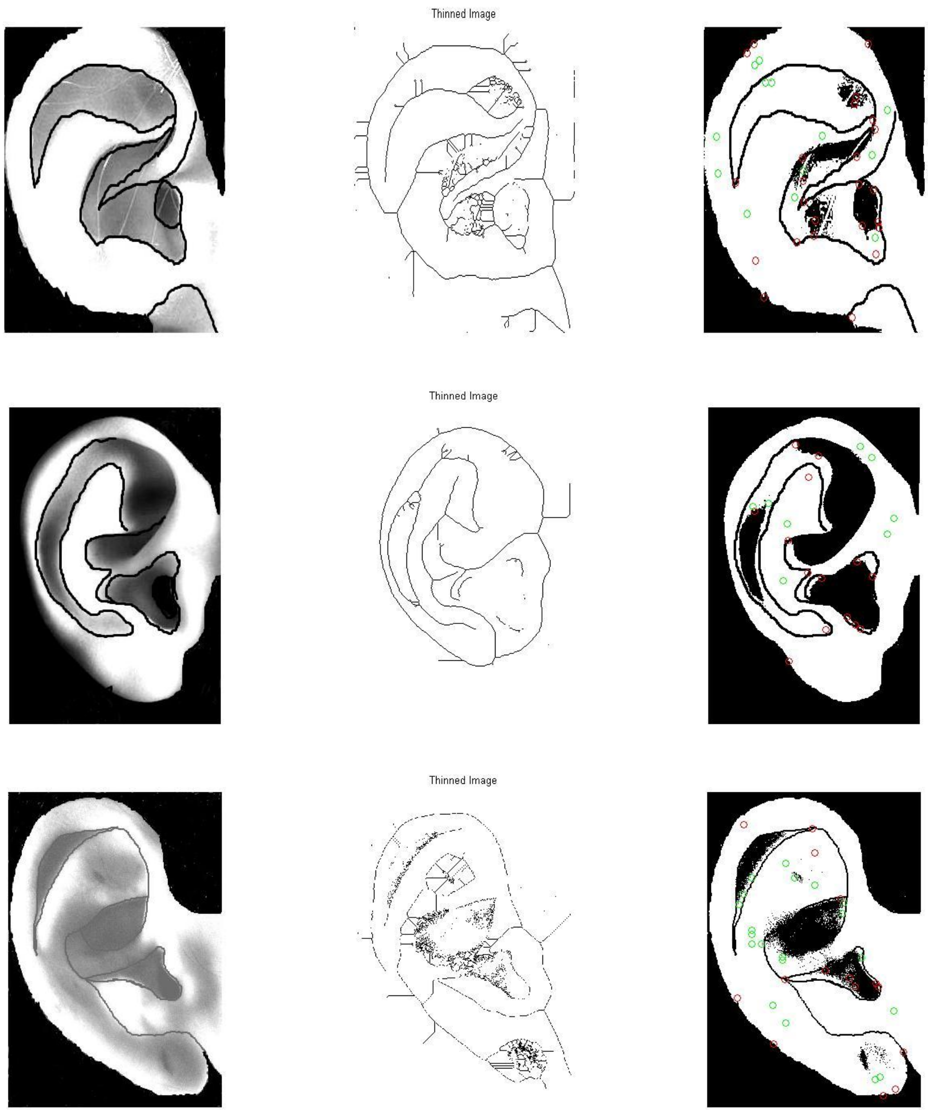
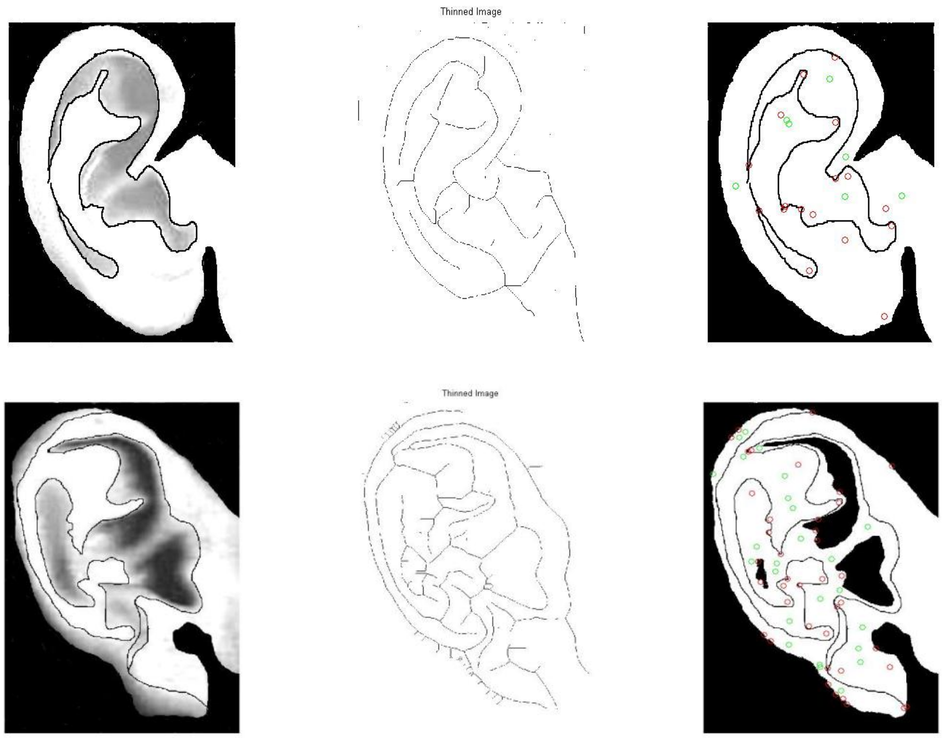


Fig. 3. 3D ear region extraction

After image thinning features such as branch points and line points are marked. False branch points and line points can be removed by distance calculation method. Distance calculation method is defined as the distance between branch points and line points is smaller than fixed distance or the distance between two branch points is smaller than fixed distance or the distance between two line points is smaller than fixed distance. False feature removal is followed by feature matching. At last branch points and line points of five ear image is obtained. By comparing the feature data of tested ear image with five ear images, original ear image is recognized.

IV. RESULTS





(1) (2) (3)

Fig.. 4. Ear feature recognition (1) Input image (2) Thinned image (3) Feature extracted image (branch and line points)

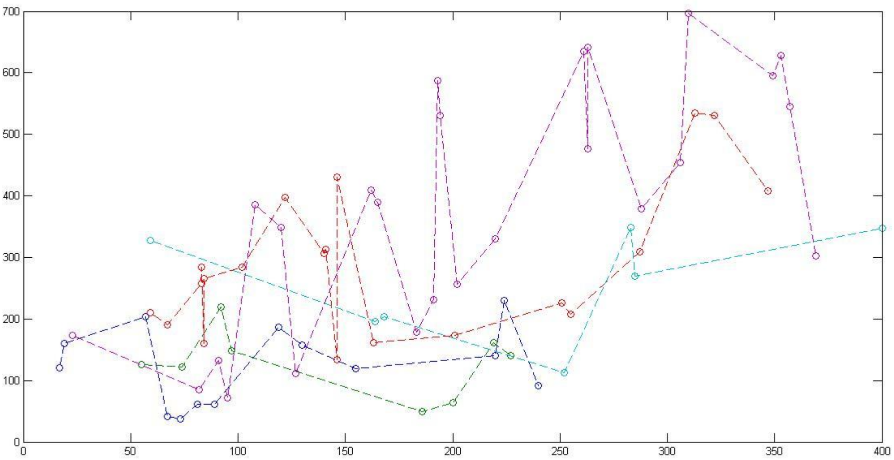


Fig.. 5. Branch points of five ear images

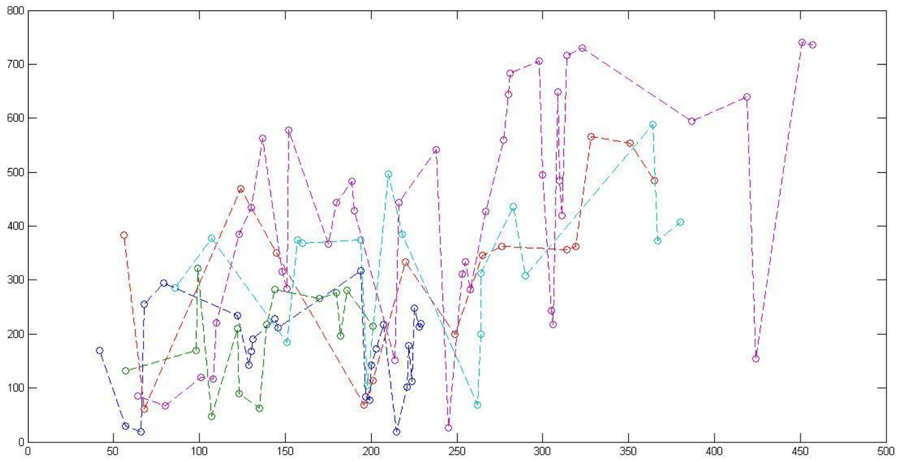


Fig.. 6. Line points of five ear images

TABLE I Branch Points and Line Points of Ear 1

Lines			Branches				
X	**Y**	**Angle**	**X**	**Y**	**Angle 1**	**Angle 2**	**Angle 3**
42	170	274	17	120	154	17	153
68	255	68	67	42	67	37	73
130	168	147	89	61	88	66	89
215	19	222	220	140	221	129	149
229	219	229	240	91	167	247	166

TABLE II Branch Points and Line Points of Ear 2

Lines			Branches				
X	**Y**	**Angle**	**X**	**Y**	**Angle 1**	**Angle 2**	**Angle 3**
57	132	68	55	126	61	121	62
99	322	99	92	220	131	207	132
135	62	135	186	50	192	195	193
182	196	182	219	161	141	227	145
201	215	201	227	141	69	134	68

TABLE III Branch Points and Line Points of Ear 3

Lines			Branches				
X	**Y**	**Angle**	**X**	**Y**	**Angle 1**	**Angle 2**	**Angle 3**
56	384	56	59	210	59	200	61
145	350	145	67	191	67	186	67
220	333	221	140	307	145	77	146
319	363	271	255	207	241	309	241
365	484	370	347	408	274	369	275

TABLE IV Branch Points and Line Points of Ear 4

Lines			Branches				
X	**Y**	**Angle**	**X**	**Y**	**Angle 1**	**Angle 2**	**Angle 3**
86	286	378	59	328	319	114	318
160	368	218	164	196	165	405	166
262	69	283	252	113	113	252	297
290	308	368	285	270	303	528	304
380	407	366	400	348	428	420	429

TABLE V Branch Points and Line Points of Ear 5

Lines			Branches				
X	**Y**	**Angle**	**X**	**Y**	**Angle 1**	**Angle 2**	**Angle 3**
64	85	77	23	174	174	31	174
123	385	435	108	72	85	82	62
190	428	203	191	232	179	183	604
323	730	314	310	697	657	264	506
457	736	457	369	302	369	163	390

CONCLUSION

This paper has displayed strategies for human distinguishment utilizing 3D ear images. It has proposed methods for programmed location of ear and in addition distinguishment on sectioned ear. Ear recognition execution of the proposed method is discovered to be effective and strong when contrasted with the current systems. The proposed 3D ear feature matching approach employs both branch points and line points of 3D ear shape. This result demonstrate the exactness of novel 3-D ear shape matching approach.

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