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A Person Identification by Androgenic Hair Patterns on Low Resolution Images using Neural Network Analysis with Gabor Filter

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Abstract: There are many techniques for identify persons by finger marks, blood samples, DNA, dental records, tattoos, face images and face sketches, which are used regularly over the globe. However, they cannot decide the exact identification, where only images describing specimens are available. Androgenic hair patterns are a stable biometric trait, Medical research results have implied that and also have potential to overcome the lack of blood vessel patterns and skin mark patterns. The aim of this paper is do matching performance of androgenic hair patterns in low resolution images. By using Gabor filter it can address the tilt image problem and neural network analysis is improving the matching algorithm.

Keywords: Androgenic Hair Pattern, Neural Network Analysis, Gabor Filter, Person and victim identification, Low resolution.

I. INTRODUCTION

It is a challenging task to identify persons and victims in images describing specimen, especially when neither faces nor any skin marks are observable. To address this problem there is other proposed techniques like blood vessel patterns and skin mark patterns but they demand high resolution images to visualize hidden blood vessels and accurately detect skin marks. [1] Also for forensic analysis, there is testify collected hair in crime scenes, but still now androgenic hair patterns in images were never studied for victim identification. For use androgenic hair patterns in person identification, there is proposed an algorithm based on a Low resolution Images and Gabor orientation histograms with neural network analysis. Androgenic hair patterns in low resolution images are an effective biometric trait and the proposed Gabor orientation histograms are comparable with other well-known texture recognition methods, including local binary patterns, local Gabor binary patterns and histograms of oriented gradients.[2] Image quality is also a problem in forensic identification. The main concern of the paper is low quality images, which can be used in person identification. Surveillance cameras are fixed at heights as they detect head print.[4]

In low resolution images, Androgenic hair patterns can be used as a biometric trait for identify person and victim. For overcome the problem of low resolution, new algorithms should be developed for viewpoint and pose variations and occlusions.[3] By using an automatic segmentation algorithm it could reduce manpower. Once law enforcement agents use androgenic hair patterns in real applications, numerous images can be collected from inmates and suspects for this research direction. In addition to searching a suspect in a given database, how to assign evidential values in the form of a likelihood ratio to androgenic hair patterns is also equally important.[5]

II. OBJECTIVE

Identification of human body in low resolution images using hair pattern Medical research results have implied that androgenic hair patterns are a stable biometric trait and have potential to overcome the weaknesses of skin mark patterns and blood vessel patterns. This project finally develops a powerful system to identify persons and victims and link different cases based on non-facial skin in images describing specimens.

III. BACKGROUND

Different biometric trait are not worked in low resolution like Skin mark patterns and blood vessel patterns, so dense androgenic hair can cover them completely. Androgenic hair patterns even in low-resolution images are an effective biometric trait. So in low resolution images, study of this pattern will be easy which will make identification easier.

IV. GABOR FILTER

To capture orientation and density information in imperfectly aligned images, Gabor orientation histograms on a dynamic grid system are proposed. To capture orientation information and handle scale variation, the proposed algorithm uses real parts of Gabor filters, which are defined as,

$$G(x, y, \lambda mk, \theta k, \sigma m, \gamma) = \frac{\gamma}{2\pi\sigma_m^2} exp(-\frac{x'^2 + \gamma y'^2}{2\sigma_m^2}) \cos(\frac{2\pi x'}{\sigma_{mk}}) \quad (1)$$

where x' = x $\cos\theta_k$+ y sin $\theta_k$and y' = −x sin θ_k+ y $\cos\theta_k$are the rotated coordinates with orientation θ_k= kπ/8,λ_{mk} denotes the wavelength of the sinusoidal component, $\sigma_m$isthe standard deviation of the elliptical Gaussian window alongx' direction, γ is the spatial aspect ratio, m∈ {1, . . . , M} andk∈ {1, . . . , K} are the scale and orientation indexes respectively.To enhance robustness against brightness variation, thedirect current (DC) component in Eq. 1 is removed. In total,M× K real parts of Gabor filters with zero DC are appliedto the preprocessed images.Let$I\ (x, y)$ be a preprocessed image and$G_{rd}(x, y, \lambda_{mk}, \theta_k, \sigma_m, \gamma\ )$be a real part of a Gabor filterwith zero DC. The filter response $F_{\lambda mk,\theta k,\sigma m,\gamma}(x, y)$ can beobtained from,

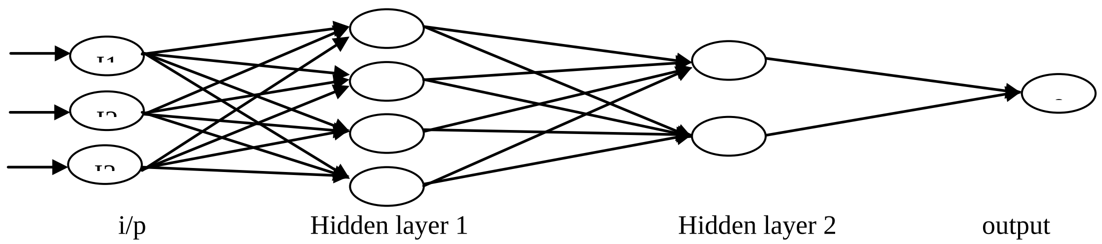
$$F_{\lambda mk,\theta k,\ \sigma m,\ \gamma}(x, y)= G_{rd}(x, y, \lambda_{mk}, \theta_k, \sigma_m, \gamma\ )* I\ (x, y) \quad (2)$$

where* denotes an operation of a two-dimensional convolution.The orientation of a pixel is calculated by,

$$O(x, y) = \arg_{\theta k}\max_{m,k} M_{\lambda mk,\theta k,\sigma m,\gamma}\ (x, y) \quad (3)$$

V. NEURAL NETWORK

Artificial Neural Network (ANN) is used for classification purpose. ANNs use statistical learning algorithms which are inspired from biological neural networks and are used to estimate or approximate functions that can depend on many number of inputs which are generally unknown. Each node represents an artificial neuron and an arrow represents a connection from output of one neuron to the input of other neuron.After being weighted and transformed by a function, the activations of these neurons are passed on to other neurons in the next layer. This process is repeated till an output neuron is activated. This determines which character was read. In ANN, simple artificial nodes, known as "neurons" are connected together to form a network this mimics or copies a biological neural network.



VI. THE PROPOSED METHOD

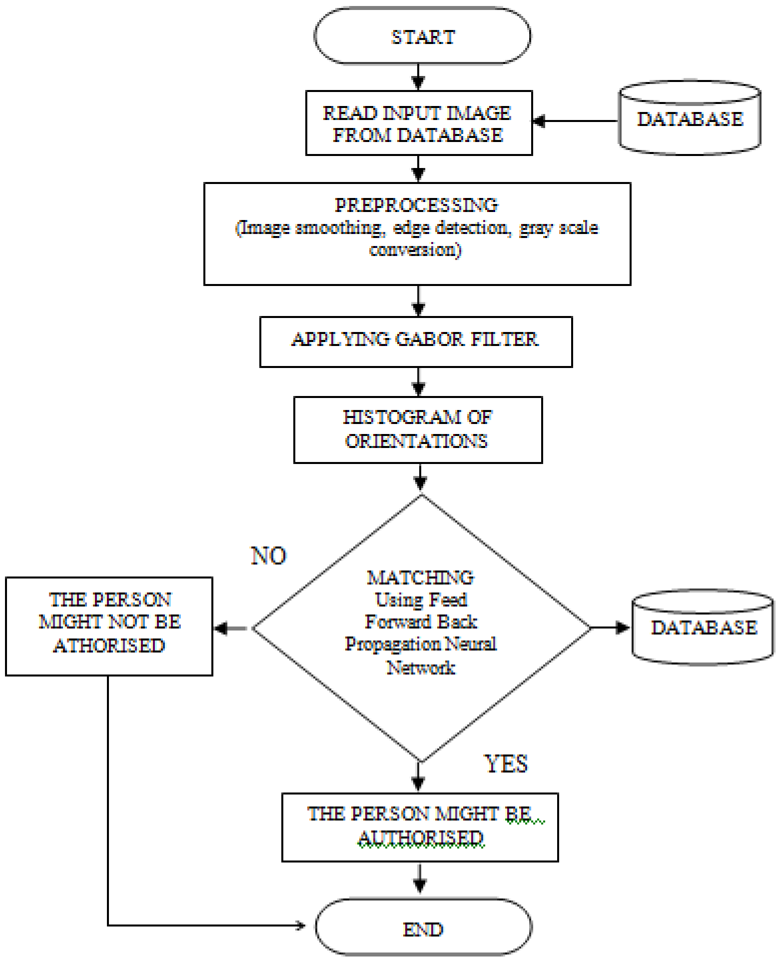


Figure 1. The Proposed Method

The proposed androgenic hair pattern identification method has three computational components, preprocessing, feature extraction and matching. The block diagram of the proposed algorithm is given in Fig. 1. The algorithm takes a color image as an input and compares it with templates in a given database. First, the input image is segmented and normalized. The segmentation process is to remove all irrelevant information e.g. background. The normalization process is to identify the common region and standardize the image size for matching. Real parts of Gabor filters with different scales and orientations are then applied to the preprocessed image to compute Gabor magnitudes these magnitudes are combined to extract local orientations and form an orientation field. It is divided into small regions for computing local orientation histograms as features. Each small region is composed of about 300 pixels. Finally, these histograms are matched with those in the database.

An input color image is first converted to a gray scale image for extracting boundaries and then is smoothed by a two dimensional median filter. Sober edge detector is applied to the smoothed gray scale image to obtain an edge image. After using median filter finally, a morphological operator with a disk shaped structuring element is applied to the image obtained from Step above. After automatically segmenting the image, it was checked manually. If there was a segmentation error, manual segmentation was performed.

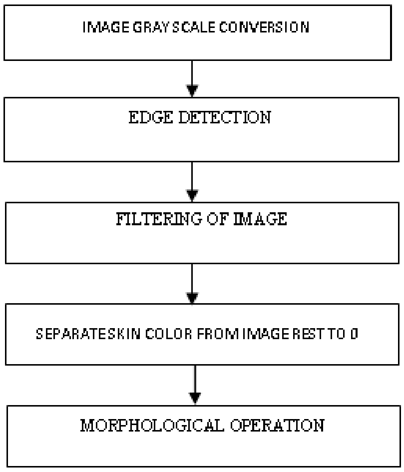


Figure 2. The Pre-processing

VII. RESULTS

Fig.(a) Fig.(b)

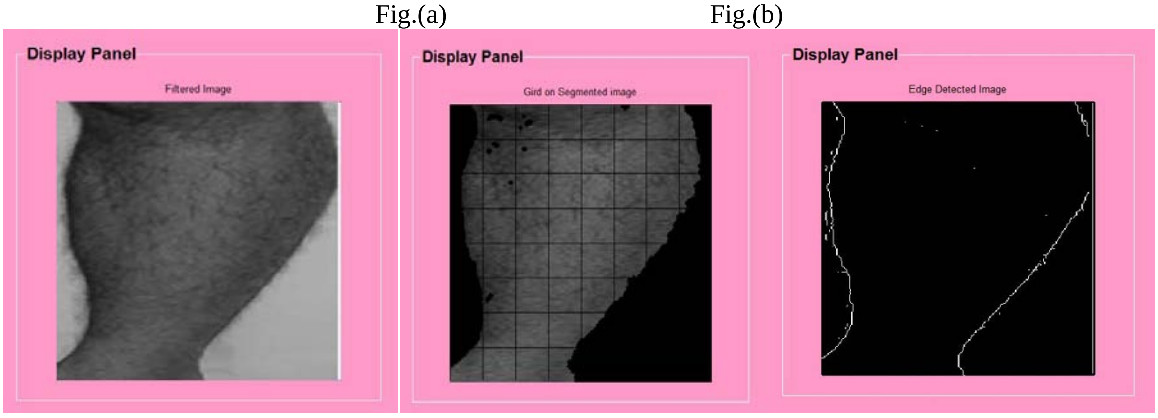


Fig.(c) Fig.(d) Fig.(e)

Fig 3

Here in Fig.(a) shownmain image of person's leg, after do gray scale as inFig. (b), it passed by median filter as in Fig. (c). then after do Grid segmentation as in fig. (d), it pass by sober edge detection as in fig. (e).
The Database have divided into two parts in which first part is of training images that consist of 20 images including both persons images and non-persons images and second part is testing that consists of 37 images. The training set was used to train the NN classifier whereas testing dataset was used to verify the accuracy and effectiveness of the trained network for the classification of persons.

TABLE

Sr. NO.	No Of Hidden Layers	TRUE POSITIVE	TRUE NEGATIVE	FALSE POSITIVE	FALSE NEGATIVE
1	10	0	30	7	0
2	20	0	30	7	0
3	50	0	30	7	0

Sr. NO.	No Of Hidden Layers	Sensitivity (%)	Specificity (%)	Accuracy (%)
1	10	0 %	81.0811	81.0811
2	20	0 %	81.0811	81.0811
3	50	0 %	81.0811	81.0811

No Of images	TP	TN	FP	FN
57	21	19	14	3

No of Images	Recall	Precision	F-Measure	Accuracy (%)
57	0.875	0.6	0.7118	70.17

VIII. CONCLUSION

From this it can conclude that Gabor filter is much more advantageous and efficient in image processing to detect hair pattern.It works similar to those of human visual system.Androgenic hair patterns in low resolution images can be used as a biometric trait for person and victim identification. However, using neural network analysis it increase the chance of TP. For robust identification, new algorithms should be developed for viewpoint and pose variations and occlusions. These proposed method can enhance the performance, which uses the dynamic grid system and the features to absorb all variations and distortions.

IX. REFERENCES

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