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A Survey on Proposed Method for Victim and Criminal Identification Based On Androgenic Hair Pattern

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ABSTRACT: Identifying criminals and victims in child pornography or masked gunmen can be a challenging task when neither faces nor tattoos are observable . Recently Skin mark patterns and blood vessel patterns are proposed to solve this problem. However, Skin mark patterns and blood vessel patterns are unseen in low-resolution images and in some cases dense androgenic hairs cover them. Medical research results have stated that androgenic hair patterns are a stable biometric trait and they have potential to overcome on drawbacks of skin mark patterns and blood vessel patterns. This paper aims to study low resolution images of androgenic hair patterns for identifying victims and criminals .

KEYWORDS: Hair pattern identification, criminal and victim identification, soft biometrics, skin marks.

I. INTRODUCTION

In police investigation and forensic evaluation Identifying criminals and victims is always an significant task.Fingermarks, DNA, blood samples, dental records, tattoos, face images and face sketches are used regularly by lawenforcement agenancy all around the world. However, they found difficulty while handling the cases, where only images describing or relating crimescene specimens are available but faces and tattoos are invisible. to avoid identification in cases like child pornography, violent protests, masked gunmen and terrorist attacks, where criminals always cover or hide their faces and tattoos.Because of the recent advancement in imaging technology and the popularity of digital cameras, imageswith victims and criminals have been increasing extensively.In count to child sexual offenders, terrorists also makeuse of this identification difficulty. Though faces and tattoos are invisible in theimages describing crime-scene specimen, other body sites areoften noticeable. In child pornography cases, we likelygetclose up images with chests ,backs, and thighs of victims orcriminals and in terroristattack ,masked gunmen, and violent protest cases.

To deal withthis challenging identification problem, blood vessel patterns[2]and skin mark patterns[3] are proposed recently .Blood vessel patterns are general and are considered steadyover a long period of time. usually, near infrared imaging systems are used to capture blood vessel patterns. New Methods arealso developed recently to visualize blood vessel patterns incolor images captured by consumer digital cameras. However, blood vessel pattern visibility depends on image quality and physiological factors like the thickness of the fat layer in the skin and skin pigmentation level. Skin marks occurring on the skin surface, are more easily observable thanblood vessels. But Skin mark patterns and blood vessel patternsboth require high resolution images and sometimes these skin marks or blood vessel patterns are invisible beacause dense androgenic hairs cover them completely. New biometric parameters have thus tobe developed.Medical research results havestated that androgenichair patterns can be used as a biometric parameter[4]. Beacause after birth There areno additional follicles naturally formed in humanbeings . All androgenic hairs apparentin a cycle. When onehair drops, formation of new hair will be at the same follicle. Though They are two different hair shafts, but appear at the samelocation. Androgenic hair cycle is long. A leg hair cycle can be up to one year. in this long period of time, we can findthe same hair shaft. There are alsocyclic changes in androgenichair growth. However, hair follicles havetheir own rhythmic cycle andthey are asynchronous[1].

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Thisimplies that all human hair does not fall out at the same timeand we can always find some matching androgenic hairs. In androgenic hair cycle only around 10% androgenic hair follicles exit permanently. However, androgenic hair follicles are only visible in highresolution images. This paper studies matching performance ofandrogenic hair patterns in low resolution images as an alternative biometric parameter for victim and criminal identification. In addition to forensic analysis, front head hair imageswere proposed to enhance face recognition systems and scalp hair images captured by overhead cameras wereproposed for observation. but scalp hairs areactually not androgenic hair.but it can be used as one parameter for matching[4].

II.RELATED WORK

A paper is presented by V. A. Randall and N. V. Botchkareva[1] named ,"The biology of hair growth," in Cosmetic Applications of Laser and Light-Based System. In the paper, they put all information about the biology of hair. They have given hair follicle anatomy and also discussed on androgenic hair cycle pattern. They also put a information on seasonal changes in androgenic hair pattern.

A paper presented by C. Tang, A. W. K. Kong, and N. Craft [2] named, "Uncovering vein patterns from color skin images for forensic analysis," in Proc. CVPR, 2011. by using Recent technological advances like digital evidence images they proposed an algorithm to expose vein patterns from the skin showing in color images for personal recognition. they modelled the inverse process of skin color formation in an image and studied spatial distributions of biophysical parameters from color images, where vein patterns can be observed. TheirExperimental results are very good. The simplicity of the vein patterns in resultant images is analogous to or even improved than that in near infrared images.

A paper is presented by Nurhudatiana, A.; Kong, A.W.-K. [3] named, "On Criminal Identification in Color Skin Images Using Skin Marks (RPPVSM) and Fusion With Inferred Vein Patterns "they presented a paper in which they proposed a new method for identification a criminal in child pornography and sexual abuse where usually criminals hide or cover their faces and tattoos, and makes identification difficult. However, natural skin marks can be observed in evidence images if they are visible. in this method they uses a group of skin marks called as Relatively Permanent Pigmented or Vascular Skin Marks (RPPVSM) as a biometric feature for identification. The results of this method high identification accuracy .

A paper presented by Han Su and Adams Wai Kin Kong[4],named "A Study on Low Resolution Androgenic Hair Patterns for Criminal and Victim Identification." to overcome on the drawbacks of matching vein pattern and skin mark pattern they have has studied androgenic hair patterns for criminal and victim identification . in this paper they proposed a method which uses androgenic hair pattern as a biometric trait for identification of victims and criminals.

III. SYSTEM DESIGN

The proposed androgenic hair pattern identification algorithm has three computational components, preprocessing, feature extraction and matching. The schematic diagram of the proposed algorithm is given in Fig. 4.1.

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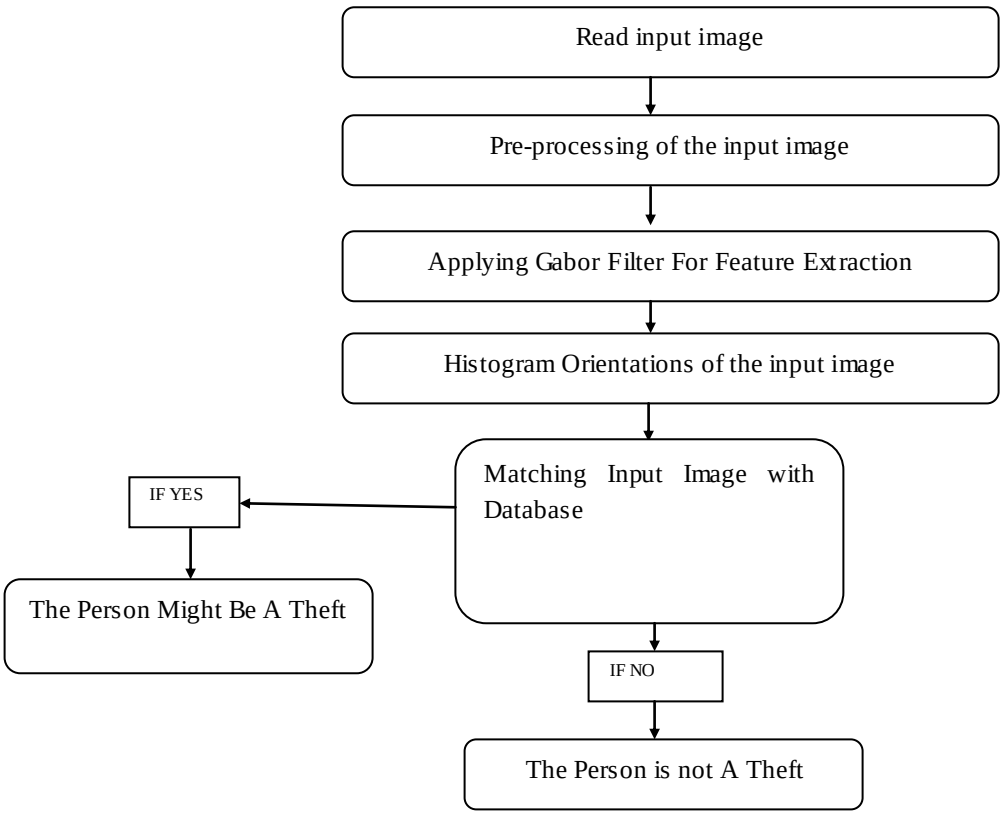

Fig. 4.1 Proposed Algorithms

- **Create cases**

1. Preprocessing of the input image
2. Feature extraction of the input image
3. Matching of the input image with the data base

- **Case 1**

1. In the first step a colour image is taken as input and is first converted to a grey scale image.
2. In order to smoothen the image atwo dimensional median filter is applied to this greyscale image.
3. After that sobel edge detector is applied on that smoothened image for obtaining the edge image.
4. This edge image is denoted as J. In this case the threshold is automatically detected.
5. In the second step the number of skin pixels in the input colourimage is detected by referring thepredefined skin colour range.
6. In the third step information obtained from the edge image and binary image are used simultaneously for obtaining the segmented image.
7. In the fourth step Otsu thresholding is applied to the segmented image in order to make the edges of the image more visible so that features can be easily extracted from the segmented image.

- **Case 2:**

1. Gabor filters can be used to extract features from the androgenic hair patterns. Gaborfilter systems produce three natural capabilities such as phases, magnitudes and orientations.

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2. The three important features extracted by the Gabor filters from androgenic hair patterns are orientations, positions and densities.
3. Due to improper alignment the boundaries obtained from the two pre-processed images of the same skin area are different. So to solve this problem orientationhistograms are generated and are used as descriptors. To calculate the orientation histograms, thepre-processed image is divided in to many rows. Then each row is again divided in to small blocks.
4. Then for each block the corresponding histograms are generated.

- **Case 3:**
    1. The last step of androgenic hair identification algorithm is the matching phase. Here an input image and a registered image in a database are given.
    2. The images stored in the database are pre-processed
    3. Here features from the database images areextracted by drawing the corresponding histograms of each image.
    4. Histograms are matched with those in the database.
    5. If histogram matches with data base then person might be a theft.
    6. If histogram does not match with data base then person might benot a theft.

II. CONCLUSION

A new criminal identification technique by using androgenic hair pattern segmentation, pattern enhancement, pattern template generation, and pattern matching is proposed. This proposed system can works on both colour and grey-scale images and the sobel filter method used for pattern enhancement has higher immunity for noise. Androgenic hair pattern recognition is very promising for positive criminal ID. Similar to blood vessel and skin mark recognition, where resolution image segmentation and recognition low is still a challenging research topic. In addition, androgenic hair pattern recognition can be combined with other methods, such as blood vessel pattern recognition or skin mark recognition to identify the criminals in forensic studies.

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