

A Survey on Identification and Analysis of Body Marks

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ABSTRACT: Body marks are the prominent sources of identifying the persons. By birth some marks are visible. Some marks are caused due to medical reasons. And some marks are due to accidental or artificial. Identification of persons on the basis of image processing is more accurate. In case of mass death due to earthquake, floods, tsunami, plane crash, identification of persons becomes tough. Hence victim identification on the basis of body marks is useful. The body mark identification can also be used as supporting evidence along with the biometrics to identify the human beings. Body marks are categorized into three types mainly, natural, medical, accidental or artificial.

KEYWORDS: Body marks, wart, mole, white patches, scar.

I. INTRODUCTION

Every person has some identical marks on their body from which we can identify persons. Marks can be found anywhere on the person's body. We can classify them based on their behavioural appearance. Such body marks are natural body marks, medical body marks, accidental body marks or it may be artificial body marks. Other than Natural texture is called body marking. Body marks recognition is an useful tool in the field of Medical Science as well as in Criminology. The proposed system helps to recognize such type of marks on body to decide whether it is caused due to Natural factors, Accidental factors, artificial factors or Criminal causes. In Medical field we can identify body marks to find out skin disease like Nevi(Mole), Lentiginos, [wart] Cherry hemangiomas and seborrheic keratoses. and surgical wounds. The Accidental marks can be identified such as skin cut by knife, wound marks due to burns, scar. Artificial marks like tattoo can also be recognized using image processing and analyzing techniques. In the field of body recognition, it is focused on identification of body marks and in the field of criminology body marks are used to identify victims using various independent methods. Natural body marks are like Wart, Mole, White patches.

We can observe various types of body marks on human bodies as depicted in Figure 1. Wart marks as shown in Figure 1(a) are also known as Lentiginos. Wart is a small growth on a person's skin and found on neck, head and other parts of the body. It is just like vesical on skin or small bubble. They are caused by viruses and have a very rough texture. Warts are classified into Plane warts, Common warts, Verrucas filiform warts and Mosaic warts. They usually disappear on their own without any medicine but it can spread through skin to skin contact or clothes, shoes etc by viruses. Moles (Nevi) shown in Figure 1 (b) is a small lesions in the skin. They are usually brownish and found on any part of the body that is Chest, Face, hands, leg etc.. Some moles are much darker and some others are skin colored. They may be rough, flat or raised and round or oval in shape. Moles are commonly found in people who are more exposed to sun rather than less exposed. Sun burns are not moles. Fair skin people have more moles than the dark skin people. Moles may respond to changes in harmonies level as during teen age they are more in number and get darker during pregnancy and fade away during old age. White patches are a condition under which certain parts of skin gradually lose color leaving behind white patches. It happens due to loss of Melanin, a dark pigment which gives color to skin. It may begin with small patches but may spread throughout body in course of time. Initially the patches may found on hands as shown in Figure 1 (c). The body deformation done by accidents is known as wound. It may be a type of injury in which skin is torn, cut or puncher. Knife cut wounds may be caused in kitchen, mutton shop, or fighting with enemies. Wounds due to knife may be over skin, or deep into the muscles. Though it appears similar to

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medical wounds we can clearly differentiate them .Wounds may be found in any part of the body that is hand , leg, face etc, . The Figure 1(d) shows wound caused by the knife.

Scars are the marks caused due to fibrous tissue that replace normal skin after injury. It is a natural part of healing process. Every wound that is after accident, surgery or disease results in some degree of scarring .Scar wounds may be found in any part of the body that is hand, leg, face etc,. which is shown in Figure 1(e).Artificial body marks are like tattoo is a form of body modification, made by inserting indelible ink into the dermis layer of the skin to change the pigment tattoo is found all over the world during New stone period. It is found on the skin of Mummy's In Europe tattooing was practiced during upper Paleolithic period. The oldest tattooed human skin is found on body of Otzi the ice man during 3370 and 3100 BC. In India tattoo was practiced by using Henna .It is most common in tribal populations and caste based hindu population in India. Tattoo's are called Pachakutharathu in Tamil Nadu and Hanchibattu in Karnataka. It is also called Tarazwa, Gondan, Ungkala etc in other parts of India. Tattoo may be found in any part of the body that is hand, shoulder, leg, face as shown in Figure 1(f).



Figure 1: Different types of body marks. (a) Wart (b) Mole (c) Whit Patches (d) Knife wound (e) Scar (f) Tattoo

II. LITERATURE SURVEY

(Juha Roning and Marcel Riech 1998) have introduced a new algorithm for early detection melanoma. The baseline algorithm requires two initial matches to register the other lesions in the images. The beginning matches are provided by a physician or an algorithm that selects the most likely initial matches. Test suggests that the baseline algorithm determines 99% of the matches correctly, and this performance is largely independent of the number of lesions in the skin images[1].(Tim K. Lee et.al., 2005) have worked on unsupervised algorithm for segmenting and counting moles from two-dimensional color images of the back torso region the method consists of a new variant of mean shift filtering that forms clusters in the image and removes noise, a region growing procedure to select candidates, and a rule-based classifier to identify moles. This algorithm was compared to an assessment by an expert dermatologist, the algorithm showed diagnostic accuracy of 90% on the test set[2].(Jean-Sebastien Pierrard and Thomas Vetter, 2007) have addressed novel framework to localize in a photograph prominent irregularities in facial skin detail analysis for face recognition in particular nevi (moles, birthmarks). The system detects potential nevi with a template matching procedure. One is a novel skin segmentation scheme based on gray scale texture analysis. The second is a local saliency measure to express a point's uniqueness and confidence taking the neighbourhood's texture characteristics into account. They focused on the methodology of detection and evaluation of such regions and showed that it is possible to determine a person's identity

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based on only a few well-chosen pixels[3].(Taeg Sang Cho et.al.,2007) have presented a reliable skin mole localization scheme to detect and label moles on skin images in the presence of clutter, occlusions and varying imaging conditions. The input image is processed with cascaded blocks to successively discard non-mole pixels and first it searches the entire input image for skin regions using a non-parametric skin detection scheme, and the detected skin regions are further processed using a difference of Gaussian (DoG) filter to find possible mole of varying sizes. Mole candidates are classified as moles in the final stage using a trained Support Vector Machine(SVM)[4].(Jung-Eun-Lee, 2008) have introduced a content based image retrieval (CBIR) system for matching and retrieval of scars, marks and tattoo using soft biometric for suspect and victim identification based on scale invariant feature transform(SIFT) and they also introduced image similarity computation based on SIFT features. Their result show rank-20 retrieval accuracies of 98.6% on good quality database(Web-DB) and 72.2% on an operational database(MI-DB)[5].(Anil K. Jain and Unsang Park 2009) have proposed soft biometric for face recognition system using micro features, namely facial marks like freckles, moles and scars. They have used Active Appearance Model (AAM) to locate and segment primary facial features for eyes, nose and mouth. They also used Laplacian-of-Gaussian (LoG) & morphological operators to detect facial marks. The classification accuracies reported are around 93.14%[6].(Chaoying Tang et.al.2011) have developed an algorithm to uncover vein patterns from the skin exposed in color images for personal identification. They modeled the inverse process of skin color formation in an image and derived spatial distributions of biophysical parameters from color images. They have generated satisfactory results indicate that vein patterns can be uncovered from color images and matched to NIR images[7].(Arfika Nurhudatiana et.al., 2011) have proposed a biometric trait composed of a group of skin marks like nevi, lentiginos, cherry hemangiomas & seborrheic keratoses. They have grouped these as Relatively Permanent Pigmented or Vascular Skin Marks (RPPVSM). They have described fundamental statistics of RPPVSM. 144 Caucasians, Asian & Latino males, images were collected. A researcher trained in dermatology manually identified their RPPVSMs. The result shows that Caucasians tend to have more RPPVSMs than Asian, Latinos. Over 80% of middle to low density RPPVSM patterns are independent and uniformly distributed [8].(Soma Biswas et.al. 2011) have performed a human viewing and successfully distinguished between identical twins. They achieved an average accuracy up to 78.82%. They observed that humans performance is much better than commercial face recognition algorithms [9].(Nikhil J. Dhinagar et.al., 2011) have developed a method to identify the skin cancer by processing the cross-section of skin sample. Here otsu's segmentation is used for three skin samples, namely, normal skin, sun tanned skin & precancerous skin. They have generated satisfactory results [10].(Chaoying Tang et.al. 2012) have implemented the algorithm based on image mapping to visualize vein patterns. The algorithm extracts information from a pair of synchronized color and near infrared images (NIR) and uses a neural network (NN) to map RGB values to NIR intensities. The NN weight adjustment scheme is proposed to improve the robustness of the algorithm. The algorithm was examined on a database with 300 pairs of color and NIR images collected from the forearms of 150 subjects. The exhibited experimental result up to 92%[11].(H. Zhang et.al.,2012) have proposed a color optimization scheme to derive the range of biophysical parameters to obtain training parameters and an automatic intensity adjustment scheme to enhance the robustness of the vein uncovering algorithm. They also developed an automatic matching algorithm for vein identification. This algorithm can handle rigid and non-rigid deformations and has an explicit pruning function to remove outliers in vein patterns. The experimental results are encouraging and indicate that the proposed vein uncovering algorithm performs better than the OBVU method and that the uncovered patterns can potentially be used for automatic criminal and victim identification [12].(Arfika et.al., 2013) have proposed study an individuality model for the independently and uniformly distributed (CSR) patterns. To implement the method of group of skin marks named the individuality of relatively permanent pigmented or vascular skin marks (RPPVMS) using biometric trait for forensic identification. RPPVMS patterns as novel biometric trait and found that RPPVMS in middle to low density patterns tend to independent and uniformly distribution. The result demonstrated that model is accurately fits the empirical random correspondences signifying the predicts of empirical result accurately [13].(Hu Han and Anil K Jain, 2013) have implemented the tattoo based identification using sketch to image matching . They constructed a tattoo sketch database with 100 sketches to tattoo image using local invariant features. The proposed approach was found to be robust against deformations like rotation, shear-warp , twirl and the method significantly out performs a state of -the- art image-to-image tattoo matcher[14].(Sandeep Kaur et.al.,2013) have worked on bite mark identification is based on the individuality of a dentition, which is used to match a bite mark to a suspected person. The study describes the classification, characteristics, mechanism of production, and appearance of bite mark injuries, collection of evidence, comparison

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techniques, and technical aids used in the analysis of the bite marks[15].(Nhat Quang Huynh et.al.,2014) have designed a preliminary report on full-body imaging system. For effectively collecting and processing biometric to concentrates on the system hardware design. An image stitching algorithm is developed for automatically labelling the locations of the biometric traits. Here a tattoo detection algorithm is proposed to enable the system for automatic tattoo database construction. The proposed tattoo images given by the algorithm are demanded by other tattoo retrieval method and are more effective even for manual search. The algorithm successfully detected 97.27% tattoos in the tattoo images[16].(Omar Abuzagheh et.al.,2014) have proposed a real time image analysis system to aid in the malignant melanoma prevention and early detection. They present an image recognition technique, where the user will be able to capture skin images of different mole types. Their system will analyse and process the images and alert the user at real-time to seek medical help urgently. And they also introduced a novel framework compared two types of classifiers. In the one level classifier they were able to classify the Normal, atypical and Melanoma images with accuracy of 65%, 55% and 70% respectively. On the other hand, the two-level classifier was able to classify the dermoscopy images with accuracy of 65%, 90% and 70% respectively[17].(Han Su and Adams Wai kin Kong 2014) are designed the algorithm for Gabor filters to compute orientation fields of androgenic hair patterns. Histograms on a dynamic grid system to describe local orientation fields & the block wise chi-square distance to measure the dissimilarity between two patterns. Experimental results indicate that androgenic hair patterns in low resolution images are effective. Gabor orientation histograms are compared with other well-known texture recognition method [18].(K, Kropidowski et.al.,2015) have presented the application of histogram based features for detection of atypical neural network and shape based features supplemented by artificial neural network for detection of irregular streaks. The exhibited experimental results for correctly detected pigmentation networks as well as correctly detected irregular streaks mainly 97.7% & 94.8% respectively.[19]. As the literature survey depicts some researchers worked on non Indian images but very few researchers worked on Indian images hence there is still space to carry out research with Indian context.

- lots of work has been carried out on identifying body marks with clear backgrounds but it's very difficult to identify classify body marks with similar color.
- Body marks identify in forensic science to identify and classify the people.
- It can be treated as Biometric.
- Can also be good tool to identify dead bodies if it developed as a product.

METHODOLOGY

The body mark images are collected from a source like digital camera, then sample images are pre-processed and features are extracted, further the extracted features are stored in the form of a knowledge base, this process is called learning phase. In testing phase when a new image is encountered features are extracted and are used to identify and classify the images based upon color, shape, texture using different classifiers. If the resulting output image is same as that of the input image then the image will be identified and classified accordingly. The Figure 2 shows the block diagram for identification and classification of body mark images.

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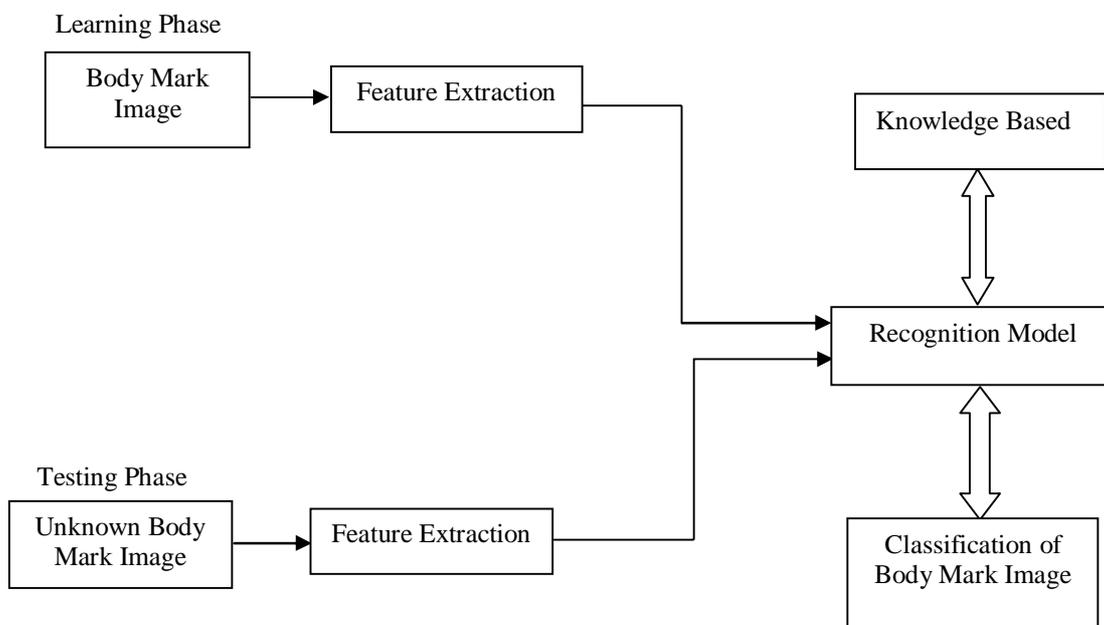


Figure 2: Block Diagram for identification and classification of body mark images

III. CONCLUSION

Human identification through digital image processing in an effective tool in modern age. It is more accurate, effective as the identification is carried out using digital technology. In several instances the face of the victim is unidentifiable. Under such instances body marks like mole, warts, scars, wound marks which are visible can be used for identification of persons.

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