A Survey Paper on the Gender Recognition Techniques

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ABSTRACT

Gender is one of the important demographic features of human being. Gender recognition is very important perceptible task as most of the human interaction is based on such gender perception. Investigation of human gender with the help of computer based perception is an interesting topic to be studied. This paper presents the study to perceive human gender on the basis on movements of the body part including the still position of human body. Human movements, for example, running, walking or climbing has been formerly proposed to identify the gender of the person. This paper surveys the approaches based on this technique. It also points out the hurdles to implement this method. We also study how different body parts help as to implement this method. This paper also surveys a brief about different approaches and obstacles that come in implementing different methods in recognizing the gender with help of computerized vision.

Keywords – Gender, Gender recognition, Gait, Geometric classification, Eigen face, PCA.

1. INTRODUCTION

Age, gender, ethnic are various demographic [1] feature of humans. Gender recognition is one of important aspect. With help of bare eyes, human can easily distinguish between man and woman. However when it comes to gender recognition with help of computer is a tedious task. Various methods are implemented to realize ones gender with help of computer. Gender recognition by face analysis, body parts, body movements, gait analysis [2] are few examples of such methods. Most of the application does not require any physical contact of body parts. Human face serves as the crucial information to perceive a human gender. However, when this method has been applied technically various real world constraints such as different head position due to walking movements have led to difficulties in its implementation. Moreover, it is difficult to detect a face when person is at distance. Human movements provide devious but revealing information. Manner of walking has become appealing approach to detect human gender even at a distance. The accentuation on mobility as a means of aggregate reconstruction of world geometry has tended to undistinguished the fact that movements can also be used for gender recognition.
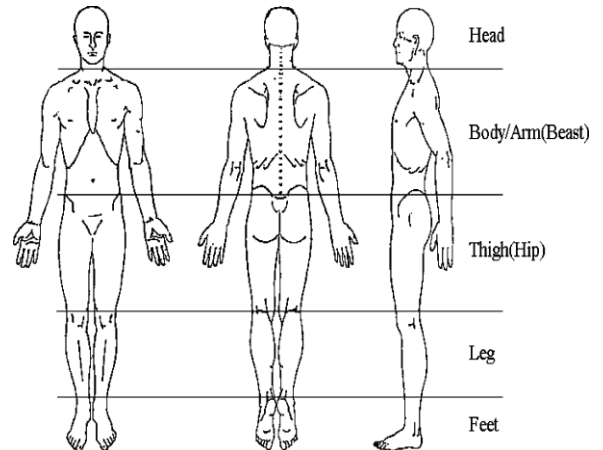

Figure 1:- Sections of body of an individual

Gender Recognition using such method is gaining popularity as it does not involve any physical contact. Also it can be implemented to a person at a distance. It works majorly in three parts. First of all we divide the given body image into number of sections (as in fig a) which supplies us with hint to perceive the gender. Next, we compare the mixed view image with fixed view image to detect similarity between them based on already fixed constraints. Lastly we fix the errors if any to show its robustness [3]. This implementation is based on low level lineament of movements. It does not involve detecting any special parts of human body. However this method is difficult to implement as compared to gender detection by face method when it comes to study still human positions (without any movement). This is because different gender people may or may not wear same color dress. There may be chances that same gender people may possess different dressing style or may have different hairstyles. Above of all, the background of the images makes it more encumbering.

2. BACKGROUND

Gender is one of the important demographic features of human being. Gender recognition is very important perceptible task as most of the human interaction is based on such gender perception. There are various methods which are significant for gender perception is as follows: **Eigen face and PCA:** The basic fundamental of this method is based on the Eigen faces proficiency in which Principal Component Analysis (PCA) is used. PCA was initiated by Karl Pearson. PCA can be defined as a statistical methodology which could be made in use to shorten the high-pitched data space to low-pitched distinctive margin. This approach is appropriate for data compaction and elimination of redundancy.

The main concept of this proficiency is depended on the fact that each notion or image could be demonstrated as a matrix which is a collection of eigenvectors that exemplify the significant element of the matrix. The eigenvectors are the

foundation for evaluation of modification among various faces. The basic merit of this technique is very effortless and it takes less time in preprocessing. The limitation is it shows commendable accomplishment only under stable surrounding.

Neural Networks: Neural networks have its utility not only in element compatibility, robot driving etc but also in the face recognition technique. The predominant target of the neural network is the feasibility of a training component of a system to seize the complex category of face pattern [].To get the outstanding accomplishment by the neural network, it is required to convert into many units of coverings, many units of nodes etc. Hence we can say that the feature extraction step is more superior to the Principal Component Analysis. If we consider the speed, the categorization time comes down to 0.5 second. The limitation of neural network approach is that the increase in units of classes leads to disintegration in computational process and identification merit.

Fisherfaces : Fisherface approach flourished in 1936 by R.A.FISHER. This approach is most extensively and progressively utilized process in face recognition [].The FISHER DISCRIMINANT ANALYSIS method which was invented by him is also entitled LINEAR DISCRIMINANT ANLYSIS (LDA) in which the subspace presentation of a cluster of face sketches is discovered and the resulting basis vectors characterizing that area are called Fisherfaces. The basic limitation of LDA technique is that the digits of pixels in sketches is greater than the digits of sketches and hence this can intensify the occurrence of error if there is a deviation in posture and the situations of lighting within the same sketches. To overcome this predicament several algorithms has been developed.

Template Matching: The methodology Template Matching is a technique in digital image formation for searching minute parts of a replica which will be equivalent to a template image. This can be utilized in producing as a factor of quality control, a conduct to drive a mobile robot, or as an approach to recognize boundaries in image. Template matching has also its eminence in the approach of face recognition technique. In this technique we can ruin other face templates from various aspects to identify single face. The prototype matching algorithm is a very general approach. The significant achievement of this technique is that it is effortless to incorporate and is affordable than any other trait identifier. The template fundamental are more extravagant and cannot easily run. The disadvantage of template matching is that it lacks behind in terms of computational complexity. Also the exposition of the template is not a straightforward task. The identification system has to be lenient to some uncertainties in between the template and test image, which may moderate out the deviations that make a person's face unique.

3. APPLICATION

Gender has an important role in social interaction. Correct gender perception leads to proper social communication. Humans can easily classify the gender. If same task of gender recognition can be done with the help of computers then it will be beneficial in many of the applications. It can be implemented to make human and computer interaction system. System can be modeled in such a way that it may behave like a human and respond spontaneously. For instance, if a robot is interacting with human, the application can be made so that it recognize the gender and address him with Mr. or Mrs. appropriately. It can be implemented in surveillance systems. In such system

particular area can be restricted to particular area only. Like, in railway ladies coach, males can be restricted to enter with help of such application. It plays an important role in indexing and searching. Consider a video or photo containing n number of person. This application can be used to index such people to find out number of males and females in the video or photo. If we want to search a person we can identify his gender and search him or her accordingly in group of males or females. This will in return decrease the number of steps required in searching in the database. Demographic studies where various features of human is studies can make use of such systems. Such systems can be applied to study various statistics of human like gender, age etc. Such system may automate the task which not only increases the speed but in turn also increases the efficiency and accuracy. A targeted advertising system can make a very efficient use of such models. In such system advertising is displayed on the board according to the gender of the people looking at the board. For example, advertising for cosmetics can be displayed if a female is detected or an ad for bikes in case if male is detected viewing the bulletin board.

4. GENDER RECOGNITION BY FACE

A person's may exhibit many variations. These variations may have negative consequences on recognition of gender with help of computer. Various other factors may also affect this. For instance age factor, ethnicity factor, accessories worn, different facial expressions [4] etc. Implementing this method involves preprocessing of the face image extracted. It includes adjusting and fixing the brightness and contrast of the image, removal of external features such as neck region, reducing the size of the image so that number of pixels involved in scanning is reduced and aligning the image appropriately. Next is classifying the facial extractions. This classification is based on fiducial points and fiducial distance. Peculiar points on the face such as eyes, nose, mouth, ears represents the fiducial points and distance between these fiducial points marks the fiducial distance. Classification can be done geometrically or on the basis of appearance. Geometrical classification is done with the help of fiducial points. Appearance based classification is done by operating the pixels of the image. Pixel intensity values serve as the direct input to the classifier. This leads to the large number of peculiarities which increases with increase in size. Datasets included only the front image of the face. Various classifiers had to be applied for different pose of the image. Studies have shown that 3D approach has more efficient consequences to implement this method. However implementing this 3D method has certain drawbacks which include more cost of setup and higher level of calculations leading to increased complexities. However sometimes it still becomes difficult for the system to recognize the gender due to certain biological conditions. As in case, mostly males have facial hair like beard and moustaches. But due to certain hormonal secretions results in growth of such facial hairs in women also which leads to incompatibility with the system to recognize the gender. Following chart shows some of the methods of gender recognition by face.
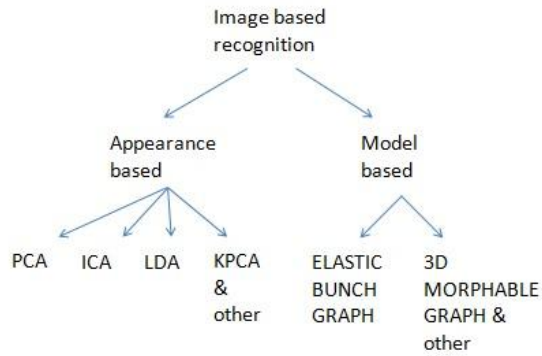
Figure 2:- Showing various approaches for face recognition

4. GENDER RECOGNITION BY GAIT

The style of walking is known as gait. It is determined by various factors which includes one's weight, height of legs and also the pose while movement. Even the footwear worn by the individual also has impact on it.
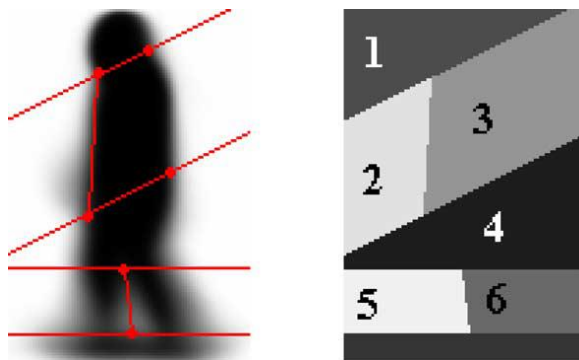

Figure 3:- Segmented/parts of body

The most important advantage of gender recognition by gait is that it can be implemented even at low resolution. Thus it eliminates the disadvantage of implementing other method at high resolution where features are not distinguished if proper resolution is not available. The outline is divided into six parts as shown in figure. The first part consists of head and shoulder. The second and third consist of front and back of trunk of the body. Front and back of thigh comprises of the fourth and fifth part whereas back and front of foot makes the sixth and seventh part. Such division increases the degree of accuracy. It involves two calculations. The first one is to calculate the average deviation of the segmented features across the time. The other is calculation of the magnitude and phase of the segmented region which are result of the walking frequency. However this method is view dependent. This can be removed by normalizing the view as the canonical view. This is possible only when the precise joint movement of the walker is available. Still certain biological factor disables the system to take the decision in the determining the gender. For instance some males have females type walking style while some females walk manly. Dressing style also has impact on this. Some clothing like pants, trousers, jeans are common for both men and women which again confuses the system to recognize the gender. Recognition from a database of 10 sequences of seven subjects showed classification rates of

100% for 16 eigenvectors and 88% for eight, compared with 100% for the (computationally much more demanding) spatio-temporal image correlation approach, and with robustness to noise[5].

5. GENDER RECOGNITION BY BODY

In this method rather than studying a particular body part or particular movement, we examine the body either wholly or partially to determine the gender. Applying this method also includes the consideration of clothes, accessories worn, hairstyle etc. This method, however, is difficult to implement. This is because two people of different gender may have same dressing style. Similarly, cases may be possible were similar gender people may possess different hairstyles. Also, sometimes physical changes occurred in the body due to hormonal changes may cause difficulties in implementing the same. For the purposes of full-body gender classification, it would be useful to include automatic person detection, in order to segment out the figure before presenting the result to the gender classifier [6].

The preprocessing step involved in this method is normalizing the height by making the body image centrally aligned. Image is then divided into number of segments. Each segment is then computed upon to find the histogram of gradient for each segment. Each segment of image is then collected so that overlapping blocks of images is formed. The overlapped block is normalized to get the appropriate contrast. The accuracy with which observers identified actors was calculated as follows. Because this was a three-alternative forced choice task, chance performance is 33.3% correct [7]. As compared to other method the descriptor used in this method is far better than other methods.

6. CONCLUSION

Our paper dealt with general study on various method of gender recognition. It also conveyed various factors affecting it. Various aspects like accuracy, performance were also taken into consideration. In gender recognition by face, fiducial points and distance played important role. While studying this method we concluded that it is best suited when features has to be extracted from front portion. However lots of work still is to be done when it comes to extracting features from multi view angles. On finding facial method unsuitable for gender recognition, we moved towards this approach by taking body parts and its movement into consideration. Certain biological as well as other factors are obstacles in implementing this method, but still results are far better as compared to gender recognition by face.

7. REFERENCES

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