Human Gait Detection Using Silhouette Image Recognition

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Abstract: In today's world biometric has taken a wide role in human's life. So, there is an advance in this field among which Gait recognition approach is in major interest by which person identification has became an easy task. In this paper a OU-ISIR database case is used by which silhouette extraction from a blurred image made possible. Moving image parameters such as west size, hip size, foot size, step size etc. can be extracted and it can be matched to the data in our database, which was used to identify culprits by detectives, in most of the cases it proved helpful also if data is not available in data base then also its helpful itself for finding the exact gender or age of that suspect. The method of gender classification is used in this paper where amount of people are assigned as human observers who predicts by seeing the silhouette image parameters such as hair, style, chest, hip, dressing etc from the picture. The techniques used for gender identification but for age detection our OU-ISIR is used. In our paper there is a 2 groups of peoples as child and adult.

Keywords: OU-ISIR, Gait, Silhouette, ANN, biometric.

I. Introduction

In present days both the genders plays a major role in social environment, on this separation itself several relations are dependent and for assembling the different kind of peoples this classification of gender is essential. If this classification is efficient it will be used in different applications of biometric. There are different identification techniques are developed which helps in investigation of police, allowing female constables for woman criminals, allowing gent constables for gent criminals and many similar like things. Among all the techniques Gait technique is very popularly used which totally lies on suspects walk, foot style, hip style etc identification. by using all these parameters we can identify the suspect from the blurred distance in any picture or image. Number of researches is going on in this Gait recognition field. Till now Gait did fully achieved the success in differencing exactly both the genders (man and woman), whenever discussed for far distance field picture identification Gait is only to be used. In previous techniques of gender identification suspect cooperation for identifying the gender[1] was very important, where suspect was given tracers on every joint of his/her body and recoded the moments. It's proved very impractical to have tracers on whole body for recognition and even asking to have short pants for tracing. Silhouette identification from the various pictures and identifying the subject's image is very difficult.

Modal based approach proves an costly than the physical based appearance Gait technique which proved less costly than any other approach. A targeted body is required to complete the associate task of describing such correspondence initially only for identifying the both genders (man and woman) from the silhouette of moving images for suspect identification with their physical moments. Finalization of identification of suspect is done by considering various parameters that is given by observers, better results are obtained by this analytical gender identifying cross race approach done by numbers of observations. Observer based identification also have some drawbacks such as, if subject is carrying any carry bag, wearing jacket or coat etc. silhouette image will can't be identifiable which seems to be similar in Gait based approach also. All these problems we discussed are tried to solve in this paper. Totally based on biometric approach such as voice, face,

eyes etc. lots of work is done specific for identifying gender (male or female). Artificial neural networks ANN base back propagation is used now a days for human gender identification, that bares an 7.2% of error rate according to standards by US that proves an average efficiency rate that ever recorded an is enhanced to 12.2% that says that silhouette of any suspect can be identified even on general based computers. After number of researches done on this moving picture identification researchers came to an conclusion that using an Gait based technique is efficient and essential for classifying the gender. Point lights are connected at joints of subject's body which is at fixed points only for moments identification totally in 71 different connective observation points, using this proves the dynamic parts of body can be read efficiently by placing lights and making silhouette like image with present subject body for identifying gender. This point light technique is most popular in different studios and in different techniques it is used.

As we discussed in the dark room the number of subject bodies use to ware point lights by which observers use to classify the gender and this technique has three different modes of PCA in which the correc classification rate CCR done during the 36 subjects identification proves 90% accurate. We tahen 20 male and 16 females and 28 observers are hired that has given us this 90% efficiency in identifing difference using silhouette even with in general purpose computers. Its obvious to say if any point light is missed from body at dynamic parts then it will be dificult to classify. All the parameters are observed by observers such as head to neck, neck to hip and hip to foot moments after that concludes the exact gender of that walkers. Easy to identyfy that mans use to swing shoulders than the hip where as woman swings the hip most that their shoulders, mans use to have shoulders very broad where as womans use to have hips wider in size it It's comp makes eazy to observers but remaining other parameters makes difficulty to differ gender such as hair style, weist size, height etc these thing can be same to both genders can confuse the observers.

Till now observers based identification is done but the silhouette based observation is one more technique which is still in progress that gives the exact and accurate differences. Silhouettes are divided into further 7 parts which helps individually as per requirement and demand. Actual conic rate of mass of centre is an option to the ratio of the conics axis which is one of the important aspects. Previously used technique have 90% CCR efficiency that name is L&G having 36 subjects among which 20 male and 16 females, and its same as H&W technique that diagonally uses and utilizes the conic option for gender identification. Only the H&W technique is having highest efficiency of 92% than others and the main reason behind this is, they used different cameras in many angles which covered all the moments efficient than other techniques. According to parts of the body the image of silhouette is divided into seven parts from top to bottom such as arm, top, thigh, trunk, front leg, back leg and feet, for classifying the gender (male and female) from human body. At different situations and with different scenarios total of 400 experiments have done on silhouette images using Gait technique. The strategies such as carrying bag, wearing shoes, coat, etc are considered thoroughly for efficiency in the result obtained by observing all 7 parts of image. Further we can consider many more parameters as comprehensive needs for study of gender classification such as hair style and chest are to vital parameters of human body parts that helps in differing sex (male and female). This hair is considered as one element of the skull or neck part and other one that is chest is also considered as 2 parts for two different bodies such as for obese persons it is arm part and for thin persons it's a neck part. We generally can show the major parts which differs the both genders such as hip and Brest or chest or we can say lower part of neck and can also mark the similarities also in both genders only for efficient analysis [2]. This technique is effordable and can be elaborated for improvement in rfficiency of identification. Background image texture is removed and exact needed boy silhouette is extracted and this technique is applied for dynamic images. Full body replace of silhouette is done by the observation of static images for gender identification from human body. The SVM/RF classifier gives 70% of efficiency and accuracy in analysis of image through more tham 500 pictures. It's obvious to say that 100% efficiency can be extracted from static images where as dynamic silhouette images needed different techniques as per scenario demands, and point light techniques is considered as most frequently used lots of researchers are showing interest in this field.

2. Gender Classification

A number of observers humans are required in this classification where they decide by seeing the suspect is male or female [1] which is by considering number of parameters. CASIA database is used from where a condition is taken as shown in fig.1 a silhouette image where a gender is identified by seeing the upper and lower parts separately and graph is drawn for the success rate of identification using this Gait technique. This identification parameters are arm size, swing of arms, hip, chest etc. depending on these human classifiers tries to convince the exact gender.

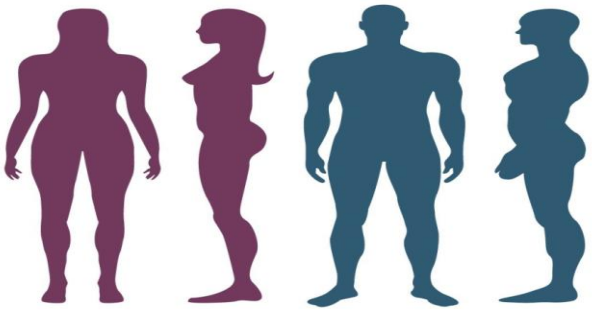

Figure.1: Silhouette image

Figure.2: Upper part

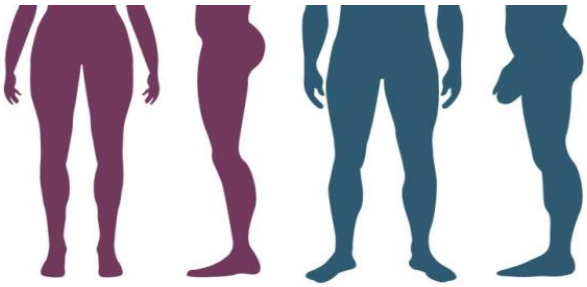

Figure.3: Lower part

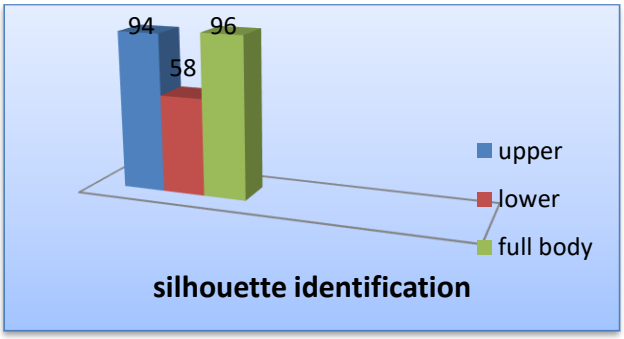

Figure.4: Identification graph

In this new technique a 28 images per second picture which is dynamic or moving image is shown on the screen and is to be observed by the observers. Seeing the any one parameter the observers we hired should tell the exact gender as male or female and classify[2] those making decisions. From the above figure we can say that fig.2 is sharing lots of information which is an upper part of body in which maximum humans succeeded. Both the moving and non moving or static and dynamic images are used for with separate upper and lower parts for classification.

In this case maximum of 48 members were voluntarily haired among them 38 are male and remaining 20 are female. the graph above in fig.4 gives the rate of success in identifying by observers from 3 images, where from lower part only 42 % success is obtained where as in upper part of image all 97% is obtained. Its clear that upper part gives lots of information about gender of perticular suspect in the silhouette image. Where as lower body dosnt contributes much in differing and it shows further difficulty in identifying when both the genders are wearing loose pants, human eves are very sensitive to moving piictures so static images have less efficiency of classification where as dynamic silhouette images are well classified. Parameters such as arms, hip, step size, foot size, head, hair style, walking, legs etc are considered in this technique we beloeve further more parameters should be included for classifying, rating is done from 0 to 5 points are given to image. 0 is for not

much data providing image through which onservers can classify ans similarly 5 is for data efficient image from which our hired human observers can easily classify the gender form silhouette. Table.1 below gives the rating ratio, among which usefull observation is hip and below neck with high skull identification where any one can exactly classify. as a result, the observers classify the given image is of both genders and now for this we apply age calculation operation.

Table.1: marks or rate of observation

Parameters	Avg
Below neck	4.2
Thickness of Legs	3.9
Swing of arms	3.7
Waist	1.3
hip	1.2
Moment of Legs	3.7
skull	4.1
Moment of Body	3.7

1. Age Calculation

Till now an gender is classified using number of Gait signatures, even a suspect data is not available in database its possible but for the exact age calculation its essential to have database then we can compare and identify, most parameters[3] of body are different to observe in both age and gender conditions such as head length, leg height, steps breadth etc are considered for age calculation of a person. Different parameters which are beyond the physical limit such as bend between head to hip and style of walking of suspect for age identification [7]. Two major age groups are subjected in this paper as child and adult, for which most popular OU-ISIR database technique is used. Commonly for age detection face recognition technique is in practice, which was done basically on 2 types of realizations one is static and other is dynamic. Having view control on total image is a static detection of face technique but it's quite opposite for the dynamic technique. Silhouette image gives lots of information than the normal picture, silhouette can gather information even if the image is blurred or not clear, and we obtain high resolution resultant information. Prediction is done biologically in this paper for age identification from the image, this wrist size, neck size, legs height etc are the expected predictions done. Step size and width are 2 major parameters essential in dynamic images. As shown in fig.5 below the marked joints parts of body are essential for identify of age calculation from human silhouette image. Here l is a parameter which gives the length of top or upper part of body in image have(xT, yT) component near to suspects chin is (xC, yC) leaded default.

$$l_h = \sqrt{(x_t - x_c)^2 + (y_t - y_c)^2} \qquad (1)$$

l_b is the parameter from head to chin part as shown in figure below, l_a is represented as chest to neck part, and s_l is considered as size of step between two legs, that varies from step to step as every person dosnt take exact walk steps every time. In dynamic bodies the joint moments should also consider which is very difficult. Foot width is represented as vertical 2 lines with legs angle size. Knee to foot is considered as one and foot to thigh is considered as other vertical line among two, angle between legs varies if high heels sandals are used by the suspect which will make little difficult to calculate. The parameter we apply for both legs front and back should be same and equal. From the equation 2 the parameters a1 and a2 legs and for thigh and foot are b1 and b2 is given.

$$l_g = \frac{(a_1+a_2)+(b_1+b_2)}{2} \qquad (2)$$

The equation 3,4 and 5 gives the t, sf, and r parameters which denotes the frame size of picture per cylces, magnitude from head to body is represented with r.

$$t = l_h + l_b \qquad (3)$$

$$sf = \frac{s_l}{N} \text{ , N stands for number of frames /cycle} \qquad (4)$$

$$r = \frac{l_h}{l_b}, \; 0 < r < 1 \qquad (5)$$

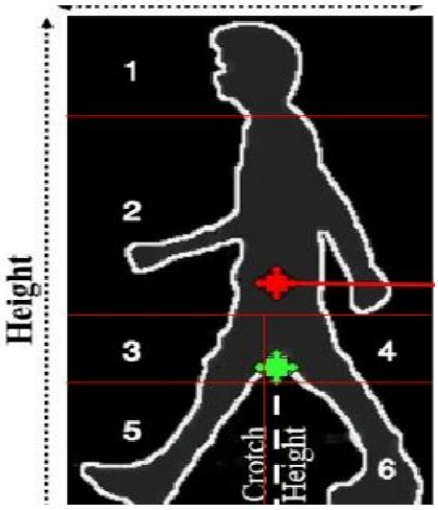

Figure.5: Parameters

2. Experimental Results

OU-ISIR (Osaka University-Institute of Scientific and Industrial Research) database technique is used in this paper that gives a better observation result with ability of silhouette image identification using group of peoples as suspected body. Updated work in this platform shows that This 20,000 people brought on same platform for observation, it's a huge information carrying system in the whole world having 5000 subjects and 4000 males and remaining are females in the database. These subject are chosen of different age groups of all varieties ranging from two years infant babies to 95 years senior citizens. As shown in below figure.4 complete information about peoples we chose as subjects having different age groups ranges with both male and female concentration. Cameras for movement coverage we used are 60 frames per second which gives the approximate information. There are different parameters to consider according to age group it varies, such as for toddles its essential to find both hands and legs moment on floor only for study but in actual case toddlers data is not required and same as for senior citizens their boy will be shinked and we check of bend in neck to hip in this case. So, in such cases it makes easy to indentify such subjects. Different parameters are considered for adults which is difficult to identify such as weist size, hip moment, leg moments, height of legs, width of foot etc. treadmills are also used for subject study as if the suspect is running then how can we ientify him so in such sinario its used with wearing different jackers, bags in different angles, our OU-ISIR database technique hase copyrights. System cant identify the age of peoples it should be done mandaterily. We encompass 20 adults and 20 childrens as different 2 groups in this experiment as same set for accessing data. Number of cameras is implanted in different angles for exact motion capturing and this angle is 85 degrees that is max. In this paper age and gender identification is major constrain so, both the genders and different age groups are taken in consideration. The silhouette image we used must be having high resolution for exact portrait of information.

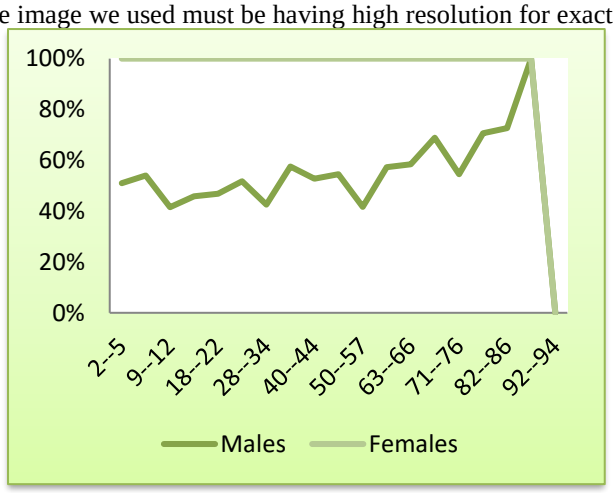

Figure.6: OU-ISIR database

127 pixels, which is similar for both the adult and child images. The practical and theoretical parameters vary such as the leg length, foot length, step size etc.

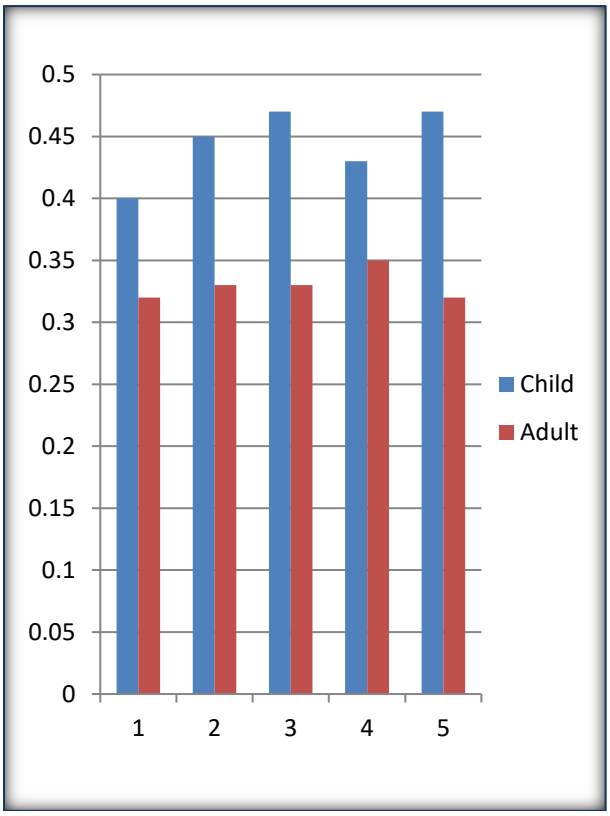

Figure.7: Subject ID

The magnitude rate is given in figure.7 as shown below in magnitudes are compared only for study or for data purpose. From figure we see that 015 magnitudes are for adults but it should be ranging from 0.12-0.25 and 0.2 is for toddlers in the experiment of age analysis. the suspect body is considered as 2 parts by police as upper part length and lower part length then by the foot style or onsidered and identifies the suspect. The resolution of silhouette image we taken should be 88x128 pixels that is height of

3. Conclusion

In this paper the specific technique used is human observers classification and OU-ISIR Gait database, by which both the major identities such as gender and age are detected might be by observing the silhouette image west, hip, foot moment, foot size with the other parameters[3] such as hair, chest back etc from the static image. Number of application are developed and number of criminal cases are solved using these techniques number of people used for identifying the silhouette
images whose answer was tallied with exact image. However all the techniques we discussed should have the prior data for comparison in the database [11]. The employed peoples are in between all group ages as subjects among them children's and adults have to be identified. We can consider the advance further more efficient techniques to be implemented by which the subject should easily identified in future scope.

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