

Gait Identification using Neural Network

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Abstract—Biometric System has become more important in security and verification of any human, which is under surveillance. Identification from distance is also possible by this technology. Researchers are taking interest to find out identification of gait by unknown manners and without informing the human as object. We are going to offer sufficient self-similarity gait recognition system for identification using artificial neural network. In which background modeling is made by video camera, in front of camera movement will be generated as to collect frames as segments using background subtraction algorithm. Then logically head (Skelton) is used to find out the walking object as a walking figure. In short, when a video framing is entered, the offered system identifies the gait properties and body based. Offered system is worked with collected gait dataset with different trials. Video framing sequence showed the algorithm attains recognition performance with its accomplishment. Human as Object identification method using gait is a different technique to verify an individual by the way he move or walk and by the intensity of moving on feet. Biometric recognition is method to assess the behavioural properties of anybody by setting up different pattern as according to need. Gait recognition is type of that biometric system which works without giving any hint to moving object quickly. This is the best way of monitoring the people. Using this system different environment can be controlled like airports, banks, airbase to detect the danger and threat.

Keywords—Gait recognition; biometric identification; neural network; back preparation; human detection and tracking; morphological operator; feature extraction

I. INTRODUCTION

From specific distance verification, biometric systems are being flourished, ever been better in different applications and fields because of uniqueness. Biometric is derived from physiological properties of individual by its behavioural characteristics which are unique to everyone. Verification or recognition using specific method gait has become more efficient in various circumstances [1]. Every human object has different physiological properties. Purpose of the system to implement such rules, patterns or algorithms that can be used to analysis any moving body by unknown manner. In sensitive environment and in this era this is the need of circumstances that machine should be intelligent which works automatically without any manual feeding and user cooperation. Often

seems sensitive environment face major issues like blur images after pixels damaged or required user cooperation [4]. So for idea of gait analysis using biometric or automatic machine is more efficient and accurate. Gait analysis covers the walking style uniquely and many subsets of walk like angles, speed, foot intensity, legs size, vein identification. This is video based technology for coming era [3]. Unique features of gait method are like changing mood, speed of moving, loading luggage or holding handbag. In this research we are using Artificial Neural Network (ANN). Our research consisted on three different portions:

- 1) Object Tracing and Detection
- 2) Training ANN
- 3) Testing ANN

This work is regarding experience on image database via algorithm walking in open air, human objects in different angles. Model based method analysis different body parts like feet, legs, toss, hands, and thighs for matching each step in sequences some parameters. Many friendly and unfriendly applications should be able to verify the people via intelligent machine. Many biometric properties are included iris matching, palm matching, vein matching and DNA equality. Further examples are signatures, voice and eye matching. Our paper is about gait verification using ANN.

Gait identification is a process of verification of any individual by unknown manner in moving state. Moving is behaviour state so it is subset of biometric monitoring. Biometric monitoring enables the environment detecting the danger and threat in a while. Gait is unmarkable, so intelligence group or banks can use it without interaction and being unfriendly with people for recognition individually depending on need. Gait can be observed after all if it shows low pixels or low resolution in image. Basically “a gait is pattern of steps of an individual”.

In Fig. 1, noise is reduced by pre-processing using background subtraction. First method of background subtraction is recursive method which uses single Gaussian method and Gaussian mixture model. Second method is Non Recursive method which uses sliding window approach. Training Portion and Testing Portion are parts of Gait recognition.

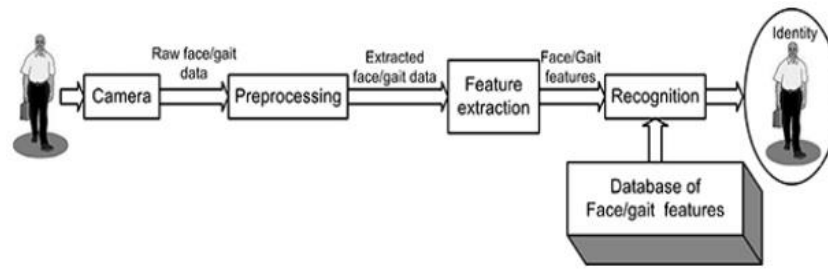


Fig. 1. Gait recognition processes.

Low resolution pictures have computational difficulty; therefore complexity increased in model based method. This model has only one advantage that it can be used to derive the signatures for gait from parameters and free effect of weight, step length, step cycle features. Where, “ANN” technique is used for training and testing objective. This research is on motion picture frames and gait image database.

Appearance based method undergo to change the appearance modification of walking direction. Model based method extract the subset of motion of moving human body by fitting models as input method for subtract motion [3]. Walking and speeding is also extracting from model based approach which is double sided movement. Human model can be generating artificially by restoring the properties like stride or kinematics of joint angle. Real-time systems can undergo like this model and parameters head, height, pelvis. Distance formula (1) can be used to calculate the distance of two points (feet) but not in moving position.

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \quad (1)$$

By taking foot step it can estimate how many miles someone can travel. By estimating steps anyone can calculate his Gait. This is manual and slow method which needs calculations. As shown in Table 1, ¹this can be estimating the Gait on Foot Calculations.

TABLE I. ESTIMATED GAIT CHART

| Distance to Gait | If you have a 4 foot Gait | If you have a 4.5 foot Gait | If you have a 5 foot Gait | If you have a 5.5 foot Gait | If you have a 6 foot Gait |
|------------------|---------------------------|-----------------------------|---------------------------|-----------------------------|---------------------------|
| 100 feet | = 25 Gaits | = about 23 Gaits | = 20 Gaits | = about 19 Gaits | = about 17 Gaits |
| 200 feet | = 50 Gaits | = about 45 Gaits | = 40 Gaits | = about 37 Gaits | = about 34 Gaits |
| 300 feet | = 75 Gaits | = about 67 Gaits | = 60 Gaits | = about 55 Gaits | = 50 Gaits |
| 400 feet | = 100 Gaits | = about 89 Gaits | = 80 Gaits | = about 73 Gaits | = about 67 Gaits |
| 500 feet | = 125 Gaits | = about 112 Gaits | = 100 Gaits | = about 91 Gaits | = about 84 Gaits |

¹<http://www.backcountryattitude.com/pacing.html>

Approach should be model free to follow and less computational.

II. METHOD AND EXPERIMENT

Self-similarity gait verification and recognition system is our research area. This system observed the gait of every individual as because gate is unique of every human being. Characteristics can be classified and recognized by taking and extracting frames for examine.

A. Framing and Bit Detection

1) First Step is shooting the video of an individual from decided specific distance and angle.

2) Convert the video in sequenced frames simultaneously. It can take time. Clarify this that frames are in structured form so easy to work with these, instead of whole video.

3) Camera is in still position and no frame is missing that body view from appeared angle. Covert each frame to grey color scheme for highlight the human in image. Background automatically will be dull using any filter.

4) Create the canvas to cover whole object to cover from each. A back foot touch the right edge and front edge is touches the left edge. Or right to top and left to bottomed edge.

B. Clustering and Separation

Motion picture of any person is converted into frames in sequence and first frame is first input second frame is second input so simultaneously. Sequence is mandatory for analysis. Subtract the background for examine the object and step length has been chosen for processing. After every step frame should be append into database for further processing and matching ideology.

1) For uniqueness no need of walking person to know or interact with biometric for identification, only motion pictures are enough to verify. Only specific angle is most important in this technique from specific distance. Secret camera can be used also because concerned only with video of that person, who is the target. Frames as images are storing in database.

2) Frames have been stored in database in sequence. After getting the frames complexity has been reduced. Only frames are target for matching or further features hunting. Angle of footsteps in the canvas is gait feature which should be saved in image database. Same step of grey cycling will be repeated for each time to subtract the background for clear the object on

front side of the frame for further processing. Only pixels of object should be highlighted.

3) The frame which has clarity in pixels should be taken and with maximum width and height as shows in Fig. 2. That will be considered as target frame obviously.

4) After hunting the frame should be save in database which are called target frame. 2D array creates in database for storing the frames. Arrays should be indexed in i and j manner. Then Target Frame should be examined for every tine feature.

C. Recognition system for gait

Fig. 1 and 2 shows the Dataset Creation Process. All above steps we did capture the video recording, classified the frames(Still Pictures) then subtract the background for clear the object, then create an matching object with black background and object converts into white color for matching the features and properties of object without telling and giving hint to him/her. After getting that target frame store this in data set in database for further processing. This is how to create the dataset for further processing. Every matching feature like a pattern is stored in database.

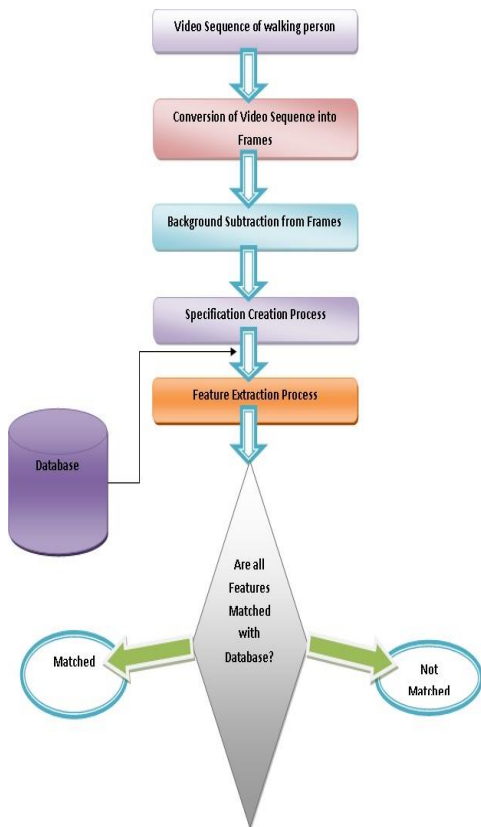


Fig. 2. Second phase of gait recognition.

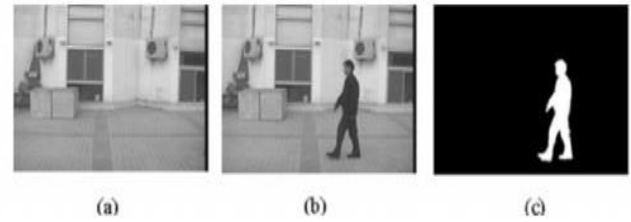


Fig. 3. Frame height and width detection system description.

1) Object tracing and tracking

First step in tracing is to capture an image, subtract all backgrounds and humans to get targeted frame by camera. All frames are stored in dataset with its final target frame. Store its properties in database like height, angle and distance between two feet. Target frame should be store in the canvas with border and separating it from background is the main feature of that frame. All the information is stored without telling the object.

2) Silhouettes modeling

Foreground detection is possible only after subtracting the background [2]. To get features foreground detection is necessary. As in Fig. 3 a static camera is used to capture the image and then processed. Definitely this is a frame work after capturing the image from video shot [5]. Simple motion detection is done in purposed system. In this method we have calculated the median values not the means values. With these medians we have found only N frames with pixels for finding its intensities. We convert human object into binary by removing the background of capture image by static camera to convert into foreground and launching target frame in dataset. Very vital point is this that colourful cloths or backgrounds, will be subtract to get the silhouettes. Only silhouette is the binary object which is desired to complete or algorithm which we applied on this method. For Gait detection we get binary silhouettes, then we set distance signal for find out the vector which is its feature. Which get after calculating the distance of pixels? In other words distance between two pixels is measured by distance signal. In Fig. 4 after subtracting the background and color full textures binary silhouette will generate a specific shape which is an output. That Shape is the identification of that person who is moving in outdoor.

First we took video shot then get a frame of a still picture, then we applied algorithm to remove the texture and colourful articles, and get the silhouette binary shape for further processing. We then calculated the distance of two pixels by distance signal to store in the dataset. Remove all the noise by applying filter (median) by the help of Gaussian model and trace out the foreground. Another algorithm moving target algorithm is applied to separate human being from colourful background. Only shapes which we got after applying algorithm are used for moving target classification.



Fig. 4. Silhouette for dataset.

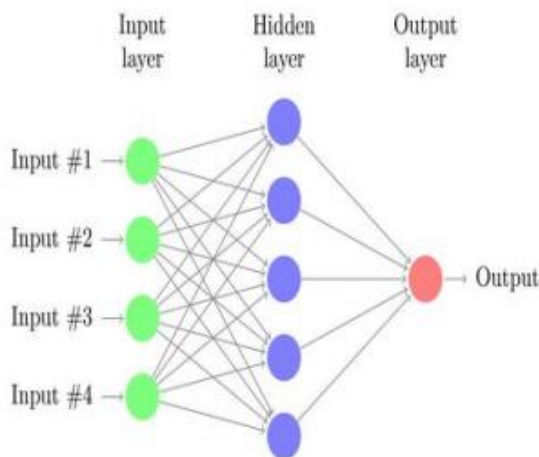


Fig. 5. Neural network layers.

3) Object tracking

Next go ahead is to find out the moving silhouettes of walking figure from extracted binary foreground picture. Morphological skeleton operator for human tracking is adopted in this research paper. Object tracking will be a machine's intelligent track.

4) Training using artificial neural network

ANN is being used in many fields like education, computer science, business, medical field and engineering to get the targets. It is a famous artificial model. Biometric works on pattern and human gait means specific walking pattern. This all study of algorithms and methodologies leads us to gait analytics. Every human has different walking style, thus every walking pattern also will be different that can be stored in dataset. These different styles of gait can be used as pattern and these patterns can be used to identify someone without telling him or her by comparing those shapes which will be obtained after applying algorithm and subtracting the backgrounds. Artificial neural network is composed of neurons. This artificial neural network can be used to solve many artificial intelligence problems, without creating real

world models of anything. Even any biological model can be represented by using artificial neural network, although they are complex. Artificial neural network model is an algorithm. ANN model removes the complexity and leads the focus on actual problem and point of view. Before converting input to output, its hidden layer computations are made with the help of intermediate layer as shows in Fig. 5. A delta rule of generalization can be considered as back propagation.

Image and signal processing is being processed by Artificial Neural Network on completion of sequence of back propagation of neural network. Output to hidden and input to hidden weight is overruling when an input pattern is propagated to forward. Network class included only multiple layers for computational units in a forward way. Every neuron in subsequent has connection to the every layered neuron.

Back Propagation is most commonly used model in artificial neural network model just because of back learning algorithm. Widrow-Hoff was created the generalization rule to multiple layers and non-linear differentiable transfer function. To train any network it uses two types of vectors: input vectors and target vectors. Until it can be near about the function, which has association with input vectors with output vectors. Hidden data will be placed between the input vector and output vector to hide the originality. Inputs can be more than one but output will be only in one and single form.

D. Testing with ANN

Comparison is essential in testing; we will compare the all features which are stored in database with the features which are stored in nodes and layers of Artificial Neural Network Model. It can possible only with ANN. Match the similar features of both sides. Target capture frame will be in output. Same like this we will store all data of everyone, which we want to identify or verified by unknown. When both data will be compared we will get a tag or alert of matching that person found. In this artificial neural network architecture feed forward back propagation learning algorithm to create train and test for gait identification and verification.

III. RESULTS

Finding matching by different patterns and biometric technology now a day's people are under observations. Researchers are trying to find out the best way and algorithms to find out the matching movement methods to know the hidden surveillance. Gait identification from distance is important feature in biometric technology which can be used to monitor the outdoor people in air ports, army base, banks, educational institute and shopping marts without knowing them that they are matching or adding into database or dataset by any pattern are under observation via any technique or algorithm. This purposed system has been tested on different type of image databases for. Gait recognition or identification in very simply demonstrated in this paper to know the threats to find out suspicious personality and generate such dataset which does not exist. In a simple way after subtracting the backgrounds and get the foregrounds in shapes for storing into databases and then matching this to stored record. In the result obviously required match will be found, if the record will be matched. This paper is about collecting data and matching the

exact person who is moving in front of static camera for identification without cooperation. Therefore, dataset is created for this purpose.

IV. FUTURE WORK

In this paper we work on creating dataset which created with capturing of images via static camera. In next we will work on heavy dataset and different algorithm technique which creates this easier to identify the movement off any human body without telling him or without cooperation with him which will be also biometrically but the method will be changed and camera will capture different angles and different shots. In future we will try to check the intensity of feet by plotting and graphs which will tell us the pressure of foot on normal speed and in speed effect position [6], [7]. Target can be disguised in different shells, this should be also identified. For this new algorithm and new tools are needed. In next paper we will work on such a thing that will cover also different angles and blessings which can be proved to capture the threads and tough targets which can be identified before any activity [8]. For this purpose we will involve also sensors with camera with infrared rays or x-rays for target identification. These are all gathering can be used also for identification. In this purposed paper we worked for single movement, and discrete body one by one, parallel identification also should be discovered. How any machine can identify parallel or bulk identities? Also we will try on this that via camera capturing eyes detection is possible and which

algorithm is suitable for this purpose. Vein detection is also part of biometric identification being physical property of any human.

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