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Design and Development of Automated Identification of Fauna by Using Fusion in Biometric System

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Abstract: *Biometric traits are used for identification of animals. We proposed the system by using feature level fusion as well as the sum score level combination for recording of animal. For the first step we download the images of tiger as well as fox. Then the images are pre-processed by using the image processing Math lab tool. Then the iris features are extracted from the images. Then it is combined at feature level fusion. We use neural network system for the Classification purpose. The result of this system is 87%. Then the match gain is calculated and sum score level combination is used for the recognition. For two different animals two matching techniques are used. One technique is by using the hamming distance and the technique for feature extraction is RED algorithm for animal identification .FAR and FRR is calculated. FAR is False acceptance rate and FRR is False rejection Rate.*

Keywords: Biometric, Multimodal, Unimodal, False Acceptance Rate and False Rejection Rate

I. INTRODUCTION

Biometric system is used for identification as well as the recognition. Biometric traits characteristics are used for the identification purpose. For animal identification we can use face of animal, Iris, texture etc. feature. For our system development we use the iris based feature extraction and classification method. We download the images from the Google. The link is mentioned in the references. Motion Sensor camera traps collects the wild life pictures with economically. It reduces the manual task. The given images are normalized and then the Normalized images are converted to the gray level images. The Gaussian filter is applied to remove the noise from the image and then the quality of image is checked by using various Quality measures like Standard deviation, Peak signal to noise ratio of the image. The feature vector is calculated from collected images [1]. Classification is done based on the features. The Fusion is done for the recognition purpose. We train the images by using neural network classifier which improves the accuracy.

II. RELATED WORK

Machine learning enables computers to the user to solve the task. Supervised learning of State-of-the-art methods by showing them correct pairs (2). Various authors have been many attempts to automatically identify animals in camera-trap images; however, many relied on hand-designed features [3] to detect animals, or were applied to small datasets. Various Authors selects the pattern based matching for the animal identification. Bolger et al. [4] applied software to help recognize individual animals.

One of the most successful ones is Yang's work [5], Spatial pyramid matching (SPM) with max pooling [6] can not only model the spatial layout of local image features. As being easy and simple to construct, the SPM kernel turns out to be highly effective in practice [7].

III. METHODOLOGY

The works of Animal studies are depending on the Camera captured images of wildlife in which the animals are identified with the help of unique patterns like spot or strips. The data used for this is cost effective. In pattern

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recognition techniques there are various methods used for the identification. Various technologies are used in the animal identification. The method for identification is select on the basis of application. Before the selection of identification technique it is necessary to consider the performance, cost etc. There are two ways for categorization of biometric system which is as follows.

A) Unimodal Biometric

It considers single biometric trait. In Unimodal Biometric system the single only one Biometric trait is used. There are various drawbacks of this system like intra class variation, inter class variation, spoofing etc.

B) Multimodal Biometric

The drawbacks of unimodal system are reduced with the help of Multimodal Biometric system. Biometric based on multiple traits [8][9].The following methodology shows the proposed system for the animal by using the multimodal system in figure

C) Camera Captured Images

The downloaded images are considered for the experiment [10].The images are of left eye and right eye of the animals are processed and the features are extracted and then match score of each eye is considered for the identification purpose. Total 150 images for different animals are used for the project. The image is resized and then used for performing the various operations.

D) Image Pre-processing

Pre-processing of camera captured images includes the de-noising the images and masking. The various filters are used to de-noising the images by converting first the RGB image to greyscale image so we can get one intensity scale.

E) Feature Extraction

The processed images are used for the feature extraction. For the iris recognition system of animal identification. Proposed system that can be used for Detection and identification of animal. The Gaussian filter is used for the image enhancement purpose. Gabor Wavelet is used to analyse signals of diverse frequency. The basic function f(x, y) is used for Gabor Wavelet. The Gaussian function is used for representing the windowing function.

$$g(x,y) = \frac{\|\vec{k}i\|^2}{\sigma_x \sigma_y} e^{\frac{\|k i\|^2}{2}\left(\frac{x^2}{\sigma_x^2}+\frac{y^2}{\sigma_y^2}\right)} \quad (2)$$

The Gabor wavelet in 2D is expressed as

$$\Psi i(x,y) = \frac{\|\vec{k}i\|^2}{\sigma_x \sigma_y} e^{\frac{\|k i\|^2}{2}\left(\frac{x^2}{\sigma_x^2}+\frac{y^2}{\sigma_y^2}\right)} e^{jk_v(x\cos\alpha_u + y\sin\alpha_u)} - e^{-\frac{\sigma_x \sigma_y}{2}} \quad (3)$$

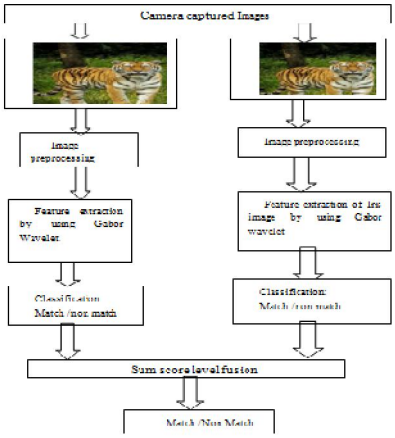

Figure 1: Proposed Methodology

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Where each $T_i(x, y)$ is characterized by vector Ki enveloped by the Gaussian function where $\sigma_S\sigma_Y$ the Standard deviation is with the Gaussian function along x and y axis. The centre frequency is characterized by the vector. The iris features are used for recognition purpose of the animal. The GUI for the feature Extraction is as follows. For the second system Gabor wavelet method is used for the iris feature extraction purpose. The calculated features are used for the recognition purpose. The classification is done by using various methods.

F) Classification Using Classifier

Here we can use different methods of classification using different classifiers for the recognition. For texture feature we have taken the edge width as a parameter and for color feature we have taken RGB as a parameter. The SVM is a supervised learning method. Hamming Distance classifier is also used for the recognition purpose. With the help of classifier we can recognize the animal. For our proposed methodology we are using hamming distance classifier and neural network classifier.

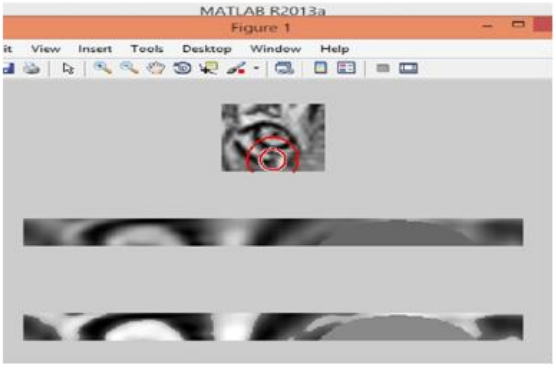

Figure 2: Feature Extraction

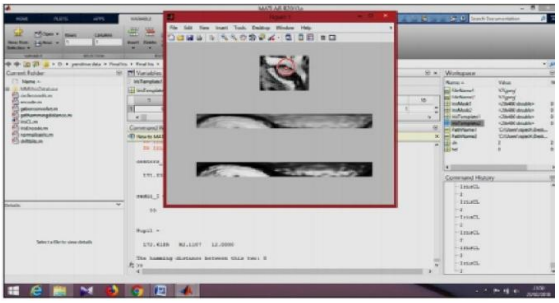

Figure 3: Matching

The second methodology is as follows

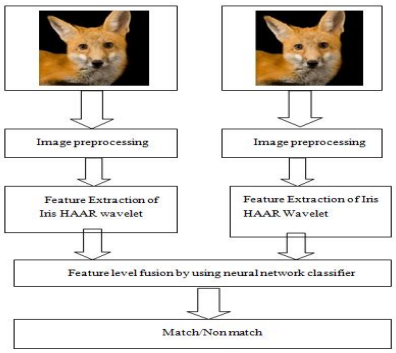

Figure 4: Methodology 2

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a) Image Acquisition

The downloaded images are considered for the image Acquisition process [11].

b) Image Pre-processing

Various methods like Gaussian filter, Median filter etc. are used for the Image preprocessing method. The Image is enhanced with the help of FFT and the other method.

c) Feature Extraction

The processed images are used for the feature extraction. For the iris recognition system of animal identification. Proposed system that can be used for Detection and identification of animal. The Iris and Pupil are detected in the proposed technology. Then the Features are extracted for classification.

d) Feature level fusion

The Extracted features are combined and used for the classification purpose. Feature level fusion is used for the classification. The feature level fusion is used for the identification of the animal. Haar wavelet is a sequence of rescaled "square-shaped" functions. Wavelet analysis is similar to Fourier analysis in that it allows a target function over an interval to be represented in terms of an orthonormal basis. Neural network classifier is used for the classification purpose. The following figure shows the GUI designed by using HAAR wavelet[9].

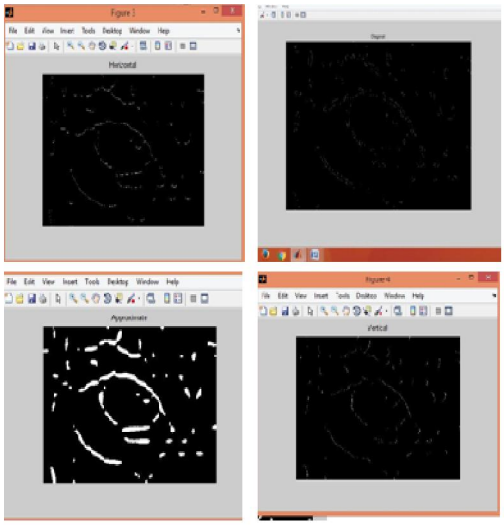

Figure 5: Haar Wavelet

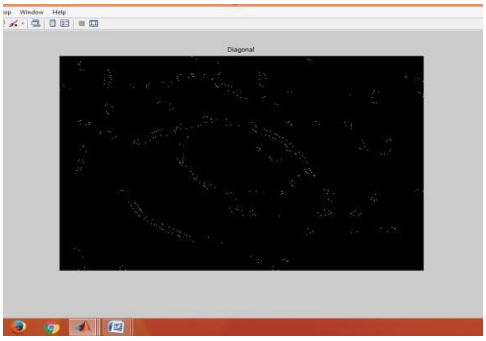

Figure 6: Horizontal

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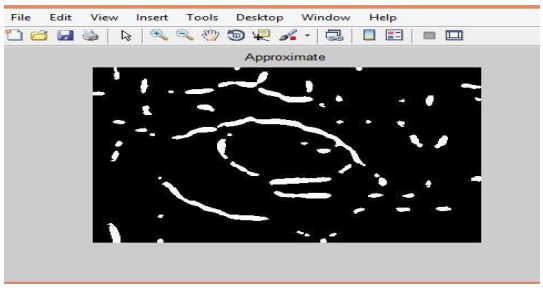

Figure 7: Feature Extraction

IV. Results and Discussion

In First methodology the images are converted to gray images. Gaussian filters are used to improve the Quality of images. The noise is removed from the given images. Then the features of iris are extracted by using Gabor wavelet method. Hamming Distance classifier is used to identify match or non match. Sum score level fusion is used to find the match or non match of the tiger images. For fox identification system the original images are converted in to the gray scale images. Then Noise is removed from the images. The feature extraction is done by using HAAR Wavelet method. Feature level fusion is used for further processing. Then the Neural Network Classifier is used for the identification purpose of the Fox.

The performance of the iris recognition system as a whole is examined. Tests were carried out to find the best separation, so that the false match and false accept rate is minimized, and to confirm that iris recognition can perform a biometric for recognition of individuals. Multimodal Biometric system is used for iris recognition. In this experiment downloaded images from the database is used [12]. The match rate will be calculated for the iris based recognition system.

V. Conclusion and Future Scope

Generally iris identification is divided into four steps namely localization, normalization, feature extraction and matching. The iris recognition system with less false acceptance rate and false rejection rate. The recognition rate is increased by using Log –Gabor wavelet and by using Score level fusion is used for the Multimodal Biometric System The experimental results show that the accuracy of system would increase on combining the traits. The system is giving an overall accuracy of 88.14% with FAR and FRR of 4.17% and 7.69 % by using Gabor Wavelet. The Multimodal Biometric system with HAAR wavelet gives the accuracy of 82.24% with FAR and FRR of 8.66% and 9.10 % in feature level fusion. The multimodal biometric system improves the performance of the system. The experimental results show that the accuracy of system would increase on combining the two algorithms. Efforts will be taken for experimentation in order to verify by fusion of different matching techniques .The Recognition rate is also improved using advanced pattern recognition and NN techniques, which will be studied in future. The intra class variation and noise removal is reduced by using this system [13]. In future Pattern recognition is used for problem solving.

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