FACIAL RECOGNITION USING NEURAL NETWORKS

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Abstract: The biometric system in our daily life plays a key role that use physiological features (fingerprint, iris, palm print, face, etc.) as well as systems that use behavioural characteristics (signature, walking, speech patterns, facial dynamics, etc.). Facial biometrics has been one of the most preferred biometric data since it generally does not require the cooperation of the user and can be obtained without violating the personal private space. The recognition is done by capturing the image of a person and remove the background of the captured image and comparing the characteristics of the new face to that of known images in the database. It has Face localization part, where mouth end point and eyeballs will be obtained. In feature Extraction, Distance between eyeballs and mouth end point will be calculated. The main face recognition methods are Geometric Feature Method and subspace analysis method and Neural Network method and Support Vector Machine (SVM) method. Facial recognition is low cost and easy to use and install while providing basic protection from unauthorized access. It is can successfully work in automatic mode, however, for higher certainty in safety.

Keywords: Face recognition, Video processing, Neural networks, Facial dynamics, Video-based face recognition

1.Introduction

Neural networks are played a crucial for providing security and solve many complex real world problems. Neural networks, also known as artificial neural networks (ANNs) or simulated neural networks (SNNs), are a subset of machine learning and are at the heart of deep learning algorithms. Their name and structure are inspired by the human brain, mimicking the way that biological neurons signal to one another. The applications of neural network is speech recognition, character recognition, signature verification ,fingerprint verification, image recognition and human face recognition. In particular the study is focused on human face recognition. Face has been one of the main biometric traits, which has many application areas including security and law enforcement, health, education, marketing, finance, entertainment, and human computer interaction. the facial recognition is very helpful in real-world by providing security to electronic devices and vehicles. the problem of face recognition in unconstrained environments is a challenging problem due to head pose, illumination, age, and facial expression related variations. There may also be changes in appearance due to make-up, facial hair or accessories (e.g. glasses, scarves). Another difficulty in face recognition is the similarity among individuals (e.g. relatives, twins).by using neural network this type of problems are solved.

2)METHODOLOGY

Geometric Feature Method:

- Geometric feature learning methods extract distinctive geometric features from images. Geometric features are features of objects constructed by a set of geometric elements like points, lines, curves or surfaces. These features can be corner features, edge features and so on, which can be detected by feature detection methods.
- The facial features such as eyes, nose, ears, mouth, etc. are different in structure, different human faces are represented according to different characteristics of the characteristic shapes of these organs. Geometric features were first used in the description and recognition of the side profile of a human face. It determines a number of feature points based on the profile line of the person's side, and then derives a set of feature quantities for recognition such as angle and distance based on these feature points.
- It is difficult to extract stable features from the image and stability is not high

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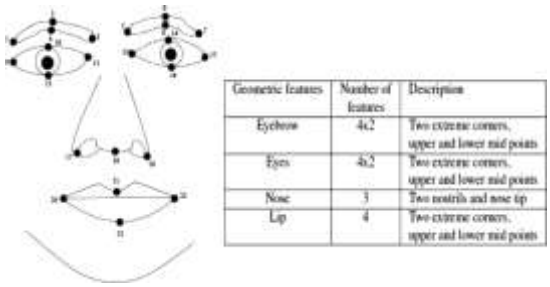
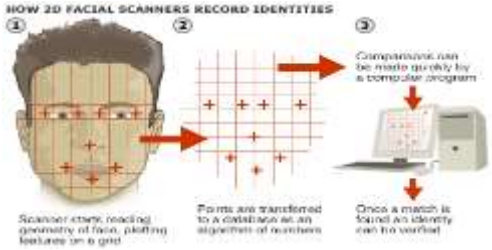


Geometric features	Number of features	Description
Eyebrow	4x2	Two extreme corners, upper and lower mid points
Eyes	4x2	Two extreme corners, upper and lower mid points
Nose	3	Two nostrils and nose tip
Lip	4	Two extreme corners, upper and lower mid points

Fig(1).Geometric features



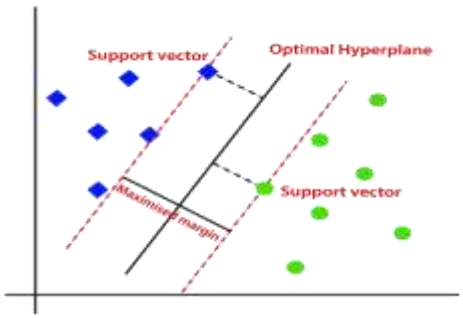
Fig(2).Facial scanner for recording identities

Support Vector Machine

- Support Vector Machine or SVM is one of the most popular Supervised Learning algorithms, which is used for Classification as well as Regression problems. However, primarily, it is used for Classification problems in Machine Learning.
- The goal of the SVM algorithm is to create the best line or decision boundary that can segregate n-dimensional space into classes so that we can easily put the new data point in the correct category in the future. This best decision boundary is called a hyperplane.
- SVM chooses the extreme points/vectors that help in creating the hyperplane.

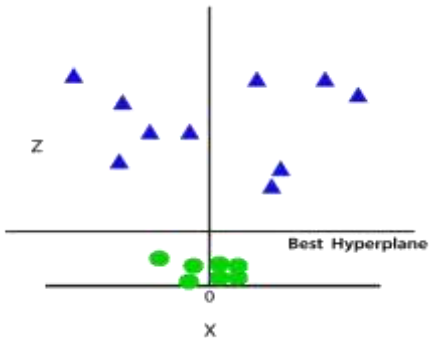
These extreme cases are called as support vectors, and hence algorithm is termed as Support Vector Machine .there are two different categories that are classified using a decision boundary or hyperplane

- The basic principle of the algorithm is to use samples to form a lattice in the high-level feature space, select sample points as the support vector near the boundary between the two types of sample points, and use the support vector to make the decision. And finally achieve the purpose of classification and identification
- For 2-D the hyper plane should be line equation i.e., y=mx + c.
- For 3-D the hyper plane should be any 2-D plane.
- For linear data, we have used two dimensions x and y, so for non-linear data, we will add a third-dimension z and it is calculated as z=x^2+y^2
- SVM algorithm is not suitable for large data sets. SVM does not perform very well when the data set has more noise



(a). Linear svm

- For linear svm we can use a segregate the data points by using a single straight line or any line equation. In the fig(a) the points are segregated by using a straight line



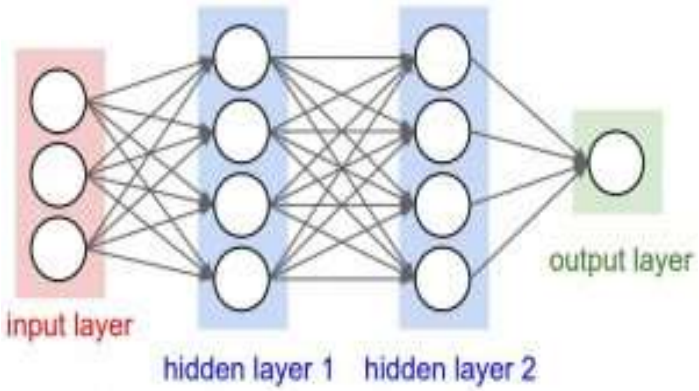
(b).Non-Linear svm

- For a non-linear svm the data points are segregated by using a 2-d plane and we can add another dimension to the graph. In the fig(b) the points are not segregated by using a line equation. the locus transformation formula i.e. $z=x^2+y^2$ is used .then

the points which lies bottom then the points are moved top then we segregate by using a line equation.

Neural Networks

- A neural network is a computational learning system that uses a network of functions to understand and translate a data input of one form into a desired output, usually in another form. The concept of the artificial neural network was inspired by human biology and the way neurons of the human brain function together to understand input from human senses
- Neural networks are being applied to many real-life problems today, including speech and image recognition, spam email filtering, finance, and medical diagnosis, face recognition.
- Neural Networks are a set of algorithms that tries to recognize the patterns, relationships, and information from the data through the process which is inspired by and works like the human brain/biology.
- Artificial neural networks (ANNs) are comprised of a node layer, containing an input layer, one or more hidden layers, and an output layer. Each node, or artificial neuron, connects to another and has an associated weight and threshold. If the output of any individual node is above the specified threshold value, that node is activated, sending data to the next layer of the network. Otherwise, no data is passed along to the next layer of the network.
- Its principle is to use a large number of simple calculation units to form a certain hierarchical structure
- Although neural networks have some advantages in face recognition, they also have considerable defects. The structure of neural networks is huge and complex, and their training requires a huge sample library. The training time often takes days or even months. The speed is not fast enough. Therefore, neural networks are not commonly used in the actual application of face recognition.

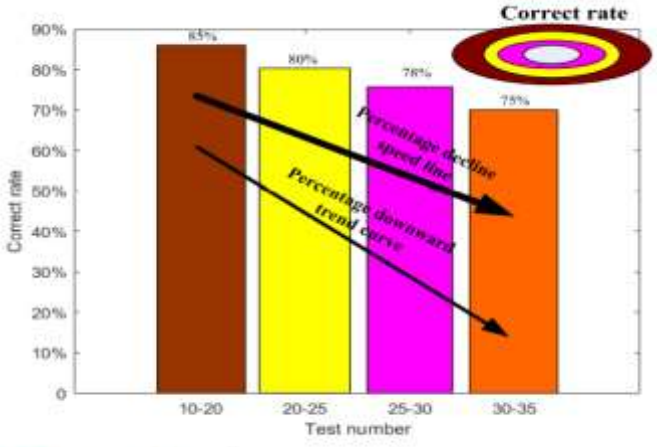


Fig(a). Layered diagram of the Convolution Neural Network

3) RESULT:

- This paper mainly sets four directions to consider the problems: the accuracy rate of the face recognition system in the actual check-in, the stability of the face recognition system with real-time video processing, and the truancy rate of the face recognition system with real-time video processing
- The test results of the system under different test sample numbers are as follows: when the input is 10 ~ 20, the recognition and sign-in correct rate is 85%; when the input is 20 ~ 50, the correct rate is 80%.
- There is an error rate of about 20% in the test results. Most face information errors that will change, such as changes in facial features, accessories, cosmetics and lighting caused by medical plastics, making it impossible to extract the correct logo from the picture.
- Another main reason is the accuracy of identification code comparison.
- The system correctly judge that the two identifiers are very similar. Under various perfect conditions, make sure to adapt to various situations.

Test number	Correct rate
10~20	85%
20~25	80%
25~30	78%
30~35	75%



GURE 6. Test number and accuracy rate chart.

4)CONCLUSION

In this paper, a new face localization technique is proposed and a new feature extraction algorithm is developed for human face recognition. The neural network model is used for recognizing the frontal or nearly frontal faces and the results are tabulated. The network is trained and tested. From these results, it can be concluded that, recognition

accuracy achieved by this method is very high. This method can be suitably extended for moving images and the images with varying background. The system has made tremendous innovations, greatly improving the security rate and Face Recognition System Based on Real-Time Video Processing reliability of face recognition technology. It is worthy of further exploration and realization by our scientists

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