Recognition Face Combined License-Plate Applying On Smart-Parking

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Abstract— For a real system, there are many factors that must be combined to make the system usable and practical. Especially the systems of supervision and security. To recognize the face plate combination car too, want to keep the vehicle is basically not even practical, but also meet the requirements of face and number plate.In fact, to keep a car in a parking lot, always be the right person in the right car. That is the basic principle. For this subject, it is understood to be the right person number plate. Face human was detected and recognized, the characters in license plate will be displayed. The PCA Algorithm and Neural Network Training are these methods were applied in this paper.

Index Terms— Principal Component Analysis, PCA, PCA Algorithm, Neural Network, Face detect, Optical Character Recognition, OCR.

1 Introduction

Face detection is a technique that locates the human face size in a photograph, thereby separating the human face. The human face has many features to recognize, if we meet a friend after a long time, we can recognize that person even though the details on the face can change like skin, roof hair. I realize not because of eyes, nose or lips or hair, that eyebrow that I recognize because of his appearance. That is, on the face of a universal feature that can be identified, our algorithm starts with this idea. Principal Component Analysis (PCA) is an image recognition algorithm based on the facial features of the face. This algorithm is used to perform two tasks: The face is the same as the face given, the second is the location of the human face in a photo. Photographs are usually color images, so the output of the original image block will be color (RGB), then we extract the number plate, continue to convert the color image into black and white. Therefore, the car license plate number is black and white, before being transformed into a binary image and then recognized.

2 Processing

2.1 Face Recognition

Human-Machine Interaction System: Helps people with disabilities or disabilities communicate. Hand-language users can communicate with ordinary people. People who are paralyzed through a number of blink marks can express what they want, such as hand gestures, facial expressions.

Initially we have a set of face images called training set. Assume that each image is M × N, we consider each of these images to be a vector in M * N space. Now every face is a vector, we see that these vectors are not randomly distributed in the image space but are distributed according to a relative law. We can say that these vectors are in a subspace called face space. From the vectors in the training set, we will find a standard base for the face space. These basic vectors can be thought of as vectors that represent the overall features of the face.

Assuming that the training set has P images, then we will have P vector:,, ...,

Average image vector: $m = \frac{1}{P}\sum_{i=1}^{P} T_i$

The difference between the faces with the average image is the vectors:

$A_i = T_i - m$, i = 1 ... P

The idea of elemental analysis is to find a set of standard vectors so that these vectors best describe the distribution of facial vectors in space. [12]Selected vectors such that:

$$-(u_i|u_j) = \begin{cases} 1 \text{ nếu } i = j \\ 0 \text{ nếu } i \neq j \end{cases}$$

$$\lambda_k = \sum_{i=1}^{P} (u_k|A_i)^2 \quad \max$$

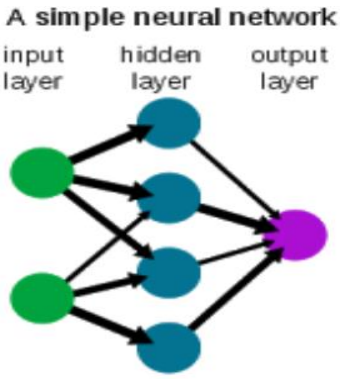

Fig 1. A simple Neural Network

The value of the nodes in the hidden class and in the output class is the value of the function with the parameter as the sum of the scales. Geometrically, the graph of the S-wave function is also called the S-function

A function s (u) is an S function if it satisfies: s (u) is a

function that is blocked. That means the values of s (u) should never exceed the upper and lower blocks of the block regardless of the value of u. s (u) is a monotonic increase function. The value of s (u) always increases as the value of u increases s (u) is continuous and smooth. Because of the continuous function s (u), it has no slots and angles. Because of the smooth continuity, the function has its derivative and slope distinct and distinct at each point. All functions satisfying these three properties can be used as the propagation function in the network. However, in practice the sigmoid function g (u) is commonly used. The sigmoid function is defined as follows:

$$g(u) = \frac{1}{1 + 1/e^{u}}$$

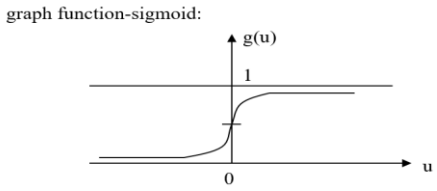

Fig 2. Graph of function Sigmoid

The 1-layer Peceptron class does not solve problems that are not able to classify a pattern linearly with hyperplasions, ie problems that are not linearly separable. A classic example given by Minsky and Papert to demonstrate the limitations of the perceptron network is that of the XOR input / output relationship. Per-class perceptron networks can only solve linearly linear problems. In fact, sample spaces often do not meet this requirement. But with the MLP-MultiLayer Perceptron, this problem can be solved. The MLP network architecture is a multi-layered straight-line architecture (with one to three hidden layers). The activation function can take many forms, not just hardlims, as in the classic Perceptron. But neurons in the same class are the same function. The architecture of a hidden two-layer MLP is shown in below:

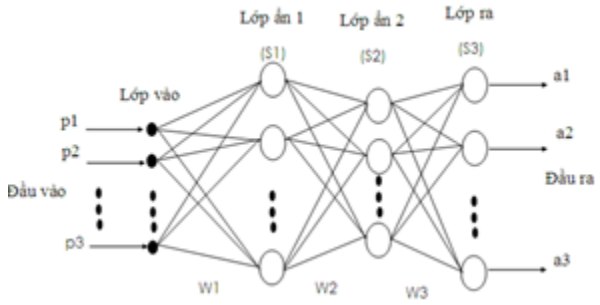

Fig 3. Multi-layer perceptron model

Rosenblatt did not solve the weighting matrix problem of the hidden layers of the MLP multilayer perceptron. Until 1986, a pretty effective way to train new MLP networks was launched by Rumelhart and MoClelland. That is the law of reverse propagation for the MLP network.

The backward-propagation algorithm is performed in accordance with the regression principle where the sensitivity of the class m is calculated from the previously calculated m + 1 layer sensitivity. Thus, in the MLP network, the sensitivity is propagated backwards from the output layer back to the hidden layers and to the input layer.

The back-propagation algorithm converges to a solution that minimizes the squared error mean because the method of weight correction and the bias coefficient of the algorithm are reversed with the gradient vector of the average error function For weight. However, for MLP networks, the squared error function is often complex and has many local extremes, so network training repeaters can only reach the local extremes of the average error function which do not reach the overall extremity. How the training process will converge will depend on the initial conditions of the training process. Especially how to choose the learning curve to increase the convergence of the network. With each math problem we have a choice of different numerical models.

Thus, when a process of mathematical law is spreading backward convergence, we can not assert that it converges to the optimal solution. You need to try with some initial conditions to ensure optimum performance.

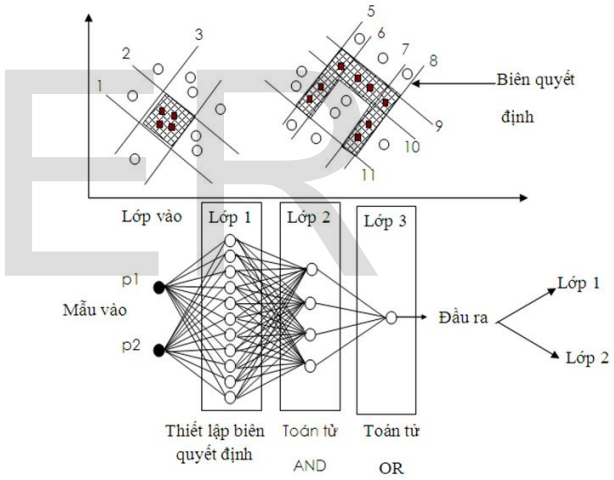

Fig 4. Input and output model

The back-propagation network is a nonlinear function approximating a function based on a given sample set. A typical neural network consists of three classes: the input layer, the hidden layer, and the output layer. Each neuron in the input layer receives the value of an independent variable and passes it to the network. Data from neurons in the input layer is aggregated and transferred into the neurons in the hidden layer. Neurons in the hidden layer are only associated with neurons in the input and output layers so only the network designer knows which layer (the user will not know). Similarly, the neurons in the output layer also receive values from hidden neurons.

The network has a bias, a sigmoid class, an output linear class, is capable of approximating any function with predefined stages of execution. The standard for backward propagation is the slope reduction algorithm. The network weights are shifted along the opposite direction of the slope vector during execution. Limits of backfill are referenced to indicate where the slope calculates for nonlinearity in a multilayer network.

Network training is the process of determining the weights of a network to approximate a given function. There are many methods for network training such as gradient reduction, Quickprop, quadratic method, cascading ... The purpose of the method is to change the weight of the error function to the smallest value.

Fig 5. Face recognition GUI

2.2 Regconition Characters from License Plate

Determining a gray threshold is crucial to the ability to select the correct number plate. Choosing the exact number plate really hard can only be determined in a certain area.
Binary is the image where the values of the pixels are only two values of 0 and 1 (white and black). To convert from a binary image to binary we set an appropriate threshold for comparison. The gray level of the image will be used to compare this threshold value. For papers Proceed with each number plate using the technique of image scanning and image segmentation, then select the objects in the image to fit the size and area. Standardize the size of the objects then save the objects into an array, in order from the objects in the number plate from left to right and from top to bottom. Identifies the characters in the object image. Vehicle number plate recognition model, based on the characteristic matching method. Build templates into different layers, then label them. The selection of object features is the selection of geometric elements. Transformation of individual elements can change the order of quantities.

After separating characters, we have to classify them into the same class as the sample classes. Thus, we select these character classes to compare with each other in the sample. The results of each comparison find the correlation coefficient then proceed to save them together with other classes. [13] When finished, select the class that has the highest correlation coefficient. This class will have the name corresponding to what character you are exporting to the character screen.

Fig 6. Character recognition GUI

Fig 7. Binarized Image[13]

3 SIMULATING IN MATLAB PROGRAM

The face when taking the database should be placed very close to the camera (20-40cm), good light conditions, background should not be near the color of human skin (brown, orange, red, purple ...), the sampler registration base must keep the posture as little movement as possible, do not move much, moving far, moving speed must be low camera to catch the face, The model must wear bright colors, separate the skin color, not close to the skin color, hair must be neat, when registering to wear glasses, when the identity must wear glasses.

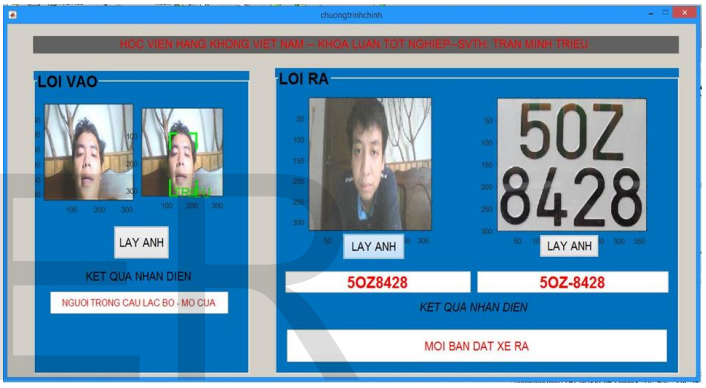

Fig 8. Face combined character recognition GUI

The most prominent feature of the face recognition system using PCA and the Neural Network is its fast processing time and high accuracy. The interface is difficult to use instead of the interface easier to use. The number of people running the system is reduced to one person. Meet some special cases encountered as users get the wrong means will alert, stranger intruded media will alarm.

CONCLUSION

The subject can be developed into a better human face recognition software, combined with some more advanced image recognition and processing algorithms to produce more accurate results. Growing up into identity threads with more images in the database, identifying images with different backgrounds, face emotions, identity through video ... This subject implements content and form simulation, running the test. There are still a lot of problems in the subject, which is a case where a large angle is taken, and the image can not be processed. In the future, this problem can be solved by rotating algorithms. picture, like radon. At present, the time is quite short, so the topic is only to put a picture at a very low angle, can read, (<5 degrees).

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