CONSIDERATIONS ON IMPLEMENTATION OF BIOMETRICS TECHNOLOGIES IN MILITARY SURVEILANCE SYSTEMS

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Abstract.
The paper presents the detection of multiple faces in real time using neural networks. The detection methods in real time using a set of small neural networks and genetic algorithms in adaptive control and surveillance zones. Neural networks and genetic algorithms are not suitable for military applications as real-time monitoring or identification of large time-due process.This paper presents how to speed up data acquisition and processing, neural networks using genetic algorithm and a small individual connected to a network sharing neurala. The method chosen is the division of human face in a lot of regions, each of which can be connected to an individual neural networks. This involves using small parts of the network and allows storing different regions using different methods of code.Genetic algorithms is used in real time search and mining of various possible targets girls are quickly analyzed using neural networks.

Keywords: neural networks, real-time processing, genetic algorithms, signal acquisition

1. INTRODUCTION

Real time detection and recognition is an important activity of research, because many real military applications can benefit from it. Scope can be defined for border security but also protection against possible terrorist actions. Currently, the fulfillment of tasks in real-time detection and recognition is provided by patrolling and surveillance optics. The specific surveillance or access areas with potential terrorist threat require further action to improve security systems to ensure efficiency and optical sensors. Acquisition performance can be uncertain systems to rapid changes of details as facial physiognomy, but also filling certain angles of view of cameras used. Scenario is more realistic in bad weather, arrangement or operation of acquisition targets. In this way it creates a security gap in the surveillance system, easily exploited for illegal transport of persons or in the context of possible terrorist actions against the strategic objectives. Mentioned the need to prevent situations leading to the design of effective surveillance systems. This is the rationale applied research activity proposed in the paper. From academic point of view, besides the important application, operation and the scientific techniques and methods of use or encounter difficulties in modeling the acquired signals and their exploitation in order to achieve good detection performance. Contribute to a clarification of these issues is the objective performance of the work.

Modeling techniques to the nature of biometric signal acquisition, the primary issue addressed is an important challenge. Their characterization in terms of spectral, statistical or otherwise, may represent an important step in extracting and interpreting information contained biometric signal, focusing in particular on the detection of areas of analysis useful. In the context of biometric data acquisition systems, characterization stastistica is more difficult especially in small grazing angles and for systems that analyze a larger area than that covered the target events.

Another component insufficiently explored in the literature is the modeling of biometric signals that provide data from corrupted or small bodies, insufficient for correct processing.

To validate the results there is opportunity to use new procedures and algorithms for detection and biometric data processors based on the use of neural networks, namely the estimation of parameters that provided good model for similar signals.

Further experimentation in real-time detection to detect objects girls is another challenge to recent research.

Faces are three-dimensional objects that appear different when purchased dimensional, depending on the position but also other parameters belonging to the technology used.

This makes the extraction facial to do with dificultate.Cand extract decreases the number of features also reduces the ability of girls extraction system in real time.

In my work on neural network analysis proposed small, fast and the simple and fast extraction areas, areas controlled using adaptive search based on the use of a genetic algorithm.

Typically a neural network is used for data analysis of a sample.

The application proposed sub-divides the sample into a lot of parts using a specialized neural network for each region.Divide the sample ensures that the system can learn diterite regions of the face using a better encoding acquired signals for each sub-region.

For example lip color coding region XYZ space is considered the best solution by analyzing lip redness.

Equally useful is the analysis of the color of their skin regions using spatial codes XIY.Mai than are those characteristics most suitable for the analysis of the eye.

Therefore sub-division in areas of the face can produce better results than classical methods.

A sample size is set to 30x30 pixels for reasons explained in the next section.
During the test samples can be extracted sequentially, in the image, each position in the image can be tested.
Store more samples is performed on image sizes or pyramid, the method can be used for face detection for more than a size analyzed.
During the experiments caused by real-time processing has been demonstrated as a method of testing is not an approachable method for this system.
Using genetic algorithm introduces higher speed, size and rotation principle invariante.In instead of sliding, sample the target image and scaling it uses genetic algorithm to extract random samples of image positions and sizes or orientations.
After each run the process, we explored the searches are not the whole picture, but a selected area depends on the detection results.
Experiments [1] proposed a real-time robust detection using integrated picture offered by other sisteme.Desi have very good results, the systems were very complex, involving a wide range of these metode.
In [2] proposed a hybrid system using images and sunete.Astfel, starting position of the face is estimated from a microphone acoustic Directive as signal strength.
In other works [3] involves using face detection in color shades as well as information about face shape.Detectors used in face detection [4] gave an accuracy of 99.3% and the detector used in [6] offering a rate of about 30 ms / image.
In this paper I intend to elaborate on neural networks and their architecture, to show how to speed up the search by using a genetic algorithm adaptive final cercetare.In area can be computer simulations and draw conclusions on the implementation of biometric systems different applications of military interest.

2. SUBDIVISION AND LEARNING

The documentation activities I wanted to focus on examples that use networks may depend on the size neuronale.Rezultatele neural network analysis.
For example for an example 30x30 pixels, using 2 parts / pixels, a neural network has an input level of 1800 nodes.
If your network has a level 20 hidden nodes, the result and increase its size.
Depending on the size neural network is a major dezavanaj [4] of the present methods of learning, especially facial regions that do not contribute any useful model, for example, evidence of corners.
Passing over this problem may experience learning individual parts using facial division.
Important features of the face can include eyes, eyebrows, nose and lips.
Subsections define their area of fetei.Si other sections could be learned but may have different priority levels.
This paper aims to analyze the four neural networks, one for each set of eyes and eyebrows, nose and lips.
Color regions and this may be another stage for another neural network learning.
Below I present a brief analysis of each of these networks.
I proposed analysis using 30x30 pixels in size since this size is the minimum that are extractable facial details in real time.
Larger size of the face is better but requires time and technical resources to analyze much larger.
Neural networks have three levels of training algorithms that drive back.
Number of nodes in the hidden levels is determined experimentally so that each network node to be output.

2.1 The Neural Networks eyes and eyebrows regions

Combining Decision eyes and eyebrows in the same sub-image is based on separation difficulties of detail, particularly the USB camera images acquired over 2 meters.
Size chosen for this section is 15x10 pixels.
Analysis showed that this region is one of the most intunecte regions of the face.
Color detected in this region produce several effects.
One possible method of analysis could start with the reference peaks between subregions analyzed and would be based on the use of filters [7].
Thus each pixel is encoded using a purchased component.
During experiments to date has shown that the hidden levels in these sub-regions is 8.
Output level contains a node.Neural network size is 2417. [9] can be discussed and the existence of the same neural regions on either side of the face.

2.2 The lips neural networks

The analysis of the face, lip color can be a reference to the rest of the face feature that differentiates the different races of people.
Analyses show that most people have reddish lips.
This can be implemented as part redness present in lip color space using XYZ color coding region for the lips.

Sub-image size set to 15x10 pixels may have all, each pixel is represented in two componente.Una may be part of the representation space X XYZ [8], and another may be shining (redness) also represented in XYZ space component.

2.3 The neural network of the nose

Nose region is one of the most changeable in time with the main features brightness (color) and convexity.Distances from the nose to other areas of the peaks can be considered benchmarks for research.
Coding region of the nose requires a combination of color and information of the regions analyzed peaks.Representations can be made using YIQ color space, and for each peak detected optimally chosen filter.
Represented using color component sizes of components I and Q.
Sub-image size may be 10x10 pixels.

2.4 Cheeks neural network

Regions of skin color is one of the main facial features that could be analyzed, it contains more information.
Sub-pixel images can be 10x10 pixeli.Fiecare is encoded and represented in two parts (color (I, Q) with spatial representation culorilorYIQ.
Thus Y can define the brightness / brightness and I, Q component specific to each individual average.

2.5 The difference measurements

Following studies can be a database containing more images.Each image will have details for each region of each individual neuron.
The image subdivision and use of small neural networks will follow reduce the processing time of the measurements analyzed.

2.6 The dates of neural networks

Acquisitions involve facial image analysis, a type of addiction can be scanned with presents technologies.The images, capture video, photos obtained from digital cameras with different performance.
These ratings will have to be defined at the beginning of the experiments according to the final goal.

3. SYSTEMS ARCHITECTURES AND DATABASES

Recently proposed a generalization of generic applications called watch list checking, the verification of identity of a person unknown shall be made in relation to a list
people "suspected" and not to one person. Generic biometric system architecture includes the following modules:
a) a sensor used to collect primary information programming, and their conversion
in digital format
b) a signal processing algorithm to extract a "signature" biometric appropriate
c) a database to store the "signature" from a population of subjects
d) a procedure for comparison of "signature" corresponding to an unknown person with those stored in the database,
e) a decision procedure (fully automatic or assisted by man) that uses the previous comparison result to carry out an action.

3.1 Stages of signal processing in a system of recognition / verification of faces

The main steps of signal processing purchase a block architecture are:
I. The acquisition and preprocessing (normalization appearance, illumination normalization, segmentation front / background detection fiduciale points);
II. Features extraction and representation (features global / local geometrical models / statistical phrase extraction / movement, the real value / full / real / binary);
III. Classification data (single classifier / whole, type metric mean value / degree of confidence);
IV. Decision

3.2 Databases

Research has shown recognition performance using a fairly large list of databases, most available free for research purposes. They differ in the number of people included, the number of photos of the same subject, resolution and format, and among them we mention [15]:
- *Olivetti database*: contains about 10 different images for a total of 40 people, showing variations in terms of orientation, rotation in the image (up to 20 °), the scale of representation (up to 10%) and facial expressions under conditions of controlled lighting. Dimensions of each image are 112x92 pixels, using 256 levels of gray, and the examples shown in Fig.3.2.1 The experiments were performed randomly allocated a maximum of 5 images (out of 10) of each individual training set and the rest formed the test set.

Fig. 3.2.1 Examples of images from Olivetti database

-*Yale-database*: contains 165 images of 15 persons, characterized by significant variability of facial expressions, as shown in Fig. 3.2.2Due to small size of the database, carry out several experiments blocking the test set with a single picture of each person.

Fig. 3.2.2 Sample images from Yale database

Another architecture is hierarchical organization faces, partitioning executed on a tree structure. The type of encoding original image can also be influenced by the need to ensure invariance to common transformations.
Recent research related to architecture "optical flow" [16], based on the representation of variation (gradient) in intensity between two distinct images of the same persoane.Studiile were based on frequency domain representation of images: phase information is more important for discrimination (separation) than the amplitude, as suggested by the example in Fig. 3.2.3 [17]

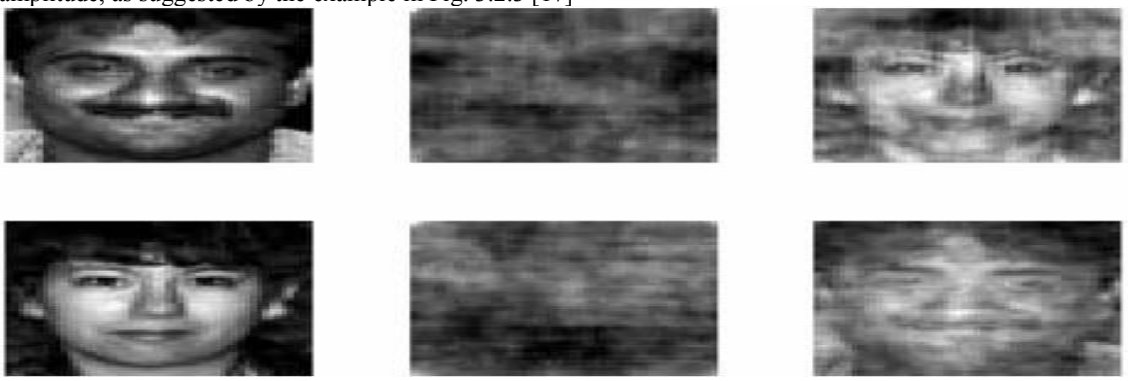

Fig3.2.3 a) original image b) the same amplitude and phase random, images reconstructed using the correct amplitude and phase information corresponding to the other person

New opportunities for research can be based on neural networks autoasociative architecture, shown in Fig. 3.2.4 as a multilayer network with the same number of inputs and outputs, and the same data inputs and outputs delivered as desired.
It is trained using examples belonging to a single class (different images of the same people).
In the test phase, a new image is applied to input reconstruction error (Euclidean distance between input and output) is used as discriminatory information.
It has been shown that the image belongs correct (test image corresponds to the person whose photos were used to determine the neural network parameter values) and the error will be much lower than for other classes.
This approach is particularly useful in applications to verify and solve problems because of a limited number of photographs of aceleeaşi people.

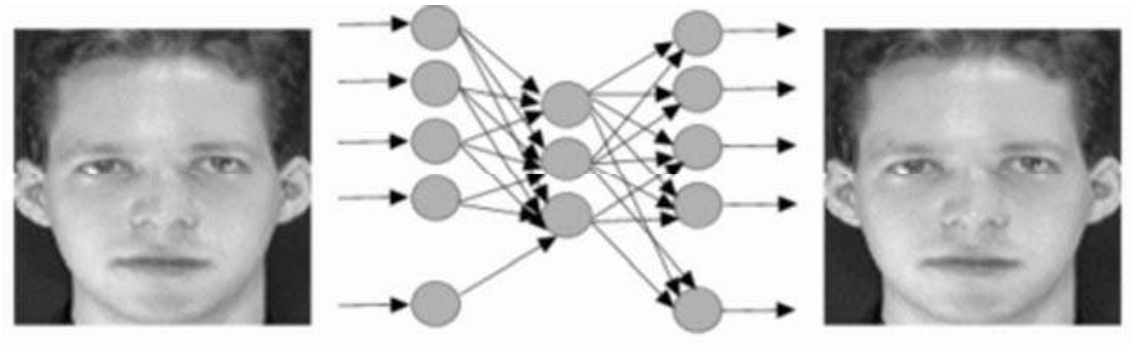

Fig. 3.2.4 Neural network architecture autoasociative

4. LOCAL PROCESSING SISTEMS

A series of recent works refers to the representation of natural objects by parts, justified intuitively by their several advantages that local deformation stability, high degree of invariance with respect to light level, tolerance partial coverage. In the case of the processing of faces, the image is decomposed into a linear combination of images well localized in space, as shown in Fig. 4, which can interpret the components of individual databases.

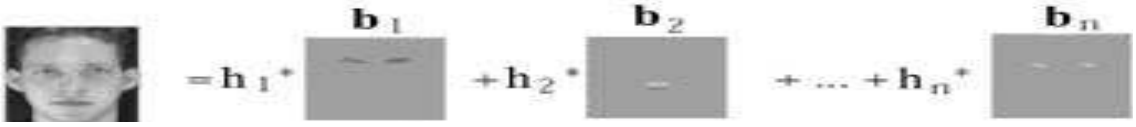

Fig. 4 Representation of faces parts

The general procedure is as follows: images used are combined under a matrix X, each column of the matrix representing pixel brightness vector corresponding to a particular photo.

If we noted with B the set of basis vectors (located space) and image decomposition coefficients matrix H with respect to this basis (these coefficients are projections based on the X data matrix B).

If the number of basis vectors is less than the length of vectors of matrix X (and, usually, so it happened) then work to achieve data compression, and each row of the matrix H will form "signature" of an image database. We can write: X ~ BH effective recognition procedure can be based on identifying the minimum distance between such a signature corresponding to a test image and the image signature from training set.

The various techniques used on the specific constraints imposed by B and / or H, in some cases resulting in spatially localized basis.

5. CONCLUSIONS

Many face recognition techniques are very sensitive to correct alignment of images that form the training set, degrading performance is significantly easier if they are translated or rotated.

For this reason, many solutions use a preprocessing step prior to automatic or manual that result in obtaining a database consisting of images of the same scale of representation and without being affected by relative translations and rotations in the image.

In addition, there are theoretical arguments that justify the exclusive use of the area that defines itself, eliminating the influence of background and hair. For this purpose you can use "masks" oval respectively AR database application.

Large size of images is often a problem because the amount of calculation can become excessive in some cases.

Given the results confirming the slow degradation of recognition performance in relation to the resolution used, may apply subsampling procedure leading to a reasonable size of the image to about 1000pixells.

In particular, the Discrete Wavelet Transform can be used, which reduces dimensionality while ensuring invariance with respect to facial expression.

The work may have potential applications for the system of defense, public order and national security and public services, as follows:

Prison-access control staff and inmates, and visitors;

Border-control: popular biometric techniques in order identicarii persons of interest, followed, suspects, people data in confinement;

-Banks: providing user authentication ATMs additional security methods. Often they are seen as integration in cards

-Voting systems: ensuring confidence in the correct identicare voters and ensuring that each person votes only once;

-Access to computers and the network: using biometric techniques based on footprint (due to small size) to authorize access to devices like PDA, PC and other peripherals;

-Public services: the use of biometric techniques in conjunction with cards health, auto permits etc.

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