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FACE RECOGNITION SYSTEM UNDER MORPHING ATTACKS USING DBN AND SOM

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Abstract— One of the most compelling challenges in statistical pattern recognition and machine learning today consists of bridging the gap between discrete structures (such as graphs or diagrams) and continuous structures (such as n-polytopes).

In this project propose to map a dynamic Bayesian network (DBN) to an ordered family of α-shapes to improve DBNs classification power. This mission is achieved by: 1) embedding a DBN into a topological manifold and 2) applying the α-shape geometric constructor to build hierarchical structures assigned to the DBN.

This continuous representation of traditional DBNs as α-shapes allows more information to be obtained about the objects to be classified. These latter are viewed as hierarchies of geometrical objects with different levels of detail. Topological signatures are therefore unraveled and classification accuracy is enhanced.

This project has been applied the proposed formalism to the task of facial identification across ages. Preliminary results demonstrate that the proposed formalism is a powerful tool since it has outperformed some DBN models, the k-NN classifier, and some recent approaches.

The project is designed using Microsoft Visual Studio .Net 2005 as front end. The coding language used is Visual C# .Net. MS-SQL Server 2000 is used as back end database.

I.INTRODUCTION

There are still many other applications in which prediction and identification success is subject to a "correct" DBN modeling. In other words, probabilistic graphical models require the number of nodes (random variables) to be known. However, this information is not always available. Furthermore, capturing instantaneous and incremental changes of the data poses another great challenge to a graphical representation such as a DBN. The current problem is to find the face data of the selected employee even if photos of various ages are given. Hence an application is required to apply DBN to detect the face data among the given image database collection.

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II. EXISTING SYSTEM

In existing system, first 'N' number of face images for a given age (A) is stored in the database. Then the observations of images at various time periods (A+1, A+2, A+3,…) are converted into Dynamic Bayesian Network (DBN). Once all feature vectors assigned to local areas of a face image are captured, they are viewed as Visual Observations (VOs). Nine facial regions are considered: hair (H), between hair and forehead (HF), forehead (F), ears (EA), eyes (E), nose (N), cheeks (CH), mouth (M), and chin (C) are latent variables (or hidden states) and the block feature vectors O_i are the observables; all these variables represent vertices of a DBN which is an Hidden Markov Model (HMM).

The weights in this DBN represent conditional probabilities values between a facial region and a feature vector, or between two facial regions or between two feature vectors. These weights are incrementally updated and learned using the training set of facial images of the same individual.

III.PROPOSED SYSTEM

The proposed system implements all the existing system methodologies. Instead of using DBN, Self-Organized Feature Maps are used for classification. The Self-Organized Feature Maps consists of two layers of neurons (Fig. 1). The first layer is not actually a neurons layer, it only receives the input data and transfers it to the second layer. Let us consider the simplest case, when neurons of the second layer are combined into a two-dimensional grid.

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Each neuron of the third layer connects with each neuron of the second layer. The number of neurons in the second layer can be chosen arbitrarily, and differs from task to task. Each neuron of the second layer has its own *weights vector* whose dimension is equal to the dimension of the input layer. The neurons are connected to adjacent neurons by a neighborhood relation, which dictates the topology or structure of the map. Such a neighborhood relation is assigned by a special function called a *topological neighborhood.*

In the beginning of the functioning, all weights

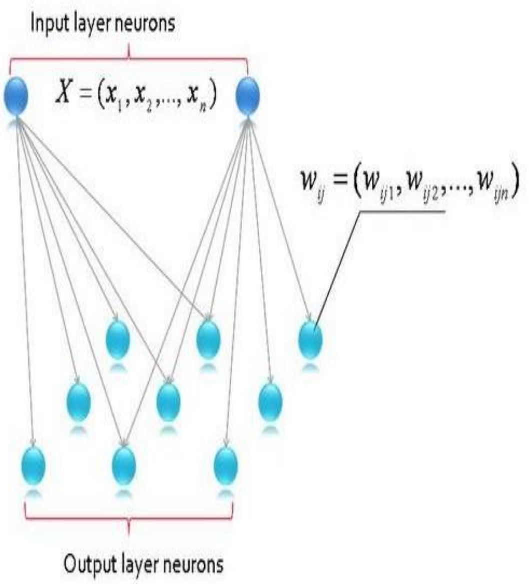


Fig. 1. The architecture of an SOFM NN

vectors of the second layer's neurons are set to random values. After that, some input-vector from the set of learning vectors is selected and set to the input of the NN. At this step, the differences between the input vector and all neurons vectors are calculated as follows:

$$D_{ij} = |X^l - W_{ij}| = \sqrt{(x_1 - w_{ij1})^2 + \cdots + (x_n - w_{ijn})^2}$$

$$D(k_1, k_2) = \min_{i,j} D_{i,j}$$

Where *i* and *j* are the indices of neurons in the output layer. After that, the NN chooses the *winner-neuron*, i.e., the neuron whose weights vector is the most similar to the input vector:

Here, k_1 and k_2 are indices of the winner-neuron. Now, we need to make a correction of the weights vectors of the winner and all the adjacent neurons. The neighborhood of a neuron is determined by a topological neighborhood function.

Often, each input vector from the training set is presented to the NN, and learning continues either some fixed number of cycles or while the difference between an input and the weights vectors reach some epsilon value. The difference between adjacent neurons decreases with time, and hence they organize into **groups (maps) which correspond to one of the classes** from the learning set.

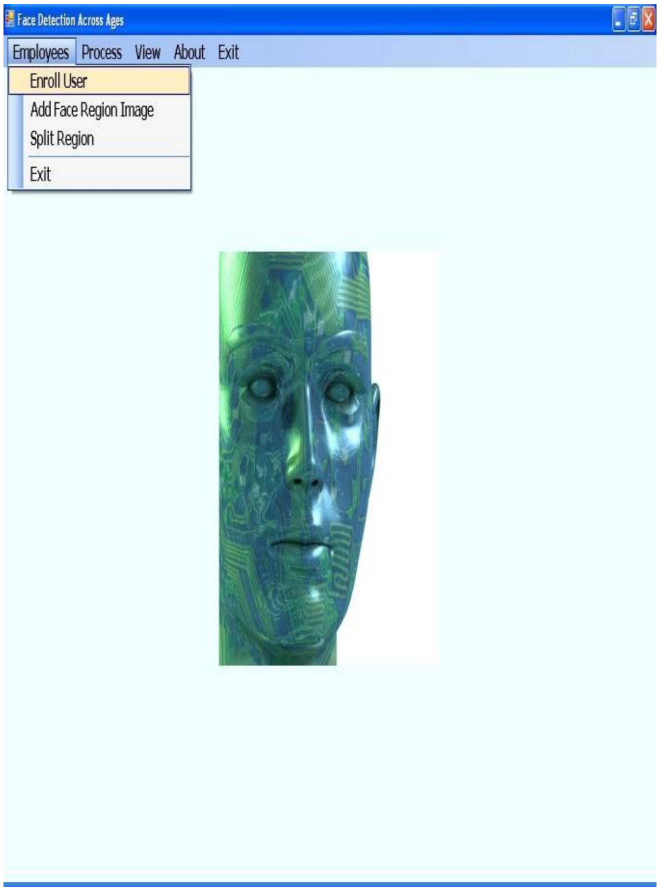
The weights in this second layer represent conditional probabilities values between a facial region and a feature vector, or between two facial regions or between two feature vectors. These weights are incrementally updated and learned using the training set of facial images of the same individual.

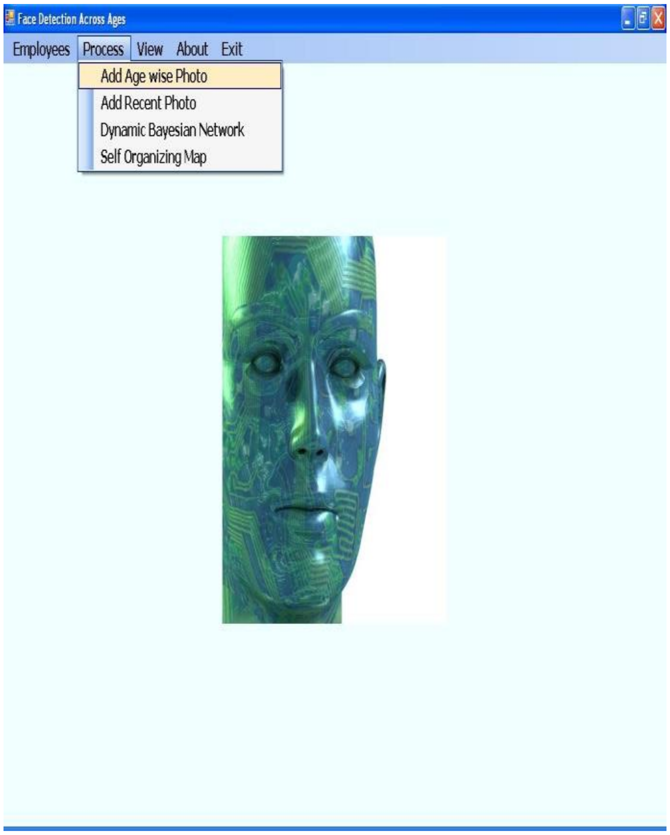
IV. ADVANTAGES OF THE PROPOSED SYSTEM

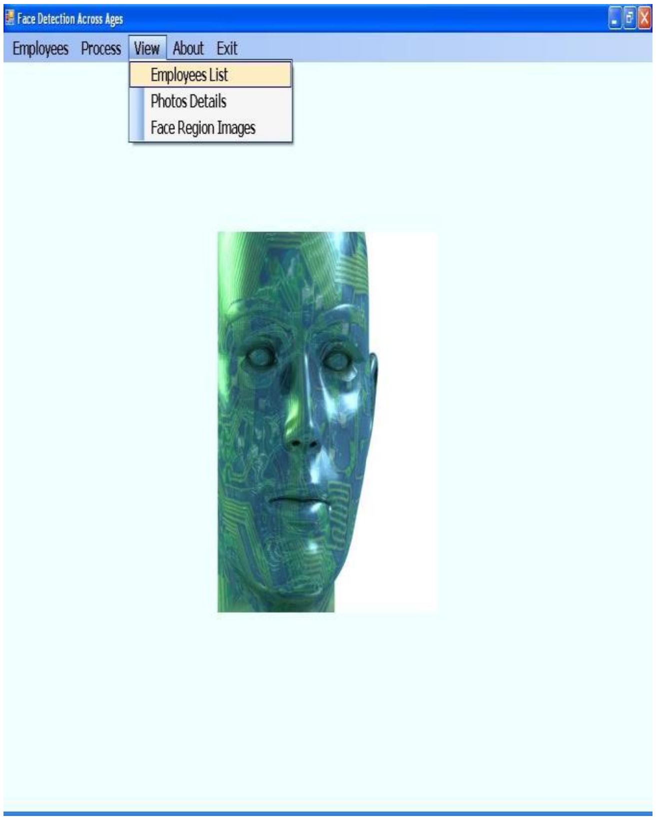
The following advantages are present in the proposed system.

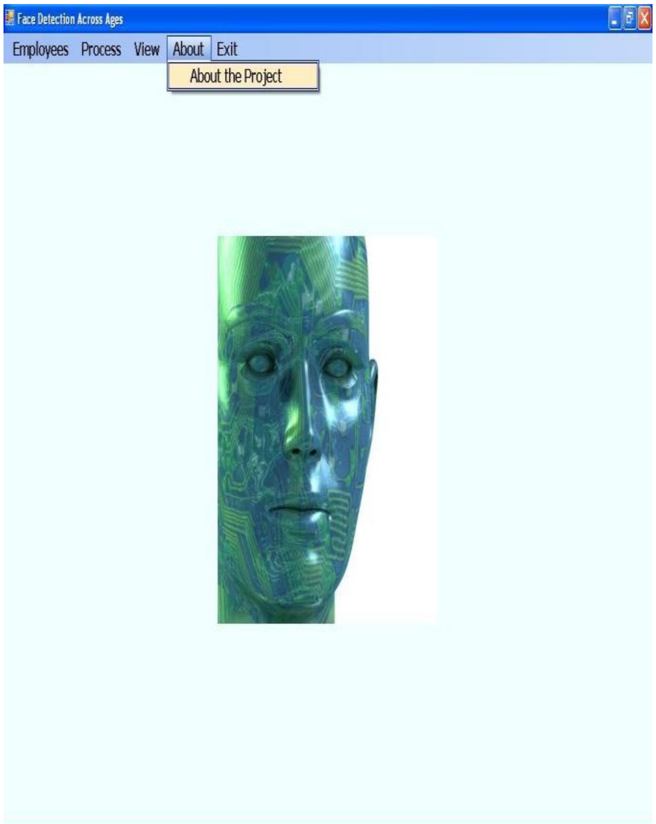
- Images with different resolution (A) and (B) collection can be collected and applied.
- Images can be given with different size across different ages.
- Dynamic constraint during training is considered. Hidden State sequences are maintained in (Self Organizing Map) network.

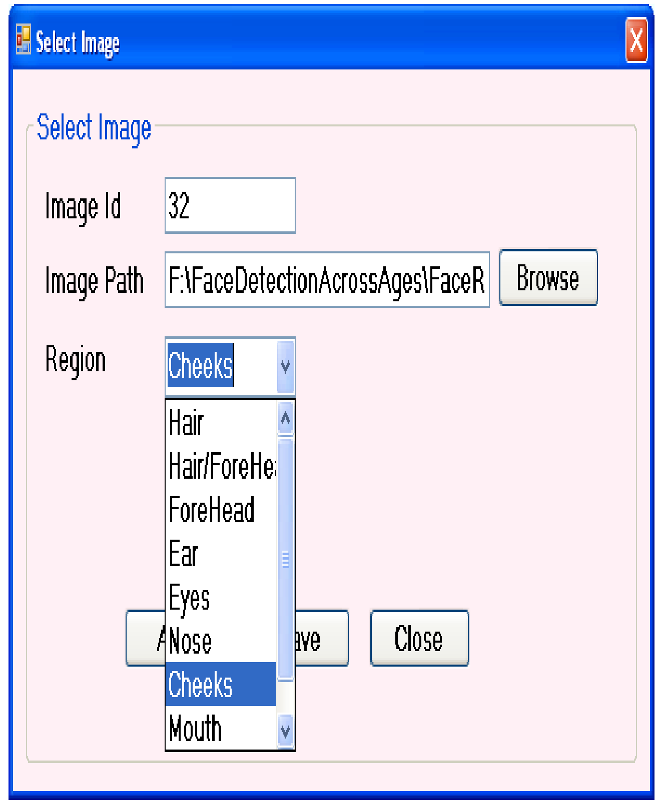
SCREENSHOTS








Face Detection Across Ages
Employees
Process
View
About
Exit
About the Project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Hair
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Eyes
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Cheeks
Mouth
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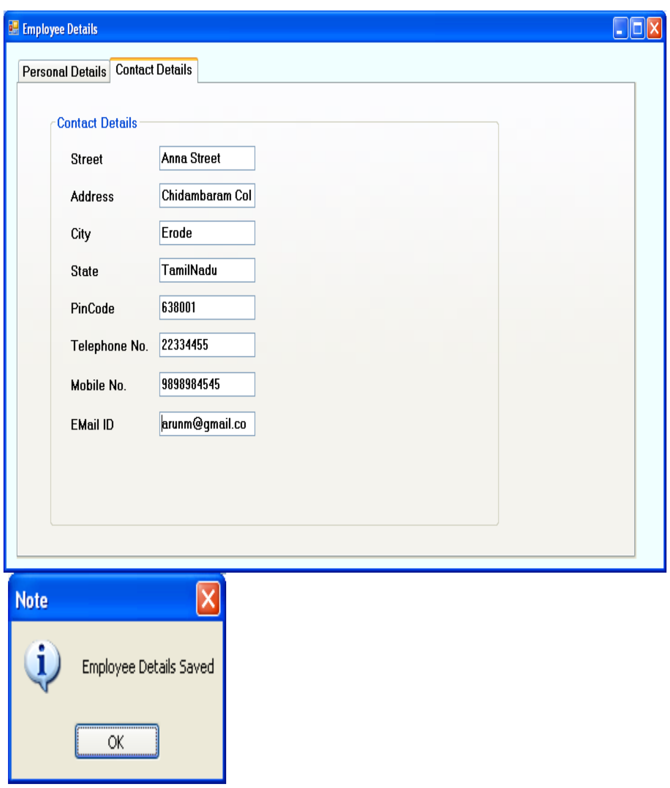
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Contact Details
Contact Details
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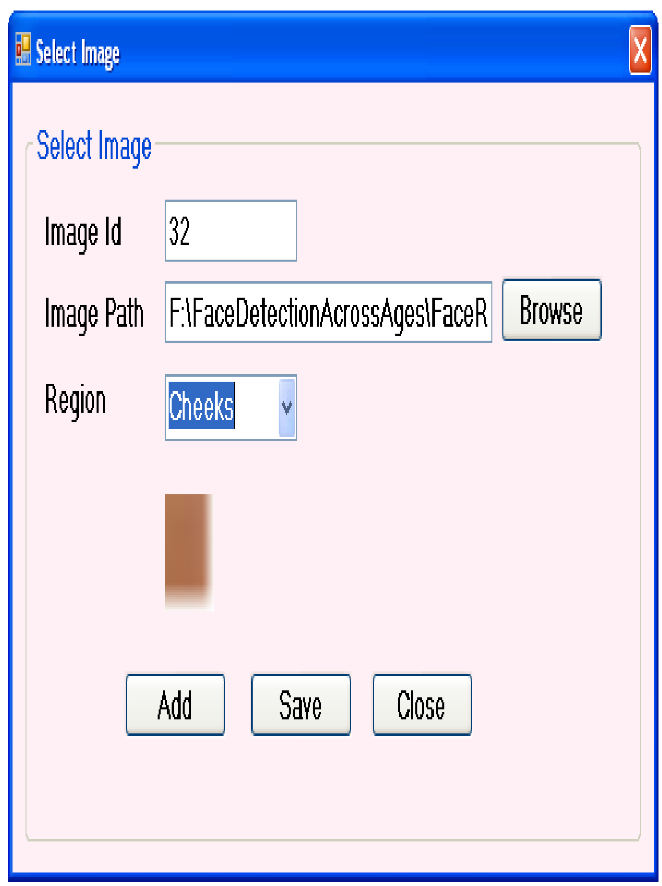
Address
Chidambaram Col
City
Erode
State
TamilNadu
PinCode
638001
Telephone No.
22334455
Mobile No.
9898984545
EMail ID
arunm@gmail.co
Note
Employee Details Saved
OK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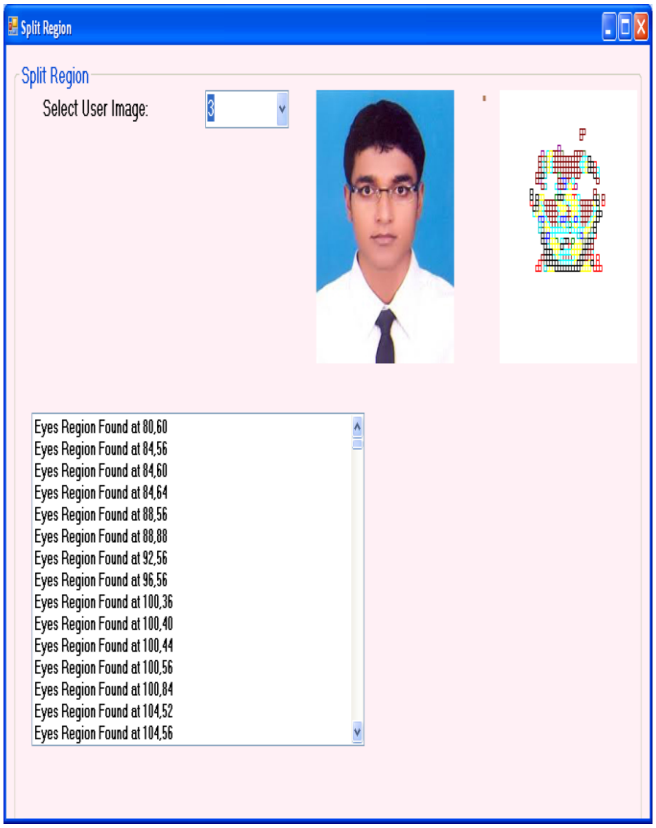
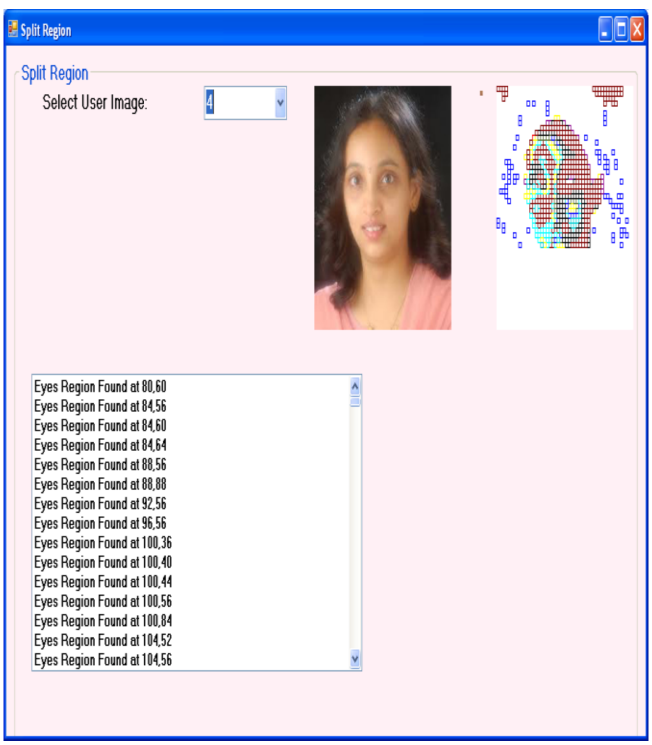

Split Region
Split Region
Select User Image:
3
Eyes Region Found at 80,60
Eyes Region Found at 84,56
Eyes Region Found at 84,60
Eyes Region Found at 84,64
Eyes Region Found at 88,56
Eyes Region Found at 88,88
Eyes Region Found at 92,56
Eyes Region Found at 96,56
Eyes Region Found at 100,36
Eyes Region Found at 100,40
Eyes Region Found at 100,44
Eyes Region Found at 100,56
Eyes Region Found at 100,84
Eyes Region Found at 104,52
Eyes Region Found at 104,56


Split Region
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Eyes Region Found at 104,52
Eyes Region Found at 104,56


Photo Details
Photo Details
Photo Details
S.No
11
Photo
Entry Time
13/03/2014
Employee Id
1
Name
Arun
Photo Path
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Age
40
Browse
Add
Update
Close


Photo Details
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Photo Details
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Photo
Entry Time
13/03/2014
Employee Id
1
Name
Arun
Photo Path
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Age
42
Browse
Add
Update
Close

V. CONCLUSION

This project studied photo comparison using DBN and Self-Organized Feature Maps. It is found that the application works well for images with different resolution

(A) and (B) collection can be collected and applied. In addition, images can be given with different size across different ages. Dynamic constraint during training is considered. Hidden State sequences are maintained in (Self Organizing Map) network.

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