

An Adaptive Neuro Fuzzy Inference based Smart Attendance System using Video Surveillance Camera

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Abstract The classroom attendance survey is a major factor to check the student's criteria to complete the course. Taking attendance by announcing the names or roll numbers to make presence count of a class is time consuming. As per the development in technology there are alternatives like face detection and fingerprint has developed. These developed system also is the time consuming one, the person have to go in front of fingerprint machine or camera and if there are too many people's then there is wait of queue. Due such process there is limitation that person have to be present in front of system. By considering this fact, such types of attendance systems are available in many of the organizations. To overcome above limitation, an ANFIS based smart attendance system using video camera is developed to take attendance of a student who is available in a classroom during class period. This system will take the record at the start time of class as well as end time of class. So that the professor will get an option to choose which time record it has to consider for academic presence.

Keywords — ANFIS, Attendance System, Face Detection, Face Recognition.

I. INTRODUCTION

The manual attendance system in most educational institutions are currently going on by calling students roll call numbers or spreading a sheet to make a sign of student who are present in class. The attendance of each student in accomplishment of successful course is important concern. The presence ratio of students will creates the motivation among the classroom for the teaching learning methods and can be able to create effective environment for informative teaching. The feedback of classroom can be consider under some parameters out the different parameters the attendance ratio of students is one of it, So taking attendance regularly in a course is most important parameter. The attendance once collected on sheet will have to update on existing system due to this either of the common ways as prefer to call names, roll numbers and put a mark of presence or absence or prefer to passing a paper signing sheet will cause a non technical methods are not an efficient way since they are time consuming and can be possibility to have mistakes as well as fraud.

The Detection and recognition of human face from sequences of video frames are challenging task as there are different variations are in background of each sequence of frames like gesture, facial expressions. Most of the face detection methods focus on detecting the frontal face of humanity and ignore other things like buildings, Trees and background in the image. Usually, the face detection and recognition methods were used for the security purpose only but nowadays these methods are used for many other applications.

The architecture and learning procedure underlying ANFIS (Adaptive Network based fuzzy inference system in presented, which is a fuzzy inference system implemented in the framework of adaptive networks by using a hybrid learning procedure the proposed ANFIS can construct an input – output mapping based on both human knowledge (In the form of fuzzy if then rules) and stimulated input-output data pairs. In the process of system, the Adaptive Neuro fuzzy inference system architecture is employed to model non linear function, identity, nonlinear component in control system, predict choric time series. This process control systems are often nonlinear and difficult to control accurately. A fuzzy controller that can be considered with artificial neural network is a hybrid combination to real time applications. An Artificial Neural Network (ANN) is combination of layers in which it learns by adjusting the interconnections of layers. Fuzzy Inference system (FIS) is a popular computing framework based on the concept of, fuzzy if-then rules, and fuzzy reasoning fuzzy set theory. A Neuro-fuzzy system is simply a fuzzy inference system trained by a neural network learning algorithm [1].

This paper represents the first part of Project as Face detection & Face Recognition only with proposed process of Second part.

II. THEORETICAL OVERVIEW

In this topic, the overall structure of ANFIS is discussed with its practical approach. All the techniques which are responsible for the efficient and effective operation of controller are discussed below.

A. What is ANFIS?

ANFIS stands for Adaptive Neuro Fuzzy Inference System. By giving an input and output data set, the toolbox function Adaptive Neuro fuzzy inference system constructs a fuzzy inference system (FIS) whose membership function parameters are tuned (adjusted) using either a back propagation algorithm or in hybrid algorithm [2].

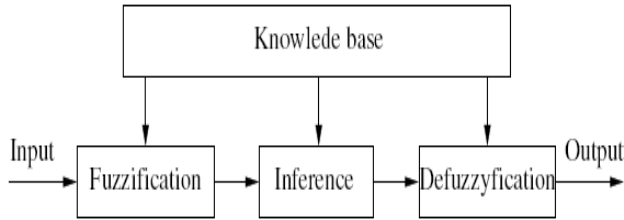


Fig. 1. Fuzzy Inference System

B. Block Diagram of ANFIS System

Below shown is the block diagram of ANFIS system. inputs are applied to the neural network after that the output of neural network is given to the fuzzy network which generates the rule base system so depending upon the rule base we can train the network, after training it generates the output for any set of input value.

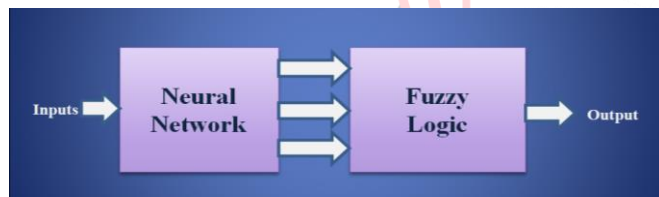


Fig. 2. Block Diagram of ANFIS System

C. Training Neural Network with Hybrid Algorithm

In the above figure of ANFIS there are feed forward model which comprises networks, in which the connections are strictly feed forward, i.e., no neuron receives input from a neuron to which the former sends its output. The model defines networks in which feedback connections are allowed, thus making the dynamical properties of a capital importance. In this work we will first see on the simpler model: the feed forward networks. To be precise, we will consider the so called multilayer perceptron (MLP), in which units are structured into ordered layers, and connections will be form only between adjacent layers in an input to output sense.

For any MLP, several parameters such as the number of layers and the number of units per layer should be defined. After this, the final step in the design is to adjust the weights of the network, so that it produces the desired output when the corresponding input is presented. Such process is known as training the weights of ANN. Network weights comprise both the previously mentioned connection weights, as well as a bias term for every unit. The latter can

be considered as the weight of a constant saturated input that the corresponding unit always receives. As initially stated, we will focus on the learning situation known as supervised training, in which a set of input/desired-output patterns is form. Thus, the artificial neural network has to be trained to produce the desired output. In use of supervised learning there is need of evaluation in which output error can be identified by comparing actual and expected output. A popular measure is the Squared Error Percentage (SEP) [3]. The error term can be optimizing for a set of pattern. At the last case, the SEP is nothing but an average value of patterns generated.

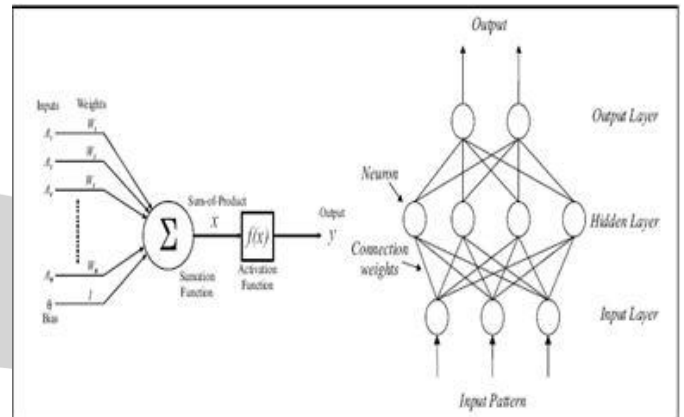


Fig. 3. An artificial neuron (left) and a multilayer perceptron (right)

III. METHODOLOGY

An ANFIS based smart attendance system helps to put attendance of the student when the face is recognized using surveillance camera. The existing attendance system has several limitations, so we propose the attendance system in such a way that it will remove the limitations of the existing system. The flow chart of proposed system is shown in Fig 5.

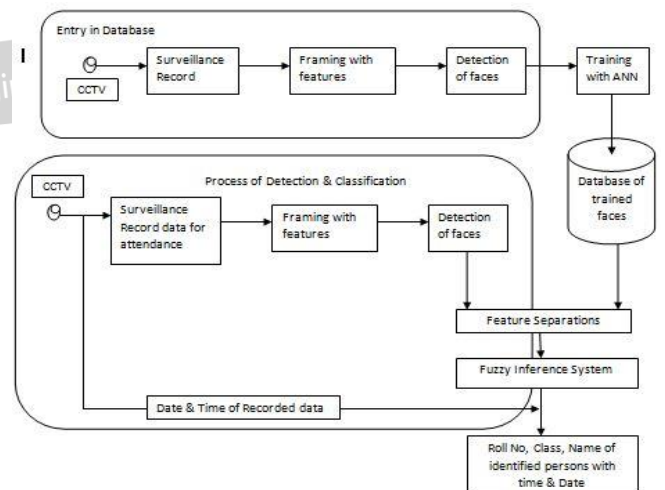


Fig. 4. Overview of the Proposed System

Flow of the proposed System

1. From the class room camera the Data of Video Surveillance can be collected.
2. Apply Adaboost Algorithm [Face Detection].
3. Extract the detected faces.

4. Perform pre-processing such as scaling, histogram equalization.
5. Convert into grey scale Faces with different orientation having dimension 24*24.
6. Before storing it will go through training methods of Artificial Neural Network.
7. After Training the data will be stored at Database.
8. Take live video surveillance data for recognition.
9. Apply classifier [Face Recognition].
10. Extract the features from detected faces.
11. Compare Features.
12. Put Student's Attendance based on recognised faces

Two main phases of the existing system are enrollment of students in the system and recognition of students and put attendance.

A. Student Enrollment:

The student enrollment process involves registration of student with the system. For registration process student need to come in front of the webcam of the laptop. At the time of registration, student's faces with different orientation are saved inside the database. In order to detect student faces, we used Face detection algorithm. As compared with other face detection algorithms available this method is much faster.

B. Video Surveillance:

Data we collect the data from a video surveillance camera.

C. Framing:

the purpose of framing is to remove frames from videos that don't have a human as an object in it. After applying framing it helps to reduce the time required to detect the human face as the frames containing only human objects are available.

D. Face Detection Algorithm:

The face detection of any person plays a vital role recognition system of face Human face detection plays an important role in face recognition system. Adaboost is an algorithm designed is used for face detection techniques. In AdaBoost each feature is applied on all the training images then the threshold value will identify for each features related with the face are classified in either of way as positive or negative. The errors or improper classification can be possible at the time of feature selection so, selection of feature will be only with minimum error rate. The adaboost algorithm is based on weights. The weights can be increased if the misclassification found. The weighting parameters under various situations can be verified as. a. Different face colours b. face colour noise c. Occlusion d. number of faces with different colours e. darkness condition f. lightning g. normal condition.

E. Database of Faces:

We store several photos of a human with different orientation inside the database. This database is used for the recognition of faces. The efficiency and accuracy of system depends on the way it has trained by the algorithm.

F. Student Recognition:

It is the process of identifying students from the database. To recognize the human face we extract the features from the faces that are available in the frames and compared that features with the features of faces present in a database.

G. Video Surveillance Data:

There are two ways to use the video surveillance data, we either uses live video from surveillance camera for recognition or we may use offline video which is already recorded and available somewhere in a system. The normal roll call attendance is a manual system by detecting the individual faces the same process will be done through digital processes such as Data collection, Framing, Detection, Training and extraction.

IV. NEURAL NETWORK TECHNIQUE

Storage can be classified with training methods. Before to store the database it is to be trained with different learning techniques then it will be classified and stored. A good demonstration for classification of face & nonface patterns is provided by 24 dimensional vectors So Back propagation algorithm is used to train the patters in both the system.

V. ADABOOST BASED TECHNIQUE

The face detection can be possible by collecting 500 faces and 9400 non faces of different scales. The adaboost technique is applied to make a good classifier by picking suitable position and scale values with scanning through image as any size greater than 24x24. If the result of scanning is positive then the report is face else it is a nonface report. The initial database is stored by training and classification techniques. When the attendance require through camera The frames from surveillance video camera is scanned through the database if the suitable weights found to be matched then it will collect the of featured person but if the frame contents done not matched with frames then the process will again reinitialized. If the frame still does not matched after repeated then the attendance of particular person cannot be identified and comes as nonface category found. The database is trained with propagation algorithms. When the actual frame weights are scanned and inferred by fuzzy system is found to be positive and then the roll number of positive inferred face is considered as presence of a person.

VI. RESULTS



Fig. 5. Simulation Gesture Recognition

The above fig 6 shows the simulation result for the gesture of head by webcam when the head turns left or right side then the notation of gesture will be identified and a notation will be shown on the top of the figure. When the head movement goes closer to cam then it shows as speed up and when head far away from cam the notation shows as speed down. If there is no movement of head then the notation is shown as stop.

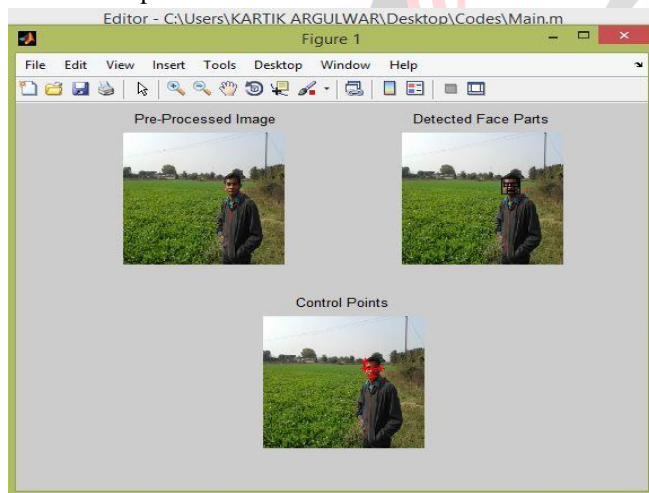


Fig. 6. Detection of control points.

The above fig 7 shows The simulation results are by generation of control points as well as command points by first image is pre processed, then the image is proceed through algorithm to detect the parts of face and finally the control points generated for the classification to estimate the result becomes face or unface.

VII. CONCLUSION

In smart monitoring attendance system with a video surveillance camera the head counts, gesture recognition and face detection are important parameters. The importance of gesture recognition is to make an efficient

interaction of human machine. In this paper we have provided a survey on gesture recognition with considering particular parameters like head gesture as well as facial marks which can be used for detection process of faces. A system is considered and called as smart monitoring attendance with the aim to make a smart attendance process so the required time by taking manual attendance can be saved as well as fraud of any process can be avoidable. The video surveillance camera will gives an exact count of attendees in a class by detecting head gesture motion as well as detection of faces with training by ANN and verified with feature extraction techniques with Fuzzy inference system which can give an accurate count in time saving manner.

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