AN INTELLIGENT TELEVISION REMOTE CONTROL BASED ON FACIAL EXPRESSION RECOGNITION

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ABSTRACT - In this modern era, Face recognition plays a vital role. This paper presents a facial expressions based technology that automates remote control of television. We introduce a framework which performs real time recognition of facial expression and automatically changes the television channel. The front end work is carried out by MATLAB software to process the image and the output from MATLAB is sent via serial communication and implemented in PROTEUS software for enabling the remote control. The implemented system aims to help the Working, Dump and Aged people which recognize the expressions and convert them into a desired data via Proteus and output is viewed through virtual terminal. The hardware setup is implemented using PIC Microcontroller. MATLAB software that process the image and the output from MATLAB is sent the TV channel data via UART communication. Then these channel data can be transmitted through TSOP.

The receiver hardware collects the channel information through RX LED. Then the data decoded by PIC Micro controller and it activates the corresponding TV Channel.

KEYWORDS: FACIAL EXPRESSION, UART COOMUNICATION, TSOP, PIC MICRO CONTROLLER.

1.INTRODUCTION

The area of human-computer interaction (HCI) will be much more effective if a computer is able to recognize the emotional state of human being. Emotional states have a greater effect on the face which can tell about mood of the person. So if we can recognize facial expressions, we will know something about the human's emotions and mood. The objective of this research is to develop Automatic Facial Expression Recognition System which can take human facial images containing some expression as input and recognize and classify it into appropriate expression class such as **HAPPY or SAD or ANGRY**.

This research focuses on the investigation of computer vision techniques designed to increase both the recognition accuracy and computational efficiency by applying some modifications in terms of face localization, feature extraction and classification algorithms and hence arriving at a simpler approach to perform facial expression recognition and classification.

2.CONVENTIONAL METHOD

There is only one training sample, it is difficult to predict facial variations such as illumination, disguise, etc. with traditional method. In addition, as for lacking training sample, it is also impossible to use DL method.

2.1 Introduction:

In recent years, lots of methods have been proposed to solve this problem. But most of these methods are traditional method. Generally speaking, these methods can be divided into four methods: expanding training sample method, generic learning method, patch based method and extracting multi-scale descriptors method. Expanding training sample method is to expand sample using some special measures such as photometric transform and geometric distortion, perturbation based method and so on.

Generic learning method is based on the fact that facial variations can be shared across different persons and with the help of an extra face database to learn similar facial variations. Patch based method extracts features on several face patches respectively, then does classification. Extracting multi-scale descriptors method uses different filters to extract facial features, then does classification.

To address the SSPP FR problem, many attempts have been made in the literature, which can be roughly classified into two categories. Patch-based methods and generic learning methods. For patch-based methods, each face sample in the biometric enrolment database is first partitioned into several local patches. Then, these patches will be treated as independent samples for feature extraction and recognition.

However, local feature extraction and discriminative learning from partitioned patches can be sensitive to image variations.s. However, this condition is not satisfied when these samples are contaminated by nuisance facial variations in the wild such as varied expressions, poor lightings and disguises.

2.2 Block Diagram:

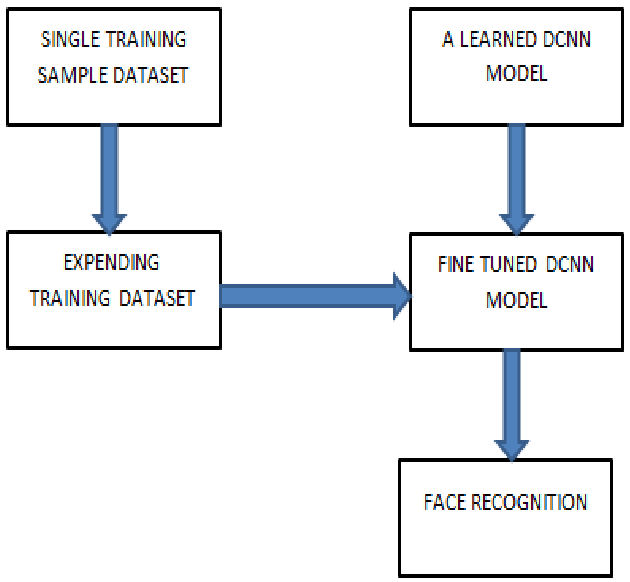

Fig 2.1 Frame work for the Existing Method

2.3 Block Diagram Explanation:

For variation dictionary learning, we first decompose each sample in the auxiliary generic set into different components via representation bases learning and sparse coding. Considering that generic samples are often of high-dimensionality and thus the related optimization problem would be time-consuming, we then develop an equivalent low rank factorization-based optimization problem and solve it efficiently. Subsequently, we leverage the Fisher information in the generic set to regroup the components with relatively low discriminative ability into a less discriminative part(LDP), to learn the intra-subject variation dictionary.

For prototype learning, we first detect the possible contaminated samples from the biometric enrolment database. Then, we leverage the learned representation bases to sparsely decompose them, and reuse Fisher information to regroup the components with relatively high discriminative ability into a more discriminative part (MDP), which separates the nuisance variations from the contaminated samples. In doing so, we can preserve the subject-specific portions of these contaminated samples and thus learn better prototypes. Furthermore, for the rest standard samples in the biometric enrolment database, we directly leverage them as the learned prototypes.

3.PROPOSED SYSTEM

Mean and Median filter are normally used to reduce noise present in an image and for preserving useful detail in the image. Adaptive filtering is more selective which helps for preserving edges and other high frequency parts of an image. Once the noise from an image has been removed the image is sent to the SVM trainer for identification of faces.

The performance of human face detection such as Knowledge based method has been proposed. This method is based on finding invariant features of a face within a complex environment, thereby generalizing the position of the face. Relationships among the features of the face fully help in determining whether a human face appears in an image or not. In different approaches invariant features, unresponsive to different positions, brightness and viewpoints are utilized to detect human faces. A statistical model is usually created for describing the relations among face features and the presence of the detected faces. Such face features, for instance are facial features, texture, and skin color.

In appearance-based method a series of face images to train a model for the face detection are employed. Various famous algorithms such as Eigen face Neural Network, and Hidden Markov Model establish the basic building block for this method. In most real-time systems the feature-based approach combined with various kinds of fast face candidate extraction methods is taken into account.

These algorithms can be integrated into a two-stage framework. In the first stage, regions that may contain a face are marked. This stage mainly pays attention to face candidates. In the second stage, the possible regions, or face candidates are sent to a "face verifier", which will give a result whether the candidates are real faces. Different methods give importance on different stages. Again if the face verifier is powerful enough to distinguish between various face and non-face patterns in almost all cases, the candidate's selection step may be omitted.

In this case, the algorithm can move through the image from left to right, and from top to bottom, treat each subregion in the image as a face candidate. On the other hand, if most non-face regions are omitted in the first stage and all faces are selected, the verifier for the face detection can be dramatically simplified or even eliminated.

3.1 PROPOSED FLOW CHART

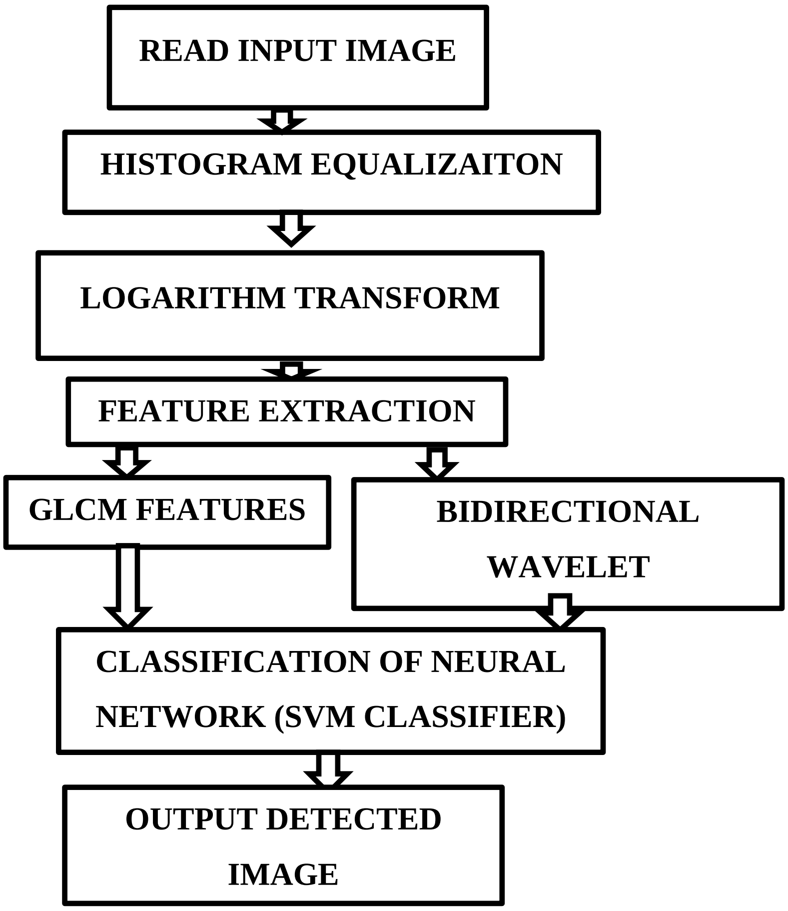

Fig 3.1 Proposed Flowchart

3.2 PROPOSED BLOCK DIAGRAM

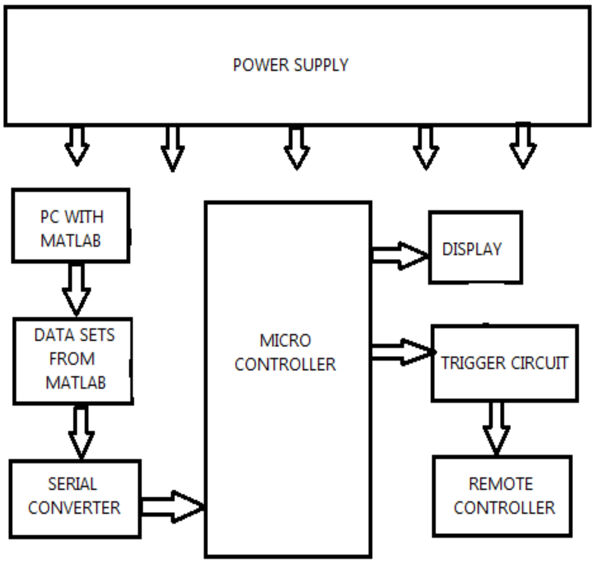

Fig 3.2 Proposed Block Diagram

3.3 PROPOSED BLOCK DIAGRAM EXPLANATION

Noisy image is given as input to remove the noise using adaptive median filter. SVM classifier is used to extract the useful information in filtered image and it gives the information about the image is SAD , HAPPY or ANGRY.Neural Network is implemented in this concept to achieve the accuracy. Once the output is received from SVM classifier using MATLAB we will get some serial data as 1 or 2. Then the serial converter is used to transfer the data from MATLAB to the Remote control using PROTEUS software.

3.4 INTERFACING PROTEUS WITH MATLAB

Proteus software has lack of sensor. So if we done Interfacing Proteus with Matlab then we can easily introduce all blocks of matlab as a input or output device for microcontroller.

For Interfacing Proteus with Matlab, we need support additional software (Virtual serial Ports Emulator) for making virtual com port. We have to making pairing between the ports which are used to interfacing Proteus with Matlab. So it is now clear that we can connect matlab with Proteus by serial Port. In bellow block diagram shows how it possible.

Fig 3.3 Interfacing Proteus with Matlab

For sending data form Matlab via serial port, we should define the com port and send the data through that. The following matlab code is for sending data through serial port.

```
clear all
s = serial('COM1','BaudRate',9600);
fopen(s);
fprintf(s,'%s','1');
fclose(s);
clear s
```

3.5 SIMULATION AND RESULT:

3.5.1 MATLAB OUTPUT SCREENSHOT

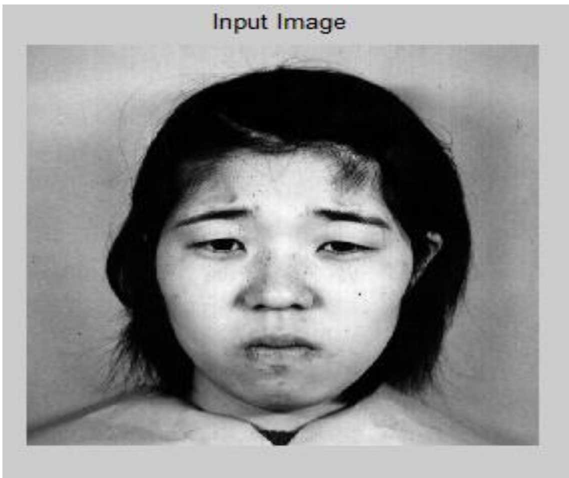

Fig 3.4 Input Image

Fig 3.4 is the input image given to the Matlab software. Fig 3.5, 3.6 and 3.7 gives the output of Histogram Equalization Image, Gamma and Intensity Adjustment as well as the Edge detection and SVM Generation based upon the proposed concept.

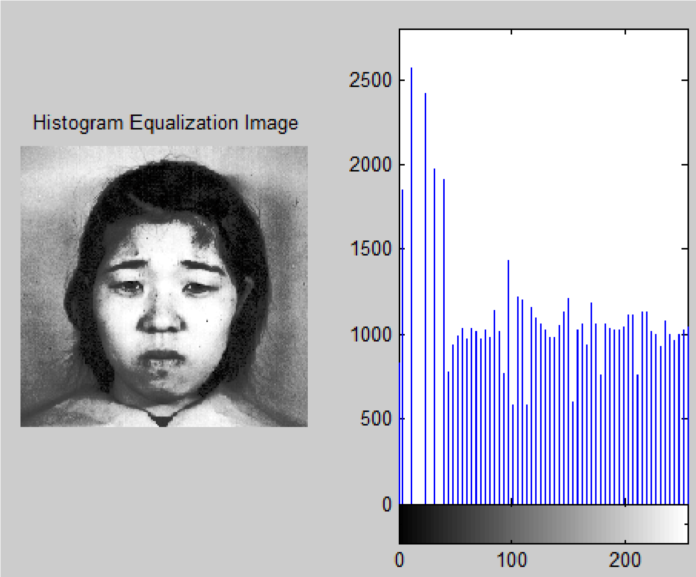

Fig 3.5 Histogram Equalization Image

Fig 3.7 Edge detection and SVM Generation

Fig 3.6 **Gamma and Intensity Adjustment**

3.5.2 FULL PROTEUS SIMULATION MODEL:

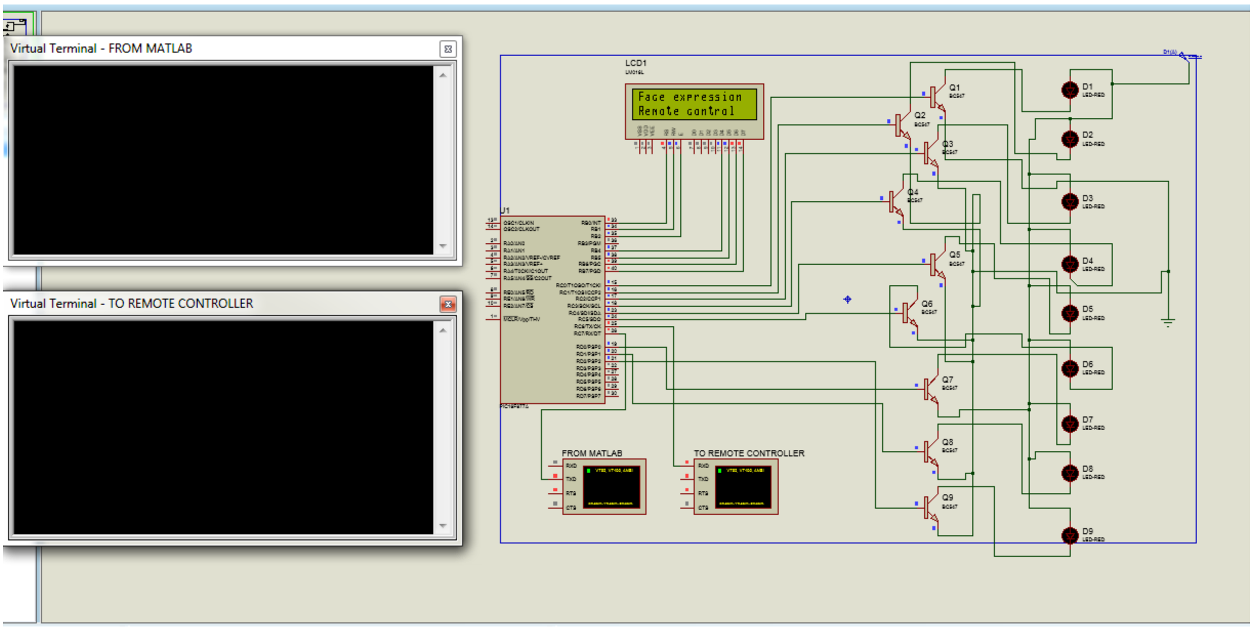

Fig 3.8 Proteus simulation Model

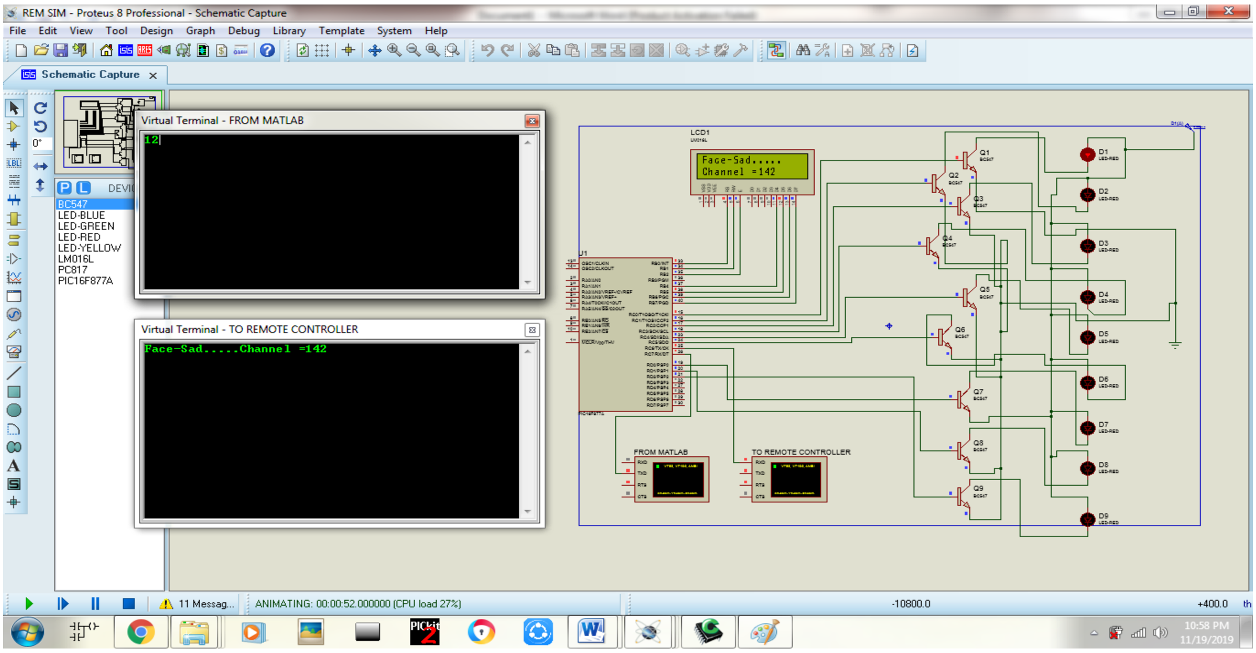

Fig 3.9 Simulation Result

Figure 3.8 and 3.9 shows the result received from Matlab software in the virtual terminal and based upon the facial expression the channel number automatically changes. If the face feels happy one channel number is changed or if the face is sad automatically some other channel is changed.

4. HARDWARE SETUP

The proposed system Hardware consists of two sections such as Transmitter and Receiver Section.

4.1 Transmitter and Receiver Section:

Transmitter has a PIC16F877A Microcontroller board and a IR LED. The Microcontroller collects the information or data from Matlab Software through a Serial communication. Then the Infrared LED transmits the data to the receiver side.

Fig 4.1 shows the receiver section consists of the power supply TSOP, PIC Microcontroller and LCD Display. The IR Led transmits the data to the TSOP in receiver section. The TSOP sends the data to the PIC Microcontroller and based upon the datas the LED glows as well as the channel is displayed in the LCD.

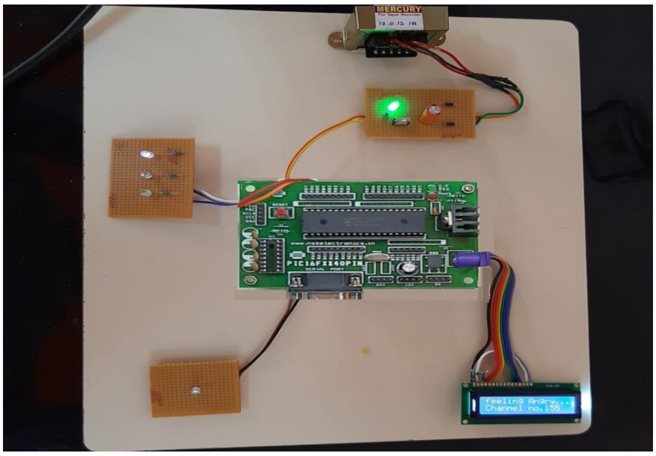

Fig 4.1 Hardware Setup

All the above mentioned automation work is implemented with the help of Embedded C coding using MPLAB IDE environment.

Fig 4.2 Hardware Output

CONCLUSION

Facial expression recognition is used in more and more applications. In this study, the suggested approach for television remote control based on processing of expression recognition is realized. The capture of face expression is accurately achieved by using Neural networks. It is concluded that this system work is depending on the MATLAB and PROTEUS software and hardware setup is implemented using the PIC16F877A Microcontroller and TSOP.

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