REAL TIME HUMAN EMOTION RECOGNITION

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Abstract: **Today, due to various factors, particularly, as social media sharing increases, the instant emotional states of the people, in particular, students, change frequently. This situation is greatly affecting the learning process and mental states as well as the motivation of the people in large in the society. Sometimes, it is not optimized or possible for the monitor to observe the emotional states of a group of people at once. Therefore, an automatic system is needed that can detect and analyze the emotional states of students in the classroom. In this study, an auxiliary information system, which uses image processing and human-computer interaction, has been developed that would be used in the field of education, medicine and so on. In this system, the dataset obtained from the peoples' faces was tested using appropriate machine. As a result, the accuracy of this system was found to be significantly accurate using Support Vector Machine. This system is aimed to direct the educator or the monitor to communicate with the students, patients or in general, a group of people in order to recognize their emotions and take appropriate actions if and when necessary.**

Index Term- Face detection, LBPH, Support vector Machine, Emotion recognition.

I. INTRODUCTION

In present day technology human-machine interaction is growing in demand and machine needs to understand human gestures and emotions. If machine can identify human emotion, it can understand human behaviour better, thus improving the task efficiency. It can serve as a vital measurement tool for behavioural science and socially intelligent software can be developed which can be used for robot intelligent software can be developed which can be used for robots. Emotions are the strong feelings which are govern by the surroundings and play a great role in daily task like decision making, learning, attention, motivation, coping, perception, planning, cognition, reasoning and many more, which leads to emotion recognition a big research field. Emotion recognition can be done by text, vocal, verbal and facial expression. In 1968, Albert Mehrabian pointed out that in human to human interaction 7% of communication is contributed by verbal cues, 38% is contributed by vocal cues and major portion 55% is contributed by facial expressions. So, facial expression analysis is one of the most important components for emotion recognition. In the existing systems facial emotion recognition from 2D images is well studied field but lack of real-time method that estimates features even low quality images. Most of the works are based on frontal view images of the faces. Where they failed to give results for non-frontal view images which are not uniform. And also the existing systems uses algorithm for skin colour detection, noise distribution which is increases the system complexity and they merge the two or three algorithm to increases the efficiency. But also increases the complexity in computation and in computational time. The existing systems failed to give the accuracy of the emotion of the person or student correctly where it misleads. And hence existing system limitations are: Time complexity, accuracy, redundancy, static.Use symmetric pattern algorithm for detecting the symmetric pattern's in face. And use dihedral groups for classifying the real emotions. Using action units we find the emotions [1]. EPCA: Extrac the facial expression Robust feature extraction. LRC: It is a classifier. It is Predictive Analysis[2].Viola-Jones algorithm used in extracting features, and facial component detection[4]-[7].Finally experimental results of the application with respect to other works in the scientific literature, the methodology we propose in this project can be used in the real uncertainty world.

II. Motivation

Most of the project on emotion analysis is not real-time entity. Their analysis are based on frontal images which are static in nature and are limited, however, are not fully considered subject-independent dynamic features, so they are not robust enough for real life recognition tasks with subject (human face) variation, head movement and illumination change. And many students suffer from stress, depression due to their personal or academic activities. Coren and Russel stated that each emotion is having the property of stereo-scope-perceptual conflict. So establishing an effective automatic emotion recognition framework is a very challenging task. This motivated to accomplish in establishing the real time application in identifying the student's emotions.

III. METHODOLOGY

When the emotion has been detected using the video modality. The system pre-process the video input by extracting frames from the input video. Frames are extracted from the video at a fixed rate. These frames are treated as static images and expressions for each of the frames are then computed. For emotion detection, there are five steps involved: Face Detection: It involves removal of unwanted data. The face-only region is detected using a face detection algorithm. The algorithm used here is Viola Jones algorithm .Feature Extraction: There are three axes considered for facial recognition namely symmetric axis, mouth axis and eye axis. With the help of them, 21 control points are located which are responsible for controlling the facial expressions and expressing all emotions. To detect the edge of the face, Canny Edge algorithm is used. Feature Vector Generation: After calculating the control points of a face, the 21 distance vectors are formed by finding the distances between particular points which are basically the end points of a single linear muscle. Feature vectors are then classified with the help of support vector machine (SVM) or Adaboost or

KNA classifier and classify into 3 emotions i.e. happy, sad and angry. And at last by extracting the feature of each individual using video modality and taking the average results of the students in classroom. Intimate to the HOD or Teacher of the class about the students' behaviour, So that the head can make change over to his students present in classroom. The Proposed system is used to overcome the problem faced in the existing system.In the proposed method we use three steps face detection using Haar cascade/Viola-Jones, features extraction using Active shape Model(ASM), (26 facial points extracted) and Ada boost classifier for classification of four emotions anger, sad, happiness and neutral. The novelty of our proposed method lies in the implementation of emotion recognition at real time on using CCTV camera's or digital camera and an average accuracy of 97% is achieved at real time.

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IV. FEATURE DETECTION AND EXTRACTION

In our project we mainly focus on two parts one is face detection using Viola-Jones and secondly emotion recognition based on the features extracted using the LBPH algorithm, those features which extracted are is given to the supervised learning algorithm (SVM) to classify the emotion into a particular category.

Face Detection: The Viola–Jones object detection framework is the first object detection framework to provide competitive object detection rates in real-time. Although it can be trained to detect a variety of object classes, it was motivated primarily by the problem of face detection. The characteristics of Viola–Jones algorithm which make it a good detection algorithm are: Robust – very high detection rate (true-positive rate) & very low false-positive rate always. Real time – For practical applications at least 2 frames per second must be processed. Face detection only (not recognition) - The goal is to distinguish faces from non-faces (detection is the first step in the recognition process).The algorithm has four stages: 1.Haar Feature Selection 2.Creating an Integral Image 3.Adaboost Training 4.Cascading Classifiers.

Haar Features: All human faces share some similar properties. These regularities may be matched using Haar Features. A few properties common to human faces:1. The eye region is darker than the upper-cheeks. 2.The nose bridge region is brighter than the eyes. Composition of properties forming match able facial features: Location and size: eyes, mouth, bridge of nose Value: oriented gradients of pixel intensities The four features matched by this algorithm are then sought in the image of a face (shown at right).Rectangle features: Value = Σ (pixels in black area) - Σ (pixels in white area) Three types: two-, three-, four-rectangles, Viola & Jones used two-rectangle features For example: the difference in brightness between the white &black rectangles over a specific area. Each feature is related to a special location in the sub-window an image representation called the integral image evaluates rectangular features in constant time, which gives them a considerable speed advantage over more sophisticated alternative features. Because each feature's rectangular area is always adjacent to at least one other rectangle, it follows that any two-rectangle feature can be computed in six array references, any three-rectangle feature in eight, and any four-rectangle feature in nine. The speed with which features may be evaluated does not adequately compensate for their number, however. For example, in a standard 24x24 pixel sub-window, there are a total of M = 162,336 possible features, and it would be prohibitively expensive to evaluate them all when testing an image. Thus, the object detection framework employs a variant of the learning algorithm AdaBoost to both select the best features and to train classifiers that use them. This algorithm constructs a "strong" classifier as a linear combination of weighted simple "weak" classifiers.

$$h_j(x) = \begin{cases} -s_j & \text{if } f_j < \theta_j \\ s_j & \text{otherwise} \end{cases}$$

The threshold value θ_j and the polarity $s_j \in \pm 1$ are determined in the training, as well as the coefficients α_j. Here a simplified version of the learning algorithm is reported:

Input: Set of N positive and negative training images with their labels (x^i, y^i). If image i is a face $y^i = 1$, if not $y^i = -1$.

1) Initialization: Assign a weight $w_1^i = \frac{1}{N}$ to each image i.

2) For each feature f_j with j=1,……,M

   a) Renormalize the weights such that they sum to one.

   b) Apply the feature to each image in the training set, then find the optimal threshold and polarity θ_j, s_j that minimizes the weighted classification error. That is $\theta_j, s_j = \arg\min_{\theta,s} \sum_{i=1}^{N} w_j^i \varepsilon_j^i$ where $\varepsilon_j^i = \begin{cases} 0 & \text{if } y^i = h_j(x^i, \theta_j, s_j) \\ 1 & \text{otherwise} \end{cases}$

   c) Assign a weight α_j to h_j that is inversely proportional to the error rate. In this way best classifier are considered more.

d) The weights for the next iteration, i.e. w^i_{j+1}, are reduced for the images I that were correctly classified.

3) Set the final classifier to $h(x) = \mathrm{sgn}\left(\sum_{j=1}^{M} \alpha_j h_j(x)\right)$

4) Cascade Architecture: On average only 0.01% of all sub-windows are positive (faces) Equal computation time is spent on all sub-windows Must spend most time only on potentially positive sub-windows. A simple 2-feature classifier can achieve almost 100% detection rate with 50% FP rate. That classifier can act as a 1st layer of a series to filter out most negative windows 2nd layer with 10 features can tackle "harder" negative-windows which survived the 1st layer, and so on… A cascade of gradually more complex classifiers achieves even better detection rates. The evaluation of the strong classifiers generated by the learning process can be done quickly, but it isn't fast enough to run in real-time. For this reason, the strong classifiers are arranged in a cascade in order of complexity, where each successive classifier is trained only on those selected samples which pass through the preceding classifiers. If at any stage in the cascade a classifier rejects the sub-window under inspection, no further processing is performed and continues on searching the next sub-window. The cascade therefore has the form of a degenerate tree. In the case of faces, the first classifier in the cascade – called the attention operator – uses only two features to achieve a false negative rate of approximately 0% and a false positive rate of 40%. The effect of this single classifier is to reduce by roughly half the number of times the entire cascade is evaluated. In cascading, each stage consists of a strong classifier. So all the features are grouped into several stages where each stage has certain number of features. The job of each stage is to determine whether a given sub-window is definitely not a face or may be a face. A given sub-window is immediately discarded as not a face if it fails in any of the stages. A simple framework for cascade training is given below:i)f = the maximum acceptable false positive rate per layer. ii)d = the minimum acceptable detection rate per layer.iii)F target = target overall false positive rate.iv) P = set of positive examples. v)N = set of negative examples. The cascade architecture has interesting implications for the performance of the individual classifiers. Because the activation of each classifier depends entirely on the behavior of its predecessor, the false positive rate for an entire cascade is

$F = \prod_{i=1}^{K} f_i$ Similarly, the detection rate is: $D = \prod_{i=1}^{K} d_i$.

Local Binary Pattern Histogram: **Local Binary Pattern** (LBP) is a simple yet very efficient texture operator which labels the pixels of an image by thresholding the neighborhood of each pixel and considers the result as a binary number. Using the LBP combined with histograms we can represent the face images with a simple data vector. As LBP is a visual descriptor it can also be used for face recognition tasks, as can be seen in the following step-by-step explanation.

Steps:

Now that we know a little more about face recognition and the LBPH, let's go further and see the steps of the algorithm: **Parameters**: the LBPH uses 4 parameters: i)Radius: the radius **is** used to build the circular local binary pattern and represents the radius around the central pixel. It is usually set to 1. ii) Neighbors: the number of sample points to build the circular local binary pattern. Keep in mind: the more sample points you include, the higher the computational cost. It is usually set to 8. iv) Grid X: the number of cells in the horizontal direction. The more cells, the finer the grid, the higher the dimensionality of the resulting feature vector**.** It is usually set to 8. v) Grid Y**:** the number of cells in the vertical direction. The more cells, the finer the grid, the higher the dimensionality of the resulting feature vector. It is usually set to 8. Training the Algorithm: First, we need to train the algorithm. To do so, we need to use a dataset with the facial images of the people we want to recognize. We need to also set an ID (it may be a number or the name of the person) for each image, so the algorithm will use this information to recognize an input image and give you an output. Images of the same person must have the same ID. With the training set already constructed, let's see the LBPH computational steps.

Applying the LBP operation**:** The first computational step of the LBPH is to create an intermediate image that describes the original image in a better way, by highlighting the facial characteristics. To do so, the algorithm uses a concept of a sliding window, based on the parameters radius and neighbors. The image shows this procedure:

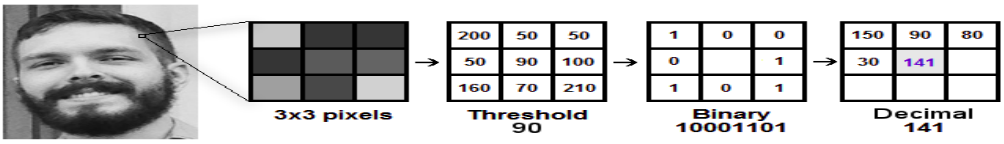

Figure 1: LBP operation

Based on the image above, let's break it into several small steps so we can understand it easily: 1) suppose we have a facial image in gray scale. 2) We can get part of this image as a window of 3x3 pixels. 3) It can also be represented as a 3x3 matrix containing the intensity of each pixel (0~255). 4) Then, we need to take the central value of the matrix to be used as the threshold. 5) This value will be used to define the new values from the 8 neighbors. 6) For each neighbor of the central value (threshold), we set a new binary value. We set 1 for values equal or higher than the threshold and 0 for values lower than the threshold. 7) Now, the matrix will contain only binary values (ignoring the central value). We need to concatenate each binary value from each position from the matrix line by line into a new binary value (e.g. 10001101). Note: some authors use other approaches to concatenate the binary values (e.g. clockwise direction), but the final result will be the same. 8) Then, we convert this binary value to a decimal value and set it to the central value of the matrix, which is actually a pixel from the original image. 9) At the end of this procedure (LBP procedure), we have a new image which represents better the characteristics of the original image. 10) Note**:** The LBP procedure was expanded to use a different number of radius and neighbors; it is called circular LBP.

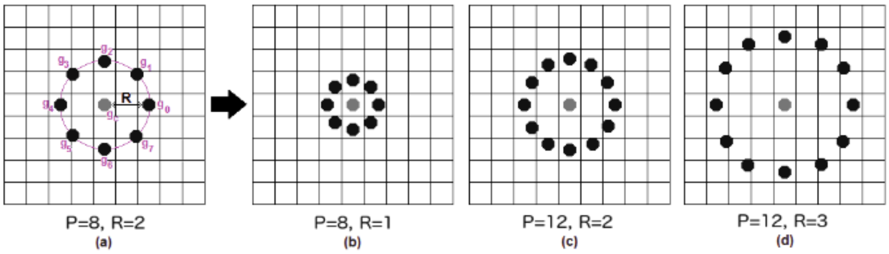

Figure 2: Circular LBP

It can be done by using bilinear interpolation. If some data point is between the pixels, it uses the values from the 4 nearest pixels (2x2) to estimate the value of the new data point. **Extracting the Histograms**: Now, using the image generated in the last step, we can use the Grid X and Grid Y parameters to divide the image into multiple grids, as can be seen in the following image:

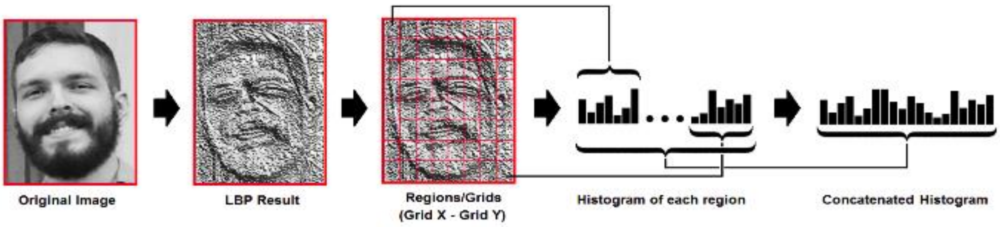

Figure 3: Extracting Histogram

Based on the image above, we can extract the histogram of each region as follow

As we have an image in gray scale, each histogram (from each grid) will contain only 256 positions (0~255) representing the occurrences of each pixel intensity.

Then, we need to concatenate each histogram to create a new and bigger histogram. Supposing we have 8x8 grids, we will have 8x8x256=16.384 positions in the final histogram. The final histogram represents the characteristics of the image original image. The LBPH algorithm is pretty much it.

Performing the face recognition**:** In this step, the algorithm is already trained. Each histogram created is used to represent each image from the training dataset. So, given an input image, we perform the steps again for this new image and create a histogram which represents the image. *So to find the image that matches the input image we just need to compare two histograms and return the image with the closest histogram. *We can use various approaches to compare the histograms (calculate the distance between two histograms). *So the algorithm output is the ID from the image with the closest histogram. The algorithm should also return the calculated distance, which can be used as a 'confidence' measurement. Note**:** don't be fooled about the 'confidence' name, as lower confidences are better because it means the distance between the two histograms is closer. *We can then use a threshold and the 'confidence' to automatically estimate if the algorithm has correctly recognized the image. We can assume that the algorithm has successfully recognized if the confidence is lower than the threshold defined. **Supervised Learning:** This deals with supervised machine learning algorithms, its advantages and disadvantages. Adaptive boosting, Support Vector Machines, and Artificial Neural Networks with Back propagation are the three supervised learning algorithms.
Machine Learning: Algorithms Types: Machine learning algorithms are organized into taxonomy, based on the desired outcome of the algorithm. Common algorithm types include:

1. Supervised learning: where the algorithm generates a function that maps inputs to desired outputs. One standard formulation of the supervised learning task is the classification problem: the learner is required to a function which maps a vector into one of several classes by looking at several input-output examples of the function.
2. Unsupervised learning: which models a set of inputs: labelled examples are not available.
3. Semi-supervised learning: This combines both labelled and unlabelled examples to generate an appropriate function or classifier.
4. Reinforcement learning**:** where the algorithm learns a policy of how to act given an observation of the world. Every action has some impact in the environment, and the environment provides feedback that guides the learning algorithm.
5. Transduction**:** similar to supervised learning, but does not explicitly construct a function: instead, tries to predict new outputs based on training inputs, training outputs, and new inputs.
6. Learning to learn: where the algorithm learns its own inductive bias based on previous experience. Supervised learning is fairly common in classification problems because the goal is often to get the computer to learn a classification system that we have created. More generally, classification learning is appropriate for any problem where deducing a classification is useful and the classification is easy to determine.

Support Vector Machine: Support Vector Machines (SVMs) classification is based on the idea of decision hyper planes that determine decision boundaries in input space or high dimensional feature space. It constructs linear functions (hyper planes either in input space or in feature space) from a set of labelled training dataset. This hyper plane will try to split the positive samples from the negative samples. The linear separator is commonly constructed with maximum distance from the hyper plane to the closest negative and positive samples. Intuitively, this causes correct classification for training data which is near, but not equal to the testing data. SVM represent the cutting edge of ranking algorithms and have been receiving special attention from the international scientific community throughout training phase SVM takes a data matrix as input data and labels each one of samples as either belonging to a given class (positive) or not (negative). It treats each sample in the matrix as a row in a input space or high dimensional feature space, where the number of attributes identifies the dimensionality of the space. SVM learning algorithm determines the best hyper plane which separates each positive and negative training sample. The trained SVM can be deployed to perform predictions about a test samples (new) in the class. Nonlinear problems in SVM are solved by mapping the *n*- dimensional input space into a high dimensional feature space.

Binary Classification: Binary SVM performs pattern recognition between two classes by finding a decision surface that has maximum distance to the closest point in the training set which are termed support vectors. Consider a training set,

$$T=\{(x_i, y_i)|x_i \in R^P, y_i \in (-1,1)\}_{i=1}^{n}$$

Where, y_i is either 1 or -1, indicating the class to which the point i x belongs. Each i x is a p-dimensional real vector. Figure 4.1 shows the classification between two classes using hyper planes.

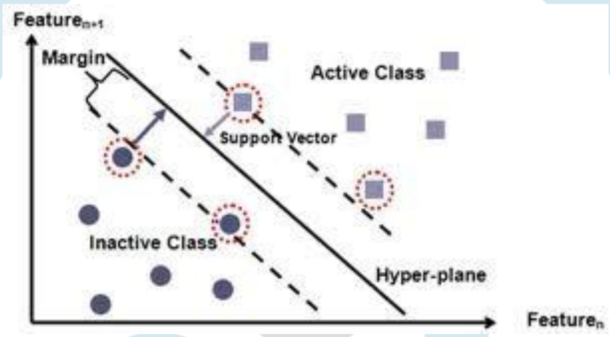

Figure 4: Binary Classification Using SVM

Multi Class Classification: There are two basic strategies for solving multiclass problems, say k-class, with SVMs: In One-Against-All (OAA) approach, M SVMs is trained. Each of the SVMs separates single class from all remaining classes. In One-Against-One (OAO) approach, M (M-1)/2 machines are trained. Each SVM separates a pair of classes. Thus one is by constructing several binary classifiers while the other is by directly considering all data in one optimization formulation. The Multiclass SVM is to construct a decision function given N samples: $(x_1, y_1) \dots (x_N, y_N)$ where xi =1...N is a vector of length n and y_1= {1,..., M} represents the class of the sample. The classical approach to solving Multiclass SVM classification problems is to consider the problem as a collection of binary classification problems. In OAA method, M classifiers are constructed one for each class. The m^{th} classifier constructs a hyper plane between class m and the M-1 remaining classes. A new test sample is allocated to the class that the distance from the margin in the positive direction is maximal. The decision boundary is given by below equation

$$f(x) = \arg\max_m [(w_m^T) + b_m]$$

Advantages of SVM: a. The computational complexity of SVMs does not depend on the dimensionality of the input space. b. SVM training always finds a global minimum, and their simple geometric interpretation provides fertile ground for further investigation. c. The SVM approach does not attempt to control model complexity by keeping the number of features small. d. In comparison with traditional multilayer percept on neural networks that suffer from the existence of multiple local minima solutions, convexity is an important and interesting property of nonlinear SVM classifiers.

V. SYSTEM DESIGN AND ANALYSIS

System Analysis: The process of studying a procedure or business in order to identify its goals and purposes and create systems and procedures that will achieve them in an efficient way. Another view sees system analysis as a problem-solving technique that breaks down a system into its component pieces for the purpose of the studying how well those component parts work and interact to accomplish their purpose. The field of system analysis relates closely to requirements analysis or to operations research. It is also an explicit formal inquiry carried out to help a decision maker identify a better course of action and make a better decision than she might otherwise have made.

System Design: Systems design is the process of defining the architecture, modules, interfaces, and data for a system to satisfy specified requirements. Systems design could be seen as the application of systems theory to product development. There is some overlap with the disciplines of systems analysis, systems architecture and systems engineering. The Purpose of this design document is to explore the logical view of architecture design, data flow diagrams, sequence diagram and an overview of the proposed system for performing the operations such as image capturing, face detection, feature extraction and emotion recognition, which when combined to give the desired output. The design activity module consist three outputs. i)Architecture design. ii)High level design. iii)Low level design. Architecture of the System: Architecture focuses on viewing of a system as a combination of various different components and how they interact with each other to produce the desired results. The focus is on identifying the components or sub-systems and how they are interconnected.

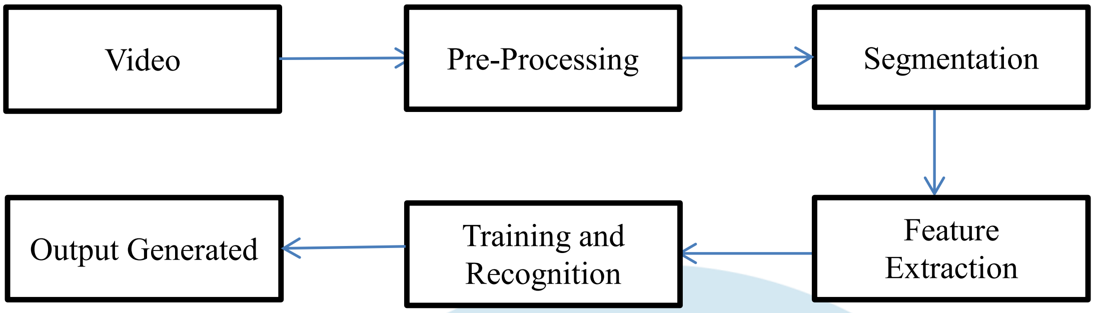

Figure5: System Architecture

In the high-level architecture of the proposed system, it is representing the user interaction with the system. Initially the system takes input video. Then all the processing is carried out inside the system. The system is responsible for processing video into image frames which are then pre-processed, then followed by segmentation. Accordingly, features are extracted, the system is trained to classify the emotions and finally, desired output is obtained.

Data Flow Diagram: DFD Level 0:The diagram below shows the level-0 data flow diagram of the system. Here, segmentation is the process of identifying the different components of the image. Segmentation involves operations such as boundary detection, differences and thresholding. Feature extraction starts from an initial set of measured data and builds derived values (features), intended to be informative and non-redundant, facilitating the subsequent learning and generalization steps. Feature extraction is related to dimensionality reduction. It involves reducing the amount of resources required to describe a large set of data. The selection of subset of initial features is called feature selection. Properly optimized feature extraction is the key to effective model construction. Then, Emotion is classified based on earlier training. The desired output is obtained and assigned to a different value.

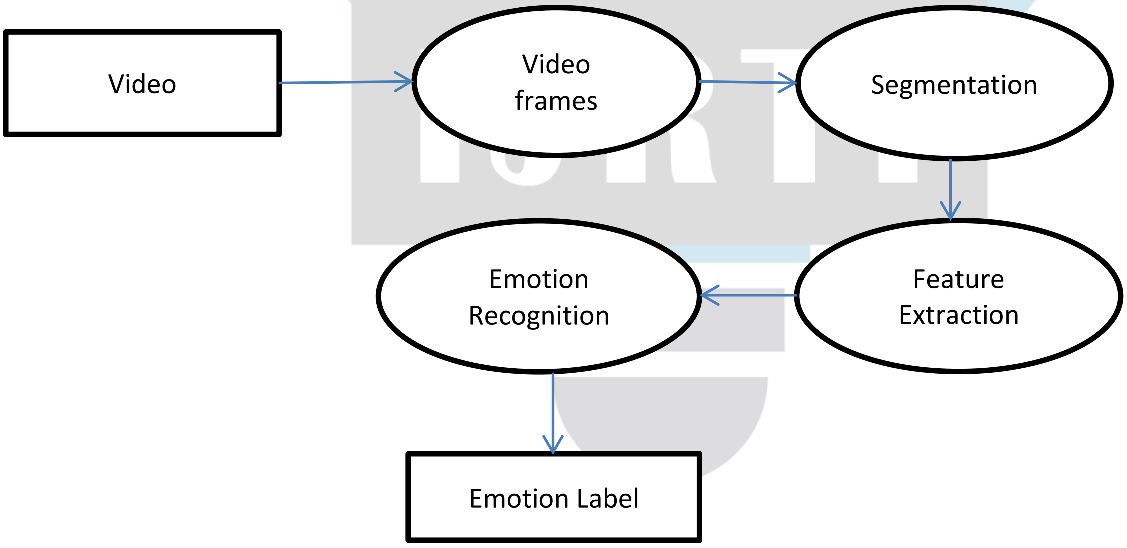

Figure6**:** Overall Diagram

DFD Level 1: The live video stream is taken and frames are extracted from the video. These frames are treated as individual images which are the inputs to the system. Boundary detection finds out edges in the image. Any differential operator can be used for boundary detection. Boundaries can be used in key vision tasks by investigating the integration of boundary information in segmentation and category recognition. Harr-Feature Extraction is been used for recognition of the face in the image. These Feature extraction a part of viola jones algorithm used for face detection with a in-built datasets. The image as been converted into gray-scale and using cascade classifier the images are classified, then the local binary pattern has been used to extract the facial features locally for each pixel of the image. Then using Supervised learning algorithm the extracted features are given as input then based on training dataset which as been trained earlier the testing image as been classified into group with a specific emotion label. Binary images are also called bi-level or two-level images. They often arise in digital image processing or are a result of operations such as segmentation, thresholding etc. Here, each pixel is stored as a single bit, i.e, 0 or 1. Binary images are produced from color images by segmentation. Edge detection also often creates a binary image with some pixels assigned to edge pixels and is also a first step in further segmentation. Subsequently, the local binary pattern feature vector is created and the 'histogram' is calculated. The histogram can be optionally normalized. Concatenating the histograms of all cells will give the feature vector for the entire window.

VI. EXPERIMENTS AND RESULTS

Testing is the process of evaluating a system or its components with the intent to find that whether it satisfies the specific requirement or not. This activity results in actual, expected and the difference between their results. In simple words testing is executing a system in order to identify any gaps, errors or missing requirements in contrary to the actual desire or requirements. System testing ensures that the entire integrated software system meets requirements. It tests a configuration to ensure known and predictable results. An example of system testing is the configuration oriented system integration test. System testing is based on process descriptions and flows, emphasizing pre-driven process links and integration points. System testing is so important because of following reasons: System testing is the first step in the Software Development Life Cycle, where the application is tested as a whole. The application is tested thoroughly to verify that it meets the functional and technical specifications. The application is tested in an environment which is very close to the production environment where the application will be deployed. System testing enables us to test, verify and validate both the business requirements as well as the Application Architecture. Features to be tested Verify that the entries are of the correct format No duplicate entries should be allowed All links should take the user to the correct page, key functions, or special test cases. In addition, systematic coverage pertaining to identify Business process flows; data fields, predefined processes, and successive processes must be considered for testing. Before functional testing is complete, additional tests are identified and the effective value of current

CONFUSION MATRIX SHOWING ACCURACY OF PROPOSED METHOD:

	HAPPY	SAD	ANGRY
HAPPY	100%		
SAD		80%	
ANGRY		20%	90%
RECOGNITION ACCURACY	100%	80%	90%

RESULT EVALUATION OF THE PROPOSED METHOD

NO. Face features in DB	Accuracy of face detection	Accuracy of emotion detection	Average Accuracy
80	95%	75%	85%
160	96%	80%	88%
320	96%	90%	93%

COMPARISION OF RESUKTS WITH EXISTING SYSTEM

Technique used	Dataset	Accuracy
Eigen faces with SVM	JAFFE	85%
Eigen faces with SVM	Collected Dataset	88%
LBPH with SVM	JAFFE	88%
LBPH WITH SVM	Collected Dataset	90%

VII. FUTURE WORK

This automated framework for emotion detection can be made significantly more efficient by improving the pattern classifiers by which it will be possible to handle more accurately the emotion of new faces to which class of emotion-cluster that will belong. However, it will be very fascinating if it is contemplated by considering both the auditory & visual information and some more attributes like EEG signal, facial color etc. together, for processing with the expectation that this kind of multi-modal information processing will become a datum of information processing in future multimedia era. Also, it may be a significant boost to improve the accuracy by taking the principal component of each individual portion of the face like eye, nose, lips, forehead, cheek etc. and then compare with the experimented images. Also, in future, this project which is implemented in the basic level, can be enhanced to be more complex, differentiating complex emotions which can be highly useful in the detection of fake emotions, depression tracking, medical diagnosis and many other critical applications.

VIII. CONCLUSION

The novelty of the proposed method lies in the implementation of emotion recognition at real time on using CCTV camera's or digital camera and an average accuracy of nearly 97% is achieved at real time.In the proposed method, the objective is to develop real time emotion recognition from facial images to recognize basic emotions like anger, disgust, happiness and neutral. The face detection method and the smile detection method embeds an algorithm called Viola-Jones algorithm and feature extraction is done using the local binary patterns histograms method. For the comparison purpose, another existing method called the method of Eigen faces is used for feature recognition which also produces significantly accurate results. The monitor who monitors the emotion status of a group of people is now able to obtain the average total emotion of the group of people for various purposes.

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