RESEARCH ARTICLE OPEN ACCESS

Recognizing Face Emotion of Down Syndrome Children using Viola Jone Technique

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ABSTRACT
Down Syndrome (Trisomy 21) is a hereditary issue, individuals influenced by this infection having quite certain facial qualities that emerge from a hereditary anomaly, whereby an individual has three duplicates of chromosome 21 rather than two. It happens in around one for every 1,000 infants brought into the world every year. It has diverse facial side effects. Kids with Down Syndrome commonly have particular facial attributes, which brings an open door for the Computer-helped recognition of Down Syndrome utilizing photos of patients. This Project adjust an activity intended to achieve a long haul period or by and large objective essentially dependent on some outstanding face acknowledgment techniques to perceive the feelings of the Down Syndrome kid. The capacity to perceive Down Syndrome facial feelings is critical for parent relationship and social modification. To be sure, past research including kids and youths demonstrated that exact acknowledgment of down Syndrome is related with higher social and scholarly capability, and with less externalizing and disguising practices; (for a meta-analysis).The results of this venture exhibit that system could aid Down Syndrome screening viably in a basic, non-obtrusive way. Down Syndrome centers around approaches to build access to therapeutic consideration and to expand future and insinuating to the comparing guardians through SMS.

Keywords :— Down syndrome children, Face Detection, Viola Jone technique

I. INTRODUCTION

Feelings are every one of those emotions that change Down Syndrome Children as to influence their decisions, and that are likewise gone to by torment or joy. Feeling is in reality a heterogeneous classification that incorporates a wide assortment of essential mental wonders. A feeling may have articulated physical backups, for example, an outward appearance, or it might be undetectable to eyewitnesses. A feeling might be significant, as in it is fundamental to Down Syndrome Child's physical survival or psychological wellness, or it might be unimportant or broken. Feelings normally intervene and encourage collaborations among people. In this way, understanding feeling regularly brings setting to apparently odd and additionally complex social correspondence. Enthusiastic Computing means to empower machines to perceive and orchestrate human feelings. As we as a whole know, a difference in client's feeling is one of the establishments of correspondence. Enthusiastic states can propel human's activities, and can likewise enhance the importance of correspondence. Feeling can be perceived through an assortment of methods.

Nonetheless, the simpler, increasingly functional technique is to analyze outward appearances. There are seven sorts of human feelings appeared to be all around unmistakable crosswise over various societies: outrage, sicken, dread, bliss, bitterness, shock, hatred. Such headway could acquire applications medication, promoting and excitement. Strangely, notwithstanding for complex articulations where a blend of feelings could be utilized as descriptors, culturally diverse understanding is as yet watched. In this way an utility that recognizes feeling from outward appearances would be broadly relevant. The point of the proposed undertaking is to perceive the outward appearance of the Down disorder kid utilizing MATLAB. The capacity to perceive passionate outward appearances is essential for regular relational connections and for social modification. Most uses of feeling acknowledgment look at static pictures of outward appearances.

It very well may be finished by first removing the face from a static picture and another route by separating a picture from a web-cam. The marker focuses (position of eyes, eyebrows, eyelids, lips) were utilized to assemble an element vector (separate between the focuses and point between them).

The vast majority of the related work is devoted to the depiction of the feeling acknowledgment calculations. A difficult issue of a programmed acknowledgment of the human face has turned into an exploration field, including an ever increasing number of researchers spend significant time in various territories, for example, a man-made brainpower, PC vision, brain research and physiology and so on.

Objective

The primary goal is assessing of Down Syndrome tyke conduct and afterward giving the likelihood to present a measurement about the viability of the tyke inclination in the homeroom and in the home with hireling house cleaner. The

work centers on the fundamental feeling acknowledgment abilities through face picture. Face Recognition ends up a standout amongst the most biometrics confirmation methods from the previous couple of years. Face acknowledgment is a fascinating and fruitful utilization of Pattern acknowledgment and Image investigation. Target of this work centers around present facial feeling acknowledgment of kid that consequently distinguishes all tracks the Down Syndrome youngster face and after that perceive feeling by utilizing Viola-Jones Techniques.

Existing System

Existing frameworks are extremely mind boggling as far as time and memory prerequisites for extricating facial highlights continuously. Undoubtedly, past research including Down Syndrome kids and youths demonstrated that exact acknowledgment of feelings is related with higher social and scholarly capability, and with less externalizing and disguising practices; (for a meta-examination).

In view of the current enthusiastic state and conduct of a client, existing frameworks have a lesser precision. Some current frameworks will in general utilize the utilization of human discourse or some of the time even the utilization of extra equipment is required for collaboration for example Expanding the all out expense brought about.

Proposed system

The Human face assumes a monstrous job for programmed acknowledgment of feeling in the field of ID of Down Syndrome tyke feelings. Down Syndrome Children facial feeling highlights are extricated, distinguished and perceived from pictures.

In light of the Down Syndrome face highlight investigation it contrasts and information base prepared pictures. In our undertaking, we are endeavoring to extricate four sorts of feelings for example Cheerful, Angry, Neutral and tragic.

•This proposed work manages estimating the outward appearances of Down Syndrome.
•It does not manage rest of body of the people.
•Since it isn't plausible to run these calculations in genuine condition, in this way a test system is created which will reenact the proposed work.
•Different sort of tests will be actualized utilizing proposed system.
•Visualization of the trial results and drawing proper execution investigation.
•Appropriate end will be made dependent on execution investigation.
•For future work reasonable future headings will be drawn thinking about impediments of existing work.

Throughout the research work emphasis has been on the use of open source tools technologies.

Section I contains the introduction about Down syndrome children, Section II contain the related work of Down syndrome child face recognition, Section III contain the methodology, Section IV explain techniques used for Face Detection and Normalization, Section V explains classification using cascade of Boost classifiers and facial expression recognition, Section VI contain the results and Section VII concludes research with future directions.

II.LITERATURE SURVEY

The soonest notable work worried of human feeling was made by Charles Darwin and distributed in 1872. He refers to another famous physiologist Müller that said "as per the sort of inclination energized, completely unique gatherings of the fiber of the facial nerves are followed up on". This announcement prompts the end that, it is conceivable to sort the diverse feelings dependent on the human outward appearances. As per AlMejrad, feelings broke down and perceived music utilizing cerebrum signals [12]. Thagard built up a calculation model to discover a system dependent on the hypothesis of feeling soundness [13].

Specialist talks about the use of highlight extraction of outward appearances with blend of neural system for the acknowledgment of various facial feelings (cheerful, tragic, furious, dread, astounded, unbiased etc...). People are equipped for delivering a large number of facial activities amid correspondence that change in multifaceted nature, power, and significance. These paper examinations the confinements with existing framework Emotion acknowledgment utilizing mind action. In this paper, a current test system has accomplished 97% precise outcomes and discloses most straightforward approach to perceive Emotion utilizing mind movement framework. Purposed framework relies on human face as we probably am aware face additionally mirrors the human mind exercises or feelings. In this paper neural system has been utilized for better outcomes. Correlations of existing Human Emotion Recognition System have been made with Brain exercises frameworks [10].

This Paper talks about Viola – Jones and Image Cropping systems to separate and distinguish the mouth areas. The proposed division procedures are connected and contrasted with discovered which strategy is reasonable for mouth locale part, and after that mouth area can be removed by difference extending and picture division methods. After the mouth area extraction, the facial feelings are grouped dependent on white pixel esteems in the removed mouth locale of face picture. The principle point of this examination work is to characterize the enthusiastic demeanor from the mouth area part of the human face [11].

Creator assessed different face identification and acknowledgment techniques, give total answer for picture based face location and acknowledgment with higher precision, better reaction rate as an underlying advance for video observation. Arrangement is proposed dependent on performed tests on different face rich databases as far as subjects, present, feelings, race and light [1].

It is investigated the capacity of individuals with Down disorder (PWDS) in perceiving facial feeling by considering programmed subjective handling dimensions of face acknowledgment [2].

Creator executed an Active shape Model (ASM) tracker, which tracks 116 facial tourist spots by means of web-cam input, the followed milestone indicates are utilized concentrate face demeanor highlights utilizing a Support Vector Machine (SVM) based classifier which offers ascend to hearty our framework by perceiving seven looks as opposed to just six appearances as in the face demeanor frameworks. This proposed framework connected to Child Affective Face Expression CAFE set, and it is gotten 93% arrangement exactness. Likewise, another investigation has been done in which kids played out each of the 7 articulation classes. General achievement rate for 4 classes of this test has been seen as 100%. This System express with three primary advances which speak to the ongoing face appearance acknowledgment of Children with Autism.

•First step is the identification of facial triangulation focuses utilizing a tracker dependent on multiresolution dynamic shape demonstrate.

•In the second step, neighborhood changes in explicit areas of the face (temple wrinkles, eye forehead wrinkles, separate eyes to eyebrows, wrinkles in cheeks, vertical and even proportions of the mouth) are determined with the assistance of point area following.

•Finally a face demeanor is distinguished by separation of the acquired credit vector to that of in the learning set [3].

Specialist proposes a novel system dependent on AI strategies to identify Down disorder consequently. A changed compelled nearby model is utilized to find facial milestones. At that point geometric highlights and surface highlights dependent on nearby twofold examples are removed around every milestone. At last, Down disorder is distinguished utilizing an assortment of classifiers. The best execution accomplished 94.6% exactness, 93.3% accuracy and 95.5% review by utilizing bolster vector machine with spiral premise work portion. The outcomes demonstrate that our strategy could aid Down disorder screening adequately in a basic, non-intrusive way [4].

A tale technique is created to recognize Down disorder in a custom face database. Gabor Wavelet Transform (GWT) is utilized as a component extraction technique. Measurement decrease is performed with Principal Component Analysis (PCA). New measurement which has most profitable data is inferred with Linear Discriminant Analysis (LDA). Grouping process is actualized with k-closest neighbor (kNN) and Support Vector Machine (SVM) techniques. The order exactness is done 96% and 97.34% with kNN and SVM techniques, separately. Distinctive investigations related with the Down Syndrome, include determination process is connected before PCA as per the relationship between's parts of highlight vectors. Best outcomes are accomplished with Euclidean separation metric for kNN and direct bit sort for SVM. Along these lines, creator built up a productive framework to perceive Down disorder from face [5].

Creator proposes a novel technique to recognize Down disorder utilizing photography for PC helped picture based facial dysmorphology. Geometric highlights dependent on facial anatomical tourist spots, neighborhood surface highlights dependent on the Contourlet change and nearby paired example are researched to speak to facial qualities. At that point a help vector machine classifier is utilized to separate ordinary and unusual cases; exactness, accuracy and review are assessed. The correlation among the geometric, neighborhood surface and consolidated highlights was performed utilizing the forget one approval. This strategy accomplished 97.92% exactness with high accuracy and review for the consolidated highlights; the identification results were higher than utilizing just geometric or surface highlights. The promising outcomes demonstrate that the potential outcome for robotized evaluation for Down disorder from basic, noninvasive imaging information [6].

In this investigation creator identify the appearances in a picture and finds the facial highlights in a picture. The location of the facial parts, for example, eyes, nose, mouth and face is an essential undertaking in this procedure. This framework is utilized to perceive and distinguish the pieces of the human facial factors in a picture. The investigation includes the calculation of Viola-Jones Cascade Object Detector which gives different mixes of channels and techniques to identify these outward appearances [7].

Outward appearance is an unmistakable stance underneath the skin of the face. They are the method for correspondence in people which pass on numerous things non-verbally. Amid the previous years face acknowledgment has gotten critical consideration as a standout amongst the most vital uses of picture comprehension and investigation. Numerous calculations have been actualized on various static and non-static conditions. Static conditions incorporate static and uniform foundation, indistinguishable postures, and comparative brightening, nonpartisan frontal face .Non static conditions incorporate position, and incomplete impediment

introduction; shifting helping conditions and facial hair which make acknowledgment process an intricate issue. Every one of these components impact face acknowledgment process. The principle stages for face acknowledgment incorporate face identification, include portrayal and orders. Specialists have depicted unmistakable methodologies for face acknowledgment. In this work, a look at face recognition systems, strategies, execution and their restrictions, Author proposed another method for Face Detection dependent on Viola and Jones calculation and vital part investigation. Toward the end it demonstrates re-enactment results for the proposed system and gives a superior arrangement than the current one [8].

This paper introduces an examination based methodology for recognizing human faces utilizing the Viola Jones calculation. Creator prepares the PC to consequently recognize the human countenances from the given pictures regardless of the light conditions. In view of the test results creator have talked about the Viola - Jones Cascade Object Detector which utilizes different channels and the highlights to distinguish the different pieces of the face [9].

This rundown of writing overview papers gives a diagram of the methods and calculations used to execute the previously mentioned phases of outward appearance acknowledgment. From this Literature Survey it is reasoned that, evacuating foundation data, expelling immaterial data, for example, clamor, non-face part and foundation would make face recognition less muddled. It is reasoned that following things make face recognition increasingly confounded: Different Facial stances, Complex foundation, shifted outward appearance, Overlapping Faces.

Face discovery framework dependent on skin shading gives the adequacy of utilized calculation in the pictures with straightforward or complex foundation. The calculation can accurately identify all countenances in the pictures. This writing review paper gives a layout of the systems and calculations used to actualize the previously mentioned phases of outward appearance acknowledgment.

III. METHODOLOGY

The guideline is to construct an appearance acknowledgment arrangement of face identification and arrangement, a picture standardization, include extraction and order. Also, AdaBoost classifier yields effective classifiers by choosing few basic visual highlights from a bigger set. Thirdly, Cascade technique is utilized for joining the mind boggling classifiers which disposes of the foundation and focus more on an article. They proposed a strategy which identifies the appearances inside a picture precisely and quickly.

The process of facial expression recognition is classified into three stages:

A. Feature extraction- Preprocessing of input images

Regularly, a robotized face appearance acknowledgment framework incorporates a database with the facial picture. It is then pre-prepared; in order to limit the natural and different varieties in a image. This incorporates the activities of a picture scaling and brilliance alteration. In the wake of including picture into a database, it is prepared and after that emotion is perceived for example the feature extracted. The highlights that the task characterizes are 4 distinct emotions.

The methodology for the feature extraction has different rules for each feature. The universal expressions can be represented by different parameters. For example, the fear expression is characterized by widened eyes and eyebrows inclined upwards. The mouth is usually open to some degree as well.

Most important feature of Haar Classifier is that, it rapidly rejects the regions that are exceptionally probably not going to be contained in an object. The core basis for Haar cascade classifier object detection is various Haar-like features. The set of the basic Haar-like-feature is by turning which the other features can be generated. Value of a Haar-like feature is the difference between the sum of the pixel gray level values within the black and white rectangular regions, i.e. *f(x)=Sumblack rectangle (pixel gray level) – Sumwhite rectangle (pixel gray level)*

The landmark points that have been used in our face model for the facial feature localization are represented in Figure 2.

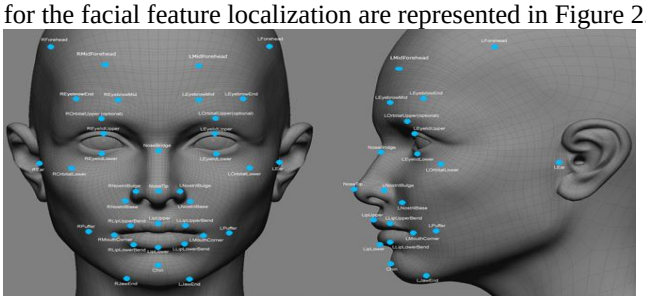

Fig 2: Illustration of parameters used in size/shape computation for facial expressions.

B. Face Detection

Facial expression recognition has turned into a dynamic territory of research. There are numerous applications and calculations that utilization outward appearances to assess human instinct, sentiments, judgment, feeling .These articulations are created because of contortions of facial highlights because of the compression of facial muscles. Outward appearance acknowledgment isn't a simple errand as a result of conditions like light, facial impediments, face shading, face shape and so forth. The facial expression detection system is divided into four major steps:

- Face detection.
- Normalization.

- Feature extraction
- Classification

Face detection & normalization phase detects the face and lighting effects are reduced to some extent. The next step is feature extraction which extracts the features & irrelevant features are eliminated in feature selection process. Final step is classification where the facial expressions are classified in to four basic emotions (Neutral, Happy, Angry and Sad). Generally, there are two techniques in the facial expression recognition process the first technique is based on facial feature & the other considers the holistic view of the recognition problem. Figure 4 shows proposed system architecture.

C. Facial expression recognition and classification

Face Emotion recognition is the process of identifying people emotion in images or videos by analyzing and comparing patterns most typically from facial expressions. Algorithms for face emotion recognition typically extract facial expressions features and compare them to a database to find the best match. Face emotion recognition is an important part of many biometric, security, and surveillance systems, as well as image and video indexing systems.

People used to think that, there are six universal facial expressions, but the scientists have come up with a longer facial expressions list that consists of 21 distinct emotions.

Viola and Jones technique enables you to detect the facial features accurately. There are a number of algorithms exists to execute the face detection and they all have a certain weaknesses and strengths. Viola and Jones devised an algorithm named Haar Classifiers, which rapidly detects any object including the human faces, using AdaBoost classifier cascades which have been depending on Haar-like features.

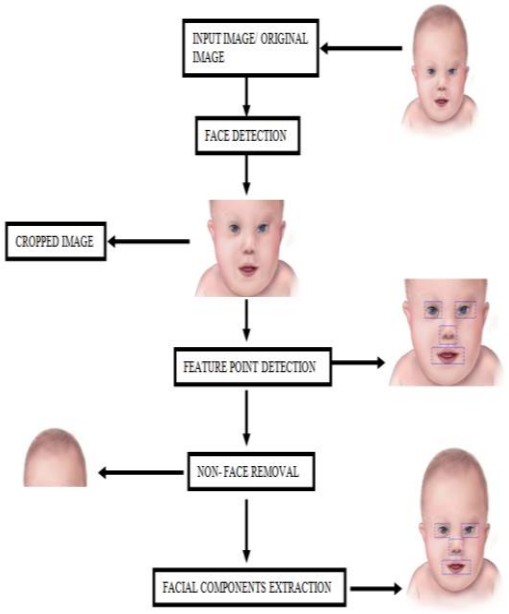

Fig. 3 Steps in Face Expression Recognition

OVERALL PROPOSED SYSTEM ARCHITECTURE DESCRIPTION:

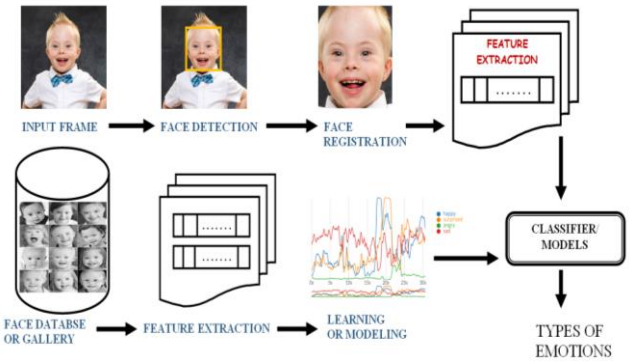

Fig. 4: Proposed System Architecture.

The universal expressions can be representing by the different parameter.

The step-by-step methodology to be followed for Human emotion recognition system using neural networks:

1. Study and analyze various old techniques for human emotion recognition.
2. Based upon above analysis a simulator is developed for Human emotion recognition by using MATLAB 7.5 version.
3. Results achieved after the execution of program are compared with the earlier outputs.

Matlab, Matlab Image Processing Toolbox, Matlab Neural NetworkToolbox, NetBeans are used for implementation. Chapter IV describes Face detection and Normalization in detail.

IV. TECHNIQUES USED FOR FACE DETECTION AND NORMALIZATION

VIOLA-JONES FACE DETECTION AND NORMALIZATION

The Viola-Jones face detection method is the first framework based on object detection that provides good detection rates in real-time is given by Paul Viola & Michael Jones in the year of 2001. This algorithm has been implemented in software 'Matlab' using the method vision.CascadeObjectDetector. The efficiency of the Viola-Jones algorithm can be significantly increased by first generating the integral image.

The Viola - Jones contains of 3 techniques for the facial parts detection:

1. The Haar like features for the feature extraction is of a rectangular type which is determined by an integral image.

2. Adaboost is a machine-learning method for detecting the face. The term 'boosted' determines the classifiers that are complex in itself at each stage, which are built of basic classifiers using any one of the four boosting techniques.
3. Cascade classifier used to combine many of the features efficiently. The term 'cascade' in a classifier determines the several filters on a resultant classifier.

A. Viola Jones Upper Body Detection

The upper body parts can be detected using this method in the still images based on the successful object detection framework on it that also contains the model for detecting the near and frontal upper bodies. This model has been used to detect the part of the upper body of the human and also it observes the face object detection. The upper body detection in this model detects the upper body region, which consists of the head as well as the region of the shoulder combining with the face. This detail of the head and the shoulder region has been encoded using the Haar features and the object detection. Since the object in the head and face uses more type of features, this model is more robust against the pose or the changes in the image, e.g. rotating head/blinking eyes with a tilt. To detect the upper body using the classification model we have 3 properties:
1. Create a detector object and their properties.
2. Input image given is read and detects upper body.
3. Show the detected upper bodies in a bounding box.

B. Viola-Jones Face objects Detection algorithm

In the early stage the face detection in the images was a challenging task. As it have many variations of lighting conditions, poses and various factors on it. But later it was implemented in all of the recent technological products like camera to detect a face object wherever we move the camera with a region of the box. The face objects detection algorithm here consists of variations like illumination, poses and even rotated faces on it. This is detected by getting several window classifiers on the Viola Jones algorithm.

C.Viola-Jones Eye Detection Algorithm

The region of the eye is darker related to other parts of the face, so finding the regions of the eye is based on segmenting a small region of the image which is specified as a darker region. The centre part of the eye region is darker than the other region based on this model the eyebrow region has been removed. After the region of the selected eye region is done using the histogram analysis, as the region of eye exhibits two peaks whereas the region of eyebrow shows only one peak. The 2 major axis has the alignment of which is the final constraint here, so that the two eye regions corresponds to the same line.

D. Iris Pupil Detection Recognition System

The iris present in our eye has many properties based on the biometric recognition. Pupil is the centre part of the darker region pixels in an eye circled by the iris (colored part of the eye). The light may enter through the pupil and then it passes through the lens, and at last it is focused onto the retina.

There may be some information loses surrounding the pupil since the boundary region of the pupil is not always a circular part and there may be a small error in the detection of this boundary. When the head or the eye is also rotated, there occurs some problem in the segmentation of iris part.

E. Viola-Jones Nose Detection Algorithm

To detect nose, the steps are:
a) Dark White Dark Pixels: When an image is taken and it is convolved with White Dark Pixels the nostril region will be identified. This is based on the two regions of holes on the nose, which represents the dark pixels and the centre region of the nose describes the white pixels.
b) Similarity of region on both the sides: The nostrils have the region of black areas on both the left and right side of the nose which is very same. These properties have been considered as a similarity on both the sides of the region.

F. Viola-Jones Mouth Detection Algorithm

The weak classifiers may be classified in these mouth detection algorithm in which the detection and extraction of the features from the mouth region is based on a typical decision stump that uses the features of Haar to encode the details of the mouth.

vision.CascadeObjectDetector:

Detect objects using the Viola-Jones algorithm. The cascade object detector uses the Viola-Jones algorithm to detect people's faces, noses, eyes, mouth, or upper body. You can also use the Image Labeler to train a custom classifier to use with this System object. To detect facial features or upper body in an image:

- Create the vision.CascadeObjectDetector object and set its properties.
- Call the object with arguments, as if it were a function.

Steps involved in proposed system

- detector = vision.CascadeObjectDetector // creates a detector to detect objects using the Viola-Jones algorithm.
- detector = vision.CascadeObjectDetector (model) // creates a detector configured to detect objects defined by the input character vector, model.
- detector = vision.CascadeObjectDetector (XMLFILE) // creates a detector and configures it to use the custom classification model specified with the XMLFILE input.
- detector = vision.CascadeObjectDetector (Name, Value) // sets properties using one or more name-value pairs.

Enclose each property name in quotes.
For example, detector = vision.CascadeObjectDetector ('ClassificationModel', 'UpperBody')

V. CLASSIFICATION: CASCADE OF BOOSTED CLASSIFIERS

This section describes an algorithm for constructing a cascade of the classifiers which drastically reduces the computational time. The main idea is to build a set of the boosted classifiers which are smaller, but more efficient that rejects most of the negative subwindows while detecting almost all the positive instances. An input for a cascade is the collection of all the sub-windows, also called as scanning windows. First, they are passed through the first layer or stage in which all the sub-windows will be classified as faces or non faces. The negative results will be discarded, while the remaining positive subwindows will trigger the evaluation of the next stage classifier.

The sub windows that reach and pass through the last layer are classified as faces. Each stage is actually consists of only a small number of the features. In early stages, with only a small number of the selected features, it is possible to determine the existence of a non-face. On the other hand, determining the presence of a face usually needs more features. Therefore, a trained cascade of the classifiers usually has an increasing number of the features in each consecutive stage, until its last layer and become more complex increasingly. During the training of the cascade classifiers, number of the features per stage was driven through a "trial and error" process.

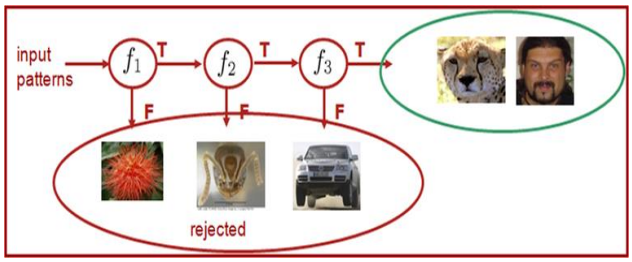

Fig.4 Cascade from simple to complex classifiers

VI. FACIAL EXPRESSION RECOGNITION

AdaBoost is an algorithm of the facial expression recognition which can classify the given image into one of the seven basic facial expressions categories (happiness, sadness, and anger, neutral).

Gabor filters with different frequencies and orientations are used for extracting the useful features from an image.

This approach results as extremely powerful because it does not require the detection of any reference point or node grid. The proposed method is a fast method and can be used for the real-time applications.

VII. RESULTS AND DISCUSSIONS

Efficiency of Viola method in terms of time and the response is much faster in the facial expression recognition. Figure 5, 6 and 7 shows Down syndrome child face input, sample output of sad emotion and sending SMS to parents.

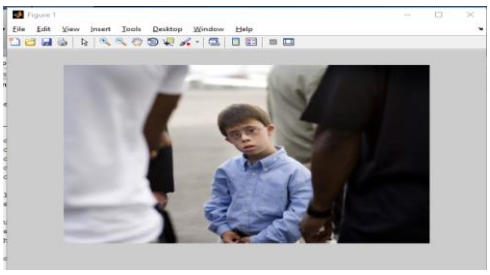

Fig 5 Down syndrome child face Input

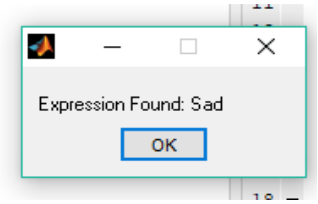

Fig 6: The sample output of sad emotion

Fig 7: Sending SMS to parents

VIII. CONCLUSION AND FUTURE WORK

Face Emotion recognition is one of the most important and a challenging problem in the field of image processing and computer vision on which many social networking platforms have been concentrating. Because of lots of application in different fields the face recognition has received great attention. The purpose of this study was to examine Down syndrome child facial emotions. A set of trained images have been feeded to the database and if any new image is given as input then the code compares the new entry with the existing similar set of images. If the input image seems to match with the existing image then the expression is finalized and the output is displayed. This concept can be further implemented into an API for easy use by all developers.

This proposed can be further developed for deaf and dumb Down Syndrome child from their actions and Recognition can be done through this application. This proposed will be useful to all the parents who care about their child. This Application leads to massive growth of child attitude and can be helpful to his future.

ACKNOWLEDGMENT

The author would like to thank SCSVMV University for supporting this work.

REFERENCES

[1]. Faizan, N. Asima, and A. Zeeshan. "Image Based Face Detection and Recognition." State of Art"," International Journal of Computer Science 9.6 (2012): 169-180.

[2]. Morales, Guadalupe Elizabeth, et al. "Contributions to the cognitive study of facial recognition on Down syndrome: A new approximation to exploring facial emotion processing style." Journal of Intellectual Disability-Diagnosis and Treatment 2.2 (2014): 124-132.

[3]. Suzan Anwar, Mariofanna milanova "Real Time Face Expression Recognition of Children with Autism" International Academy of Engineering and Medical Research (IAEMR), 2016 Volume-1, ISSUE-1

[4]. Zhao, Qian, et al. "Automated down syndrome detection using facial photographs." 2013 35th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC). IEEE, 2013.

[5]. Saraydemir, Şafak, et al. "Down syndrome diagnosis based on Gabor wavelet transform." Journal of medical systems 36.5 (2012): 3205-3213.

[6]. Zhao, Qian, et al. "Down syndrome detection from facial photographs using machine learning techniques." Medical Imaging 2013: Computer-Aided Diagnosis. Vol. 8670. International Society for Optics and Photonics, 2013.

[7]. Vikram, K., and S. Padmavathi. "Facial parts detection using Viola Jones algorithm." 2017 4th International Conference on Advanced Computing and Communication Systems (ICACCS). IEEE, 2017.

[8]. Agrawal, Samiksha, and Pallavi Khatri. "Facial expression detection techniques: based on Viola and Jones algorithm and principal component analysis." 2015 Fifth International Conference on Advanced Computing & Communication Technologies. IEEE, 2015.

[9] Nehru, Mangayarkarasi, and S. Padmavathi. "Illumination invariant face detection using viola jones algorithm." 2017 4th International Conference on Advanced Computing and Communication Systems (ICACCS). IEEE, 2017.

[10]. Dilbag Singh "Human Emotion Recognition System" 2012 International Journal of Image, Graphics and Signal Processing. IJIGSP Vol.4,No.8,Aug 2012.

[11]. G.Kalavani, S.Sathyapriya and D.Anitha. "A literature review on Emotion Recognition for Various Facial Emotional Extraction" IOSR Journal of Computer Engineering (IOSR-JCE) e-ISSN: 2278-0661,p-ISSN: 2278-8727 PP 30-33

[12]. Bhatti, Adnan Mehmood, et al. "Human emotion recognition and analysis in response to audio music using brain signals." Computers in Human Behavior 65 (2016): 267-275.

[13]. Thagard, P. "The passionate scientist: emotion in scientific cognition. The cognitive basis of science." (12): 235-250.