Evaluation Of Women Protection For Face Detection And Expression Based On Machine Learning

G. Anna Mehala[1], S. I. Padma[2], F. Preethi[3]
[1]Dept of ECE
[2]Associate Professor, Dept of ECE
[3]Assistant Professor Dept of ECE
[1, 2, 3] PET Engineering College,Vallioor, TamilNadu

Abstract- *At present scenario women and men are competing with each other in every prospect of the society and they have to face several strained cases in their day to day life especially women ,so importance have to be given for women safety. Here facial expressions plays a major role in communication and several recognition techniques are used to capture the facial expressions. This paper explains about one among the technique with the help of Blynk application and the Haar cascade algorithm.Different types of facial expressions are detected,extracted and evaluated,then with the result of the data the emotions of a particular person is detected.*

Keywords- HAAR cascade, Blynk application, OpenCv, face detection

I. INTRODUCTION

Interpersonal interaction is oftentimes intricate and nuanced, and, and its success is often predicated upon a variety of factors. These factors range widely and can include the context, mood, and timing of the interaction, as well as the expectations of the participants. For one to be a successful participant, one must perceive a counterpart's disposition as the interaction progresses and adjust accordingly. Fortunately for humans this ability is largely innate, with varying levels of proficiency. Humans can quickly and even subconsciously assess a multitude of indicators such as word choices, voice inflections, and body language to discern the sentiments of others. This analytical ability likely stems from the fact that humans share a universal set of fundamental emotions.

Significantly, these emotions are exhibited through facial expressions that are consistently correspondent. This means that regardless of language and cultural barriers, there will always be a set of fundamental facial expressions that people assess and communicate with. After extensive research, it is now generally agreed that humans share seven facial expressions that reflect the experiencing of fundamental emotions. These fundamental emotions are anger, contempt, disgust, fear, happiness, sadness, and surprise. Unless a person actively suppresses their expressions, examining a person's face can be one method of effectively discerning their genuine mood and reactions.

The universality of these expressions means that facial emotion recognition is a task that can also be accomplished by computers. Furthermore, like many other important tasks, computers can provide advantages over humans in analysis and problem-solving. Computers that can recognize facial expressions can find application where efficiency and automation can be useful, including in entertainment, social media, content analysis, criminal justice, and healthcare. For example, content providers can determine the reactions of a consumer and adjust their future offerings accordingly.

It is important for a detection approach, whether performed by a human or a computer, to have a taxonomic reference for identifying the seven target emotions. A popular facial coding system, used both by noteworthy psychologists and computer scientists such as Ekman and the Cohn Kanade group, respectively, is the Facial Action Coding System (FACS). The system uses Action Units that describe movements of certain facial muscles and muscle groups to classify emotions. Action Units detail facial movement specifics such as the inner or the outer brow raising, or nostrils dilating, or the lips pulling or puckering, as well as optional intensity information for those movements. As FACS indicates discrete and discernible facial movements and manipulations in accordance to the emotions of interest, digital image processing and analysis of visual facial features can allow for successful facial expression predictors to be trained.

II. EXISTINGSYSTEM

The face of the person in the given input image, which is then succeeded by identifying the features (eyes and mouth). These features are then passed through their respective filters and transformation, if that is a part of the decided method. The outputs are then sent to the classifiers to get classified according to the trained data. This gives us the output emotion predicted by the system. These processes will be explained in much more detail in the next sub-sections and

will give a holistic view of how the system as a whole works with various comparative methods.

Face detection is regarded as one of the most complex problems in computer vision, due to the large variations caused due to changes in lighting, facial appearance and expressions. Let's solve all the stages step by step. For face detection Viola Jones Algorithm is used.

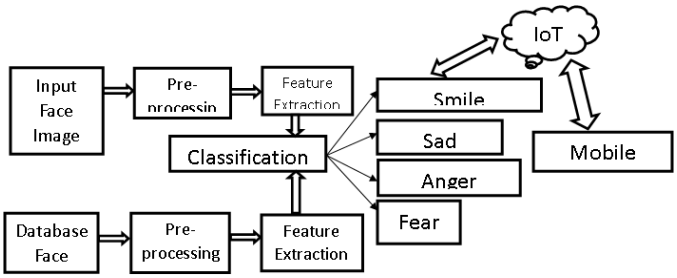
Though it was proposed in 2001 it is one of the simple and easiest method for face detection giving high accuracy. This algorithm uses Haar based feature filters. The objective of this filter is to find the face in an image given as input. In each sub window Haar features are calculated and this difference is compared with the learned threshold that separates objects and non-objects. Haar features are weak classifiers so a large number of Haar classifiers are organized in such a way that they form a strong classifier which is called as "Classifier Cascade".

Each classifier looks at the sub window and determines if the sub window looks like a face and if it does then the next classifier is applied. If all the classifiers give a positive answer, then face is there in the sub window otherwise size of sub window is changed and whole process is repeated till the face is detect. Similarly, Eyes and mouth Cascades are used to detect eyes and mouth in the sub window in which face is detected.

III. PROPOSED FRAME WORK

Security is one of the necessary requirements of homes and businesses which require biometric identification. This paper intends to identify a person through face recognition. The system which translates facial images to feature characteristics of initial training database images. Facial features are takeout from the face using Haar Cascade techniques. Nowadays, women and children safety is a prime concern of our society. Facial expression being an important mode of communicating human emotions. Expressions and emotions go hand in hand, i.e. special combinations of face muscular actions reflect a particular type of emotion. It is essential to recognize and verify the emotions of a person. It also contains pop up message box using Blynk app. It displays an alert style message pop up message according to the emotion of a person using Blynk app.

In this proposed system, to understand the emotion recognition, face recognition and some expression recognition techniques. Expressions and emotions go hand in hand, i.e. special combinations of face muscular actions reflect a particular type of emotion. If further prediction is needed, then the computationally slower Haar cascade feature extraction is performed and a class prediction is made with a trained Densenet algorithm. Reasonable accuracy is achieved with the predictor, dependent on the testing set and test emotions. Haar Cascade is a feature-based face (object) detection algorithm to detect face (object) from images. A cascade function is trained on lots of positive and negative images for detection. The camera will monitor the women's face if the women is angry or fear the GPS location is send to mobile application through Blynk application.



1)DATABASE FACE IMAGE

- The process of correctly recognising faces begins with first detecting faces from a set of objects.
- Detected emotions like happiness, sadness, fear, surprise, and anger.

2)PREPROCEESING

- Next, an image of the face is captured and analyzed.
- Most facial recognition technology relies on 2D rather than 3D images because it can more conveniently match a 2D image with public photos or those in a database.
- the ML algorithm is trained repeatedly using different data points to locate these points on the face and turn them towards the centre to align to match the database

3)FEATURE EXTRACTION

- The Haar Cascade reads the geometry of your face.
- Key factors include the distance between your eyes, the depth of your eye sockets, the distance from forehead to chin, the shape of your cheekbones, and the contour of the lips, ears, and chin.

4)INPUT FACE IMAGE

- Input image is given to the system.

- The face capture process transforms analog information (a face) into a set of digital information (data) based on the person's facial features.

5)CLASSIFICATION

- The input image is classified based on the five emotions.

6)MOBILE APPLICATION

- If the women is angry or fear, the GPS location is send to mobile application through Blynk application.

IV. METHODOLOGY

The detection and recognition implementation proposed here is a supervised learning model that will use the one versus-all (OVA) approach to train and predict the seven basic emotions (anger, contempt, disgust, fear, happiness, sadness, and surprise). The overall face extraction from the image is done first using a Viola-Jones cascade object face detector.

The Viola Jones detection framework seeks to identify faces or features of a face (or other objects) by using simple features known as Haar-like features. The process entails passing feature boxes over an image and computing the difference of summed pixel values between adjacent regions.

The difference is then compared with a threshold which indicates whether an object is considered to be detected or not. This requires thresholds that have been trained in advance for different feature boxes and features.

Specific feature boxes for facial features are used, with expectation that most faces and the features within it will meet general conditions.

Essentially, in a feature-region of interest on the face it will generally hold that some areas will be lighter or darker than surrounding area. For example, it is likely that the nose is more illuminated than sides of the face directly adjacent, or brighter than the upper lip and nose bridge area. It is used and the difference in pixel sum for the nose and the adjacent regions surpasses the threshold, a nose is identified. It is to be noted that

Haar-like features are very simple and are therefore weak classifiers, requiring multiple passes. The camera will monitoring the women's face if the women is angry or fear the GPS location is send to mobile application through Blynk application.

4.1 IMPLEMENTATION OF FACIAL EMOTION

A static approach using extracted features and emotion recognition using machine learning is used in this work. The focus is on extracting features using python and image processing libraries and using machine learning algorithms for prediction. Our implementation is divided into three parts.

The first part is image pre-processing and face detection. For face detection, inbuilt methods available in dlib library are used. Once the face is detected, the region of interest and important facial features are extracted from it. There are various features which can be used for emotion detection.

In this work, the focus is on facial points around the eyes, mouth, eyebrows etc. We have a multi-class classification problem and not multi-label. There is a subtle difference as a set of features can belong to many labels but only one unique class. The extracted facial features along with SVM are used to detect the multi-class emotions. The papers we have studied focus on SVM as one of the widely used and accepted algorithms for emotion classification.

Our database has a total of 7 classes to classify. We have compared our results with logistic regression and random forest to compare the results of different algorithms. The processing pipeline can be visualized.

4.2 PYTHON 3.7.9

Python is an interpreted, interactive, object-oriented programming language. It incorporates modules, exceptions, dynamic typing, very high level dynamic data types, and classes. Python combines remarkable power with very clear syntax. It has interfaces to many system calls and libraries, as well as to various window systems, and is extensible in C or C++. It is also usable as an extension language for

applications that need a programmable interface. Finally, Python is portable: it runs on many Unix variants, on the Mac, and on Windows 2000 and later.

The Python Software Foundation is an independent non-profit organization that holds the copyright on Python versions 2.1 and newer. The PSF's mission is to advance open source technology related to the Python programming language and to publicize the use of Python.

It is still common to start students with a procedural and statically typed language such as Pascal, C, or a subset of C++ or Java. Students may be better served by learning Python as their first language. Python has a very simple and consistent syntax and a large standard library and, most importantly, using Python in a beginning programming course lets students concentrate on important programming skills such as problem decomposition and data type design. With Python, students can be quickly introduced to basic concepts such as loops and procedures. They can probably even work with user-defined objects in their very first course.

For a student who has never programmed before, using a statically typed language seems unnatural. It presents additional complexity that the student must master and slows the pace of the course. The students are trying to learn to think like a computer, decompose problems, design consistent interfaces, and encapsulate data. While learning to use a statically typed language is important in the long term, it is not necessarily the best topic to address in the students' first programming course.

Many other aspects of Python make it a good first language. Like Java, Python has a large standard library so that students can be assigned programming projects very early in the course that *do* something. Assignments aren't restricted to the standard four-function calculator and check balancing programs. By using the standard library, students can gain the satisfaction of working on realistic applications as they learn the fundamentals of programming. Using the standard library also teaches students about code reuse. Third-party modules such as PyGame are also helpful in extending the students' reach.

Python's interactive interpreter enables students to test language features while they're programming. They can keep a window with the interpreter running while they enter their program's source in another window. If they can't remember the methods for a list, they can do something like this.

4.3 **ALGORITHM USED**

4.3.1 Haar cascade

- Haar Cascade classifiers are an effective way for face detection.
- This method was proposed by Paul Viola and Michael Jones in their paper Rapid Object Detection using a Boosted Cascade of Simple Features
- Haar Cascade is a machine learning-based approach where a lot of positive and negative images are used to train the classifier.
- As the overall detection ratios of such a cascade are multiplicative, the accuracy stays close to 100%, while the number of FP is reduced greatly.
- By using the combination of both our face and our regionalized eyes detector we were able to fully automatically detect eyes in 94% of images still keeping the value losses of 13%
- By applying minimum neighbors constraint solely to the eyes detector the accuracy of 88% was achieved.

4.3.2 **Fisher face Classifier**

Linear Discriminant Analysis is a supervised algorithm that aims for classification of the input dataset. They analyse the sub space that matches the given vectors of the same class in a single blot of the feature presentation and the different classes. Thus, it improves the ratio between the class scatter to the within class scatter. The sub space presentation of a group of face images, the outcome of the basis vector resulting that spaces are defined as Fisher faces. They are helpful when facial images have wide differences in facial expressions and illumination. Principal component Analysis is predominantly used for dimensionality reduction in facial classification, image compression, etc.

Initially, the training data is to be reduced to at least N-c dimension using Principal Component Analysis where N represents the number of images in the images in the training set and c represent the number of classes. Thereafter Linear Discriminant The algorithm employed in this case is classifying the dataset of faces into six basic emotions (anger, disgust, fear, happy, neutral, sadness) by projecting it into a 3D feature space using kernels and separating them using appropriate hyperplanes. Initially, only lips were taken into consideration, and data consisting of images of lips converted into pixel arrays and their respective labels of 6 different emotions were split into training and testing data.

This data has been trained by the SVM classifier and Grid Search. Grid search is a sub algorithm, which checks various values of 'C' and 'gamma' in the function and give out the best combination of the variables possible. The kernel

with maximum accuracy as output for the testing data is taken into consideration. Later, images of eyes were included along with those of lips, and the resulting labeled data was passed through the SVM classifier and Grid Search, and results were obtained for the combined dataset.

Gabor Filter + SVM Gabor filters have a mask i.e. an array of pixels. The pixels are then given respective values, which are in a way, used as their weights. This array is convoluted with the entire image, pixel by pixel. Gabor filters change their values according the texture of the image. They give higher values at edges and points where the texture changes Gabor filters are used to detect changes in texture as well as edges in images.

The images obtained by feature extraction are initially passed through the Gabor filter to highlight edges of the facial features, as well as their texture and then the resulting labelled data is decomposed into pixel arrays and passed through the SVM classifier (discussed previously).

The parameters of Gabor filter were set to appropriate values, and various combinations of kernels provided accuracies, out of which the maximum value was taken into consideration.

V. RESULT &CONCLUSION

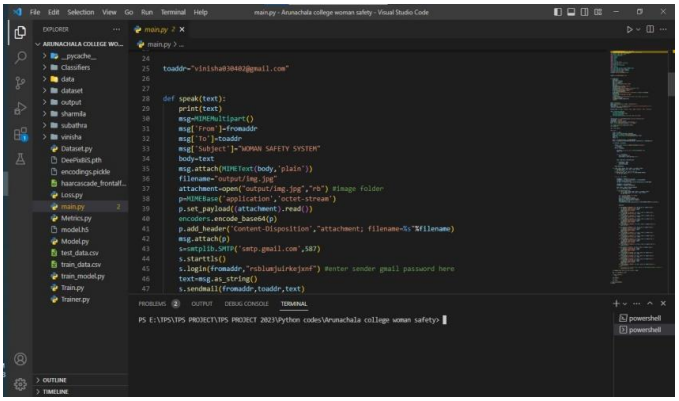
An image processing and classification method has been implemented in which face images are used to train a dual classifier predictor that predicts the seven basic human emotions given a test image. The predictor is relatively successful at predicting test data from the same dataset used to train the classifiers. However, the predictor is consistently poor at detecting the expression associated with contempt. This is likely due to a combination of lacking training and test images that clearly exhibit contempt, poor pre-training labelling of data, and the intrinsic difficulty at identifying contempt. The classifier is also not successful at predicting emotions for test data that have expressions that do not clearly belong exclusively to one of the seven basic expressions, as it has not been trained for other expressions. Future work should entail improving the robustness of the classifiers by adding more training images from different datasets, investigating more accurate detection methods that still maintain computational efficiency, and considering the classification of more nuanced and sophisticated expressions.

FUTURE ENHANCEMENT

For future work, a more robust face detection algorithm coupled with some good features can be researched to improve the results. We focused on only some distances and areas, there can be many more such interesting features on the face which can be statistically calculated and used for training the algorithm. Also, not all the features help to improve the accuracy, some maybe not helpful with the other features. Feature selection and reduction technique can be implemented on the created feature to improve the accuracy of the dataset. We can experiment with facial action coding system or feature descriptors as features or a combination of both of them. Also, we can experiment with different datasets amongst different races. This will give us an idea if the approach is similar for all kinds of faces or if some other features should be extracted to identify the emotion

RESULT

This chapter contains the screenshots of the user interface of the proposed system showing the interface and the intermediate results.



An image processing and classification method has been implemented in which face images are used to train a dual classifier predictor that predicts the five basic human emotions given a test image.

- The predictor is relatively successful at predicting test data from the same dataset used to train the classifiers.
- Facial recognition is a technology that can benefit society, including increasing safety and security, preventing crimes, and reducing human interaction.

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