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Human Sentimental Analysis & Health Monitoring

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Abstract: This paper is based upon determining the emotional state of a person by extracting facial expression of the person and also predicting the emojis and song as well corresponding to the state of mind of the person. As well in addition we have also included cursor scrolling movement using face opening and closing using facial landmarking feature. Also, will tell the health status of a person so that one can keep track of their health.

With the advancement in technology, we have been so busy working with new technologies that we sometimes get confused how actually we are feeling deep inside or what is our health status. Thus, we came to this idea that why not to create something which can tell us what is our mood and how we are feeling, while taking an understanding about our heart rate to take proper diagnosis.

I. INTRODUCTION

Human sentimental analysis & health monitoring is one of the important tool not just for a person but also seems to be a significant part of psychological reading, it is now a days also recommended by many psychologists to people who goes mental treatment.

In the developing world, sentiment analysis is a part of natural language processing whose aim is to identify the sentiments of a person by determining the facial expression of a person using dlib and facial landmarking feature, while pulse detection focus on our forehead and process the image into green colour the intensity of the colour will determine our heart rate using opencv.

Our project is basically working on several different phases that is from direct capturing image using primary camera to predicting the sentiments with upmost accuracy. We are using dlib module which facilitates facial landmarking feature then for sentiment analysis we are again using deep face library which contains pre-trained model for expression analysis.

Its really easy for human to predict the mental state of a person by just looking at their face but ever wondered, how it will be if the same can be done by computer as well. We came across several different modules and libraries which are being used majorly in this field and we also found the difference between them. The three main components of sentiment analysis include: image processing, feature extraction and feature classification. Recognizing an object into a whole image is most important part of sentimental analysis or health monitoring which is termed as face detection.

In the current times Heart attacks due to stress are very common, therefore monitoring our heart rate is important on the current times, there are many devices available in but their cost is high so having them as an additional device can be very difficult for some people. Thus, we brainstormed an idea to use web cam as a source to find heart rate to decrease the risk of heart attacks

II. BACKGROUND / LITERATURE SURVEY

Facial expression and relevant frequent changes in facial pattern tell us about the sentiments of the person and helps us in regulating the conversation with the person. Moreover, theses expressions help us in understanding the sentiments of a person in the most better way possible. Classification of facial expression or metal status of person can be use as an effective tool in behavioural studies and also for them who undergo medical rehabilitation.

Facial expression analysis deals with visual recognition of emotion and facial feature changes. Detecting a face into an entire picture is what we called face detection or facial keypoints detection which is very important feature of our project. This method is now being used by many of the applications these days such as Instagram, snapchat etc. After detecting a face successfully in a frame, deep face library helps us in determining the emotion or mood of a person. Once expression detected, then we proceeded predicting corresponding emojis and songs according to the mood of the person. This technique will provide a fast and practical approach for non-invasive emotion recognition.

Heart rate monitoring takes video from the connected device using opencv and then find the person face it will find and focus on forehead region. Then the following image will be processed removing Red and Blue colour from the person's forehead and only keeping Green colour. Intensity of green colour will decide the heart rate of the person.

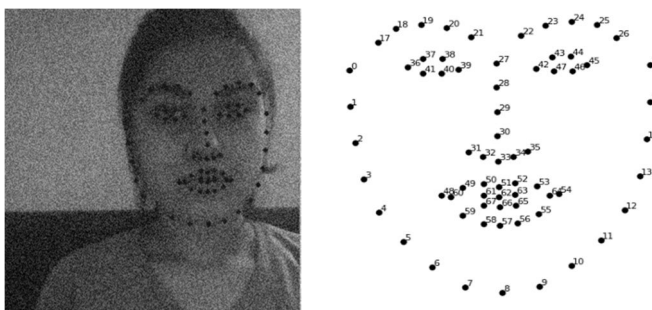


Figure 1: The six universal facial expressions of human being: anger, happiness, surprise, disgust, sadness and fear.

Psychological researchers has classified human facial into six categories those are anger, happy, sad, fear, disgust, surprise. And if you have observed then you can see that four out of six are negative emotions. These six expressions which are the most common was identified by psychologist Paul Eckman back in 1970s.

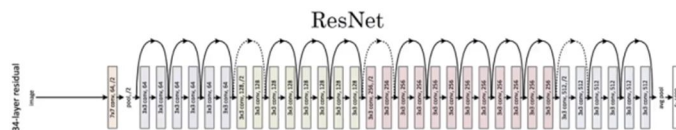
A. Data Pre-Processing

In our project we have used DLIB library for human face detection. Human face emotion recognition is having a base part that is facial landmarking which is used for face detection in an entire frame. Detection of facial landmark is a subpart of shape prediction problem, and a shape predictor attempts to localize the points over the face.



This method uses Maximum Margin Object Detector (MMOD) with CNN features. It uses data from google images so no need of large amount of data to train a custom object detector. It uses a dataset consisting of images from various datasets like ImageNet, VGG etc. In total contains 7220 images.

Dlib is inspired from a ResNet-34 model. Davis E. King modified the regular ResNet structure and re-build a neural networks consist of 29 convolutional layers. It experts 150 x 150 x 3 sized input images and represents faces as 128 dimaensional vectors.



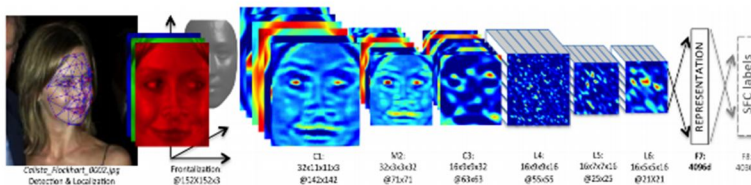
He tested the model for labeled faces in the wild (LFW) data set which worked as baseline for face recognition. He got 99.38% of its accuracy and hence dlib face recognition model can complete with the other face recognition models and human beings as well.

Step wise process of working of facial landmarking for face detection:

- 1) Point all the fiducial point to detect the face in a frame and capture the image for further execution.
- 2) After extracting face from entire frame, generate 2d image of face cropped from the original one.
- 3) Apply conversion of 2d into 3d using following relations:

$$X_{2d} = X_{3d} P$$

This conversion of face will also lead to some sort of loss in facial feature. After this we will be able to have the only part which we need to work upon. It results into a 3d aligned RGB image. This image is then send to CNN with 32 filters and performs the operation in layers of neural network.

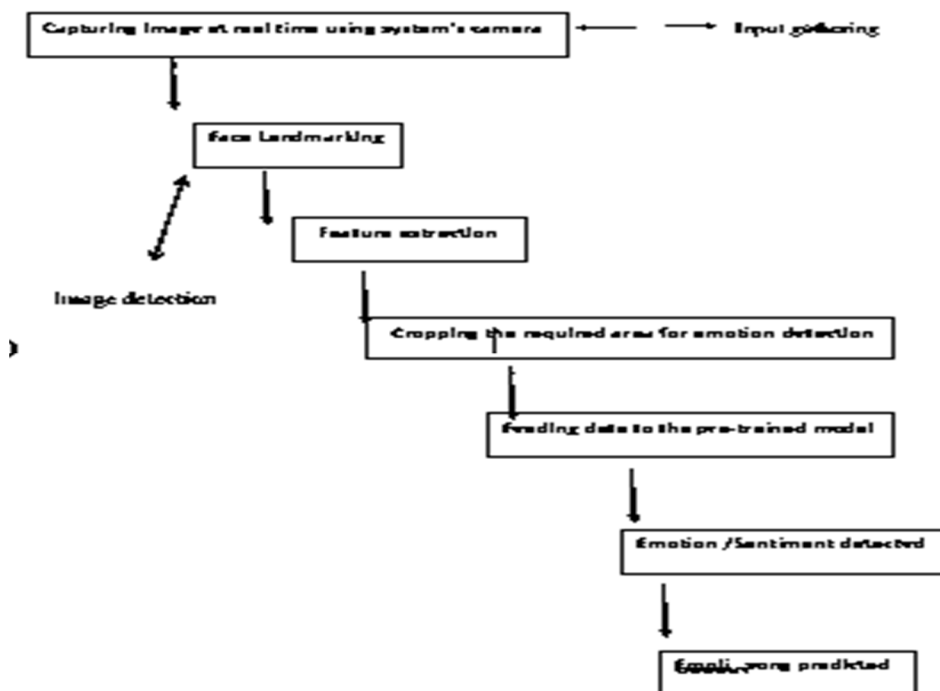


The last two layers are fully connected layers of this convolution network and helps in establishing correlation between two distant parts of the face. The model which is being used is pre trained model. So we don't actually need to perform any operation as such.

III. WORKING

Our project has been divided into many parts along with the usage of several different machine learning algorithms. Dlib is a modern C++ toolkit which includes machine learning algorithms such as deep learning, support vector machine (SVM), classification etc, numerical algorithms such as matrix manipulation, cutting plane algorithm etc. Image processing, networking etc. It's a landmark's facial detector with pre-trained models, it considers 68 different points on the face for making a whole face landmark from eyebrows to chin. These 68 points are basically present in the form of coordinates(x,y) that maps the facial points on a person's face like shown .

Flowchart of working model



A. Working Procedure

Using primary camera we are fetching the real time picture of a person to determine the emotion and health status of a person. The first step is to detect face of the person using dlib (face landmarking feature) module.

Second step includes applying deep face library to the captured image and prediction of the emotional state of a person through barchart.

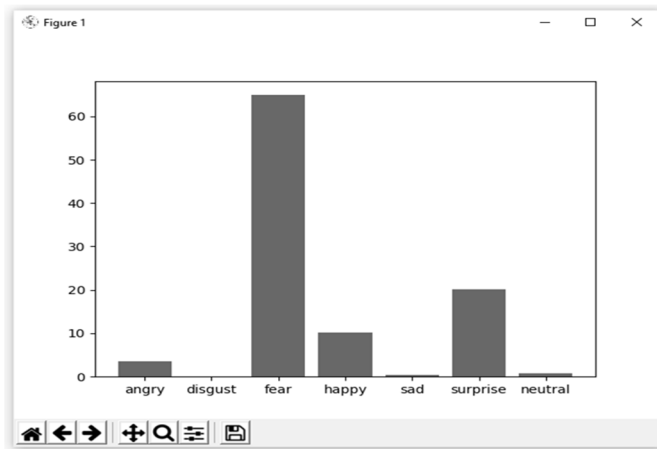


Figure 4: Statistics of the ratio of emotion a person is in at some moment

Once emotion is detected then we will be predicting songs and emojis relevant to that.

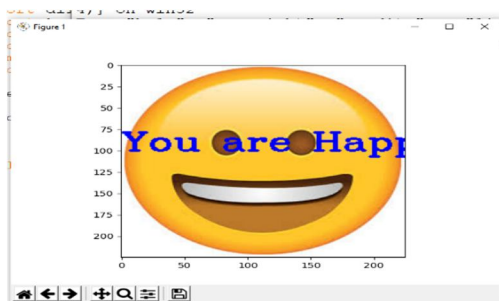


Figure 5: Emoji prediction related to the expression

For songs prediction we are using Spotify Application. We are using spotify developer for fetching mood based playlist from Spotify using API connection and successfully predicting the songs relevant to the mood on python console.

```

Command Prompt - Main.py
* Debugger is active
* Debugger PIN: 512-906-556
* Running on http://127.0.0.1:5000/ (Press CTRL+C to quit)
127.0.0.1 - - [20/Mar/2021 10:52:26] "[33mGET / HTTP/1.1-[0m" 200 -
127.0.0.1 - - [20/Mar/2021 10:52:27] "[33mGET /style.css HTTP/1.1-[0m" 404 -
127.0.0.1 - - [20/Mar/2021 10:52:27] "[33mGET /app.js HTTP/1.1-[0m" 404 -
127.0.0.1 - - [20/Mar/2021 10:52:27] "[33mGET /style.css HTTP/1.1-[0m" 404 -
127.0.0.1 - - [20/Mar/2021 10:52:27] "[33mGET /app.js HTTP/1.1-[0m" 404 -
[WARN:0] global C:\Users\apvayevor\AppData\Local\Temp\1\pip-req-build-odououiglopencv\modules\videoio\src\cap_msmf.cpp (
434) "anonymous-namespace":SourceReaderCB::SourceReaderCB terminating async callback
Pagglalal (Original Motion Picture Soundtrack)
YRF Top 10 - Midnight Hour
Ultimate Love Songs - Arijit Singh
Acche Din, Acche Gaane
Groove With Arijit Singh
Valentine Kis Ghazals
Chokher Bahire (Original Motion Picture Soundtrack)
Murshida and Other Hits
Yours Truly Arijit
Arijit Singh - Ultimate Love Songs
Shudhu Tomari Jonyo
Khaad
Sorebaad
Shezals By Trending Voices
Goipo Hileo Sotti
Chander Pahar
Soyne Bakcho
Bojhena Se Bojhena
127.0.0.1 - - [20/Mar/2021 10:54:02] "[33mGET /my-11nk/ HTTP/1.1-[0m" 200 -
    
```

Figure 6: songs prediction using spotify API

Using Machine learning technique that is Deep learning , DLIB module , SVM (support vector machine) etc. we are able to develop this project and easily can analyze facial mood expression as well cursor movement using mouth movement. After analyzing facial mood expression it detect the face mood and provides almost 75.7% accurate result and suggest music based on facial mood expression.

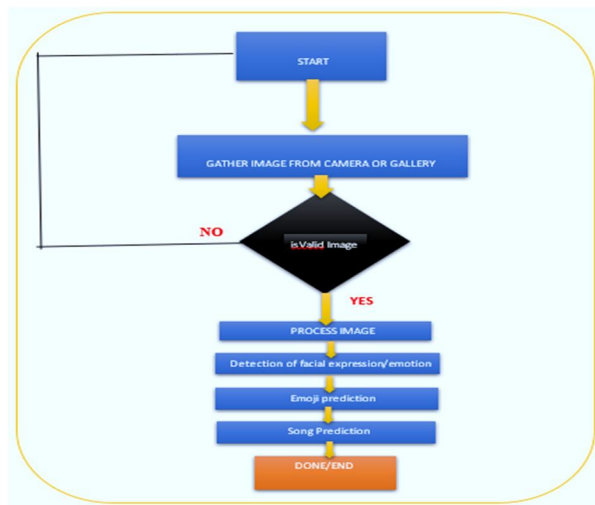


Figure 7: Descriptive analysis of the working model

Well, there are a lot work which can still be performed in this field. Including automatic playing music or videos based on sentiments of a person. This system would be also helpful in music therapy treatment and provide the music therapist the help needed to treat the patients suffering from disorders like mental stress, anxiety, acute depression and trauma. It can help in people who undergo rehab for multiple reasons mostly who are dealing with mental issues such as depression. For Pulse Detection we are using web cam which will capture the image and find persons face

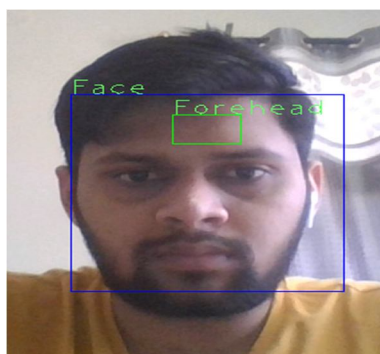


Figure 8: Finding face using opencv

Using opencv and numpy we accessed camera as our source for capturing image and focusing it into two different position determining face and forehead.



Figure 9: Focusing on forehead and determining Heart rate

We used image processing for splitting image into 3 colours removing Red and Blue and only keeping green colour. Then converting image into grayscale to create a simple image matrix then we displayed estimated bpm in image frame .

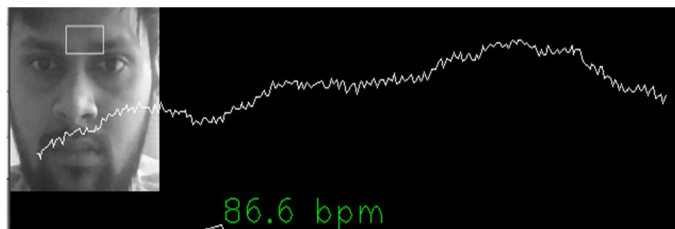


Figure 10: Plotting Heart rate

Using plot function of python, we plotted heart rate, it help us to analyse the data easily and determine if we need and immediate treatment or not. This system will be helpful in determining any early risk of heart attack

IV. CONCLUSIONS AND NEXT STEPS

Our goal in this paper was to provide a tool with the help of which we can easily determine human sentiments along with the emoji and song prediction relevant to the sentiment analysed, along with an easy tool that will help to keep the heart rate in check also, there is one additional feature of scrolling the screen up and down using mouth movement and also will tell the health status of an individual. The human face is an important organ of an human's body and it especially plays an important role in extraction of an individual's behaviour and emotional/sentimental state. Manually segregating the list of songs, emojis and generating an appropriate playlist of songs based on an individual's emotional state is a very hectic, time consuming, labor intensive and upheld task. We are using facial land marking technique to accurately. We are working with human's eyes and mouth for emotion detection. We are working and testing many images to detect human's emotions. The accuracy of our research work is 75.5%. There are many tools available in market that can help us determining our heart rate but availability of these tools at crucial time is important if we find ourselves in a bind with no such tool, we can easily use this application to our advantage. The main advantage of our tool is to detect accurate human emotions, determine heart rate and also suggest music and jokes for changing their mood and last but not the least also will able to handle cursor movement that is scrolling up and down using mouth closing and opening mouth using facial landmarking technique.

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