A Mini Project Report on

Facial Emotion Recognition

T.E. - I.T Engineering

Submitted By

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CERTIFICATE

This to certify that the Mini Project report on **Facial Emotion Recognition** has been submitted by **Sourav Joshi** (19104068), **Sakshi Deshpande** (19104002) and **Akshay Bura** (19104041) who are a Bonafede students of A. P. Shah Institute of Technology, Thane, Mumbai, as a partial fulfilment of the requirement for the degree in **Information Technology**, during the academic year **2021-2022** in the satisfactory manner as per the curriculum laid down by University of Mumbai.

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Chapter 1

Introduction

Facial emotion recognition has become an important issue in many application nowadays. In recent years, the research on facial emotion recognition has become extensive. The aim of facial emotion recognition is to help identify the state of human emotion (eg; neutral, happy, sad, surprise, fear, anger, disgust, contempt) based on particular facial images. The challenge on facial emotion recognition is to automatically recognize facial emotion state with high accuracy.[4] Therefore, it is challenging to find the similarity of the same emotion state between different person since they may express the same emotion state in various ways. As an example, the expression may varies in different situations such as the individual's mood, their skin color, age, and environment surrounds Children with autism spectrum disorder have difficulty in understanding the emotional and mental states from the facial expressions of the people they interact. The inability to understand other people's emotions will hinder their interpersonal communication.[6] Though many facial emotion recognition algorithms have been proposed in the literature, they are mainly intended for processing by a personal computer, which limits their usability in on-the-move applications where portability is desired. The portability of the system will ensure ease of use and real-time emotion recognition and that will aid for immediate feedback while communicating with caretakers.

1.1. Purpose :

Facial expression recognition software is a technology which uses biometric markers to detect emotions in human faces. Facial Emotion Recognition (FER) is the technology that analyses facial expressions from both static images and videos in order to reveal information on one's emotional state.

1.2 Objectives :

Following objectives of our project:

1. To find out the improvement opportunities for the existing facial expression recognition system.
2. To achieve efficiency in Behavioural Testing.
3. To build a tool which help in Marketing.
4. To study emotions of person in different situation.
5. To help psychologist, police.

1.2 Scope:

Following Scope of our project:

1. **People with mental disorder**
   Autism is a complicated condition that includes problems with communication and behavior. System will help them to identify.

2. **Behavioural Testing**
   A focused group of users are asked to play a game for a given amount of time and their behavior and emotions are monitored.

3. **Gaming Industry**
   It makes it easy to capture a few expressions like sadness or happiness while they walk through your product.

Chapter 2

Problem Definition:

- Facial emotion detection is an easy task for humans but not for computers.[5]
- To achieve this we have used certain Machine Learning algorithms.
- We can use this as evidence to uncover whether an individual is speaking truth or not.

Chapter 3

Proposed System

The aim of the project is to develop a system of improved facilities. The system recognizes proper emotion.

The main objective of this work is to develop an application for facial expression. The application allows users to identify facial expression in real time. User get accurate result based on persons emotions.

The system is being built for:

- People who suffer from mental disorder.
- Market Research
- Gaming Industry

3.1 Feature and Functionality

The following features and functionality will provide the user a better and smooth experience:

- **Platform Independent:**

  User can use this system on any device.

- **Real-Time Emotion detection :**

  The emotion detection of user can change in real-time

- **Accuracy :**

  System will detect emotions with greater accuracy.

Chapter 4

Project Outcomes

This Final Project aimed to create a practical and useable product, which can be considered as software and even an educational tool.

- To discover emotions of the user.
- Implementation of machine learning algorithms.
- Platform Independent.
- Easy Interface & Easy to Manage.
- Users can detect emotion 24/7 anytime on any device.

Chapter 5

Software Requirement:

- **Streamlit** : It is an open-source web application framework for Machine Learning and Data Science Projects. We are using this library for developing our user interface.
- **OpenCV** : OpenCV is a library of programming functions mainly aimed at real-time computer vision. Originally developed by Intel, it was later supported by Willow Garage then Itseez. The library is cross-platform and free for use under the open-source Apache 2 License.
- **Tensorflow** : TensorFlow is a free and open-source software library for machine learning and artificial intelligence. It can be used across a range of tasks but has a particular focus on training and inference of deep neural networks.
- **Numpy** :NumPy is a library for the Python programming language, adding support for large, multi-dimensional arrays and matrices, along with a large collection of high-level mathematical functions to operate on these arrays.

Chapter 6

Project Design

the external process describes about the task which is done externally which the user can able to see and user can control. The internal process describes about the task which is done dynamically without the user involvement.[8]

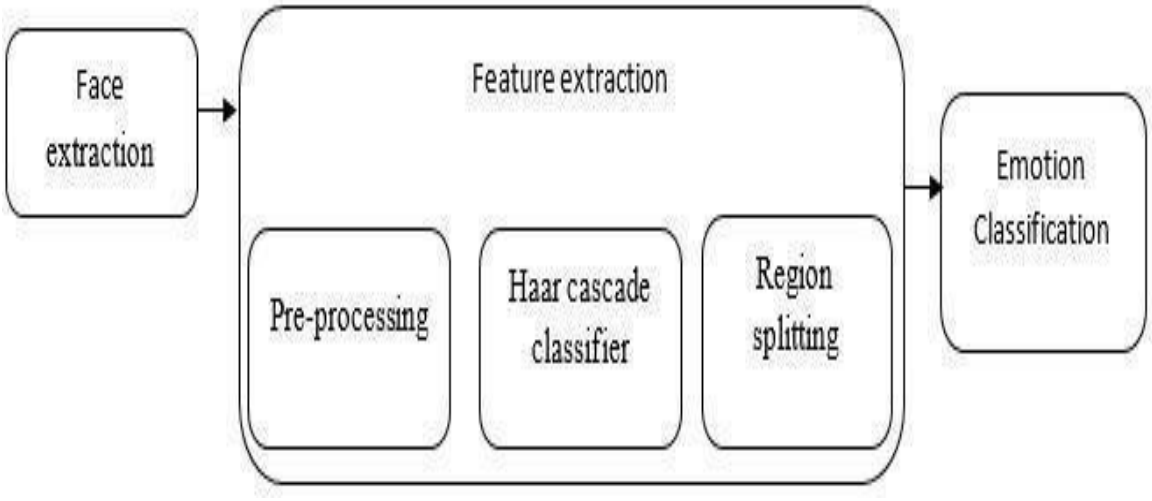

Fig 1. Architecture of Facial Emotion Recognition

FACE EXTRACTION

The human face is captured by using PC's web cam or external webcam. From that live steam the face is extracted and all other unwanted components are not considered. To achieve this efficiency and comprehensiveness I have picked the Violes-Jones Calculation for this task, so as to identify and remove the countenances. For this I have utilized the OpenCV library (to be specific classifier).[4]

FEATURE EXTRACTION

Pre-processing:

It is a common name for operations with images at the lowest level of abstraction for both input and output are intensity images. The aim of pre-processing is an improvement of the image data that suppresses unwanted distortion or enhances some image features important for further processing.[7]

Haar cascade classifier

A Haar Cascade is essentially a classifier which is utilized to recognize the item for which it has been prepared for, from the source. The Haar Cascade is prepared by superimposing the positive picture over a lot of negative pictures. The training is commonly done on a server and on different stages. Better outcomes are required by utilizing top notch picture and expanding the measure of stages for which classifier is prepared.[2] One can also use the predefined Haar Cascades which is accessible. Haar cascade classifier depends on the Haar wavelet procedure to analyse pixels in the picture into squares by work. This uses "integral picture" ideas to register the "highlights" distinguished. Haar cascades utilize the Ada-help learning calculation which chooses few significant highlights from an enormous set to give an effective result of classifier then use cascading techniques to detect face in a image.[3]

Region splitting

For the emotion recognition the main region of face under consideration are eyebrows and mouth. And the splitting of mouth and the eyebrows is named as region splitting.[8]

Expression Classification

This stage is performed by a classifier. There are various classifications methods used to extract expressions. Ekman defined two main types of classes used in facial expression recognition are action units and prototypic facial expressions.[8]

Chapter 7

Project Scheduling Template

Sr. No	Group Member	Time duration	Work to be done
1	Sourav Joshi	1st week of March	Training the dataset and testing
2	Sakshi Deshpande	3rd week of March	Creating front end of the application using Streamlit
3	Akshay Bura	2nd week of April	Connecting Front end and back end of the application

Chapter 8

Result :

In Fig 2. we can see that our application is guessing the emotion of the face i.e Neutral.

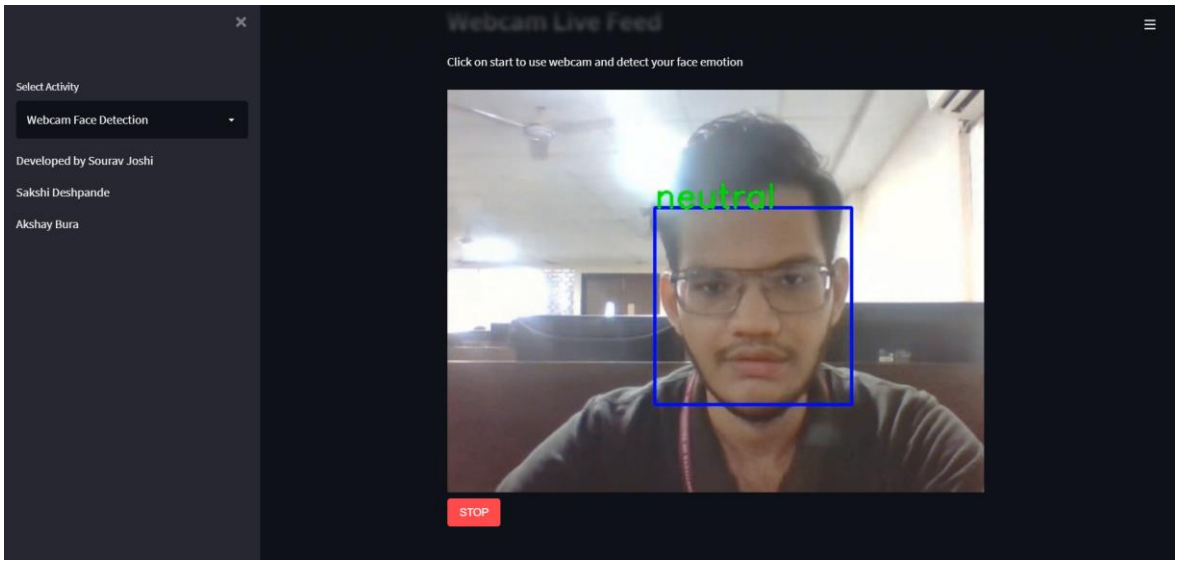

Fig 2. Neutral Emotion

In Fig 3. we can see that our application is guessing the emotion of the face i.e Happy.

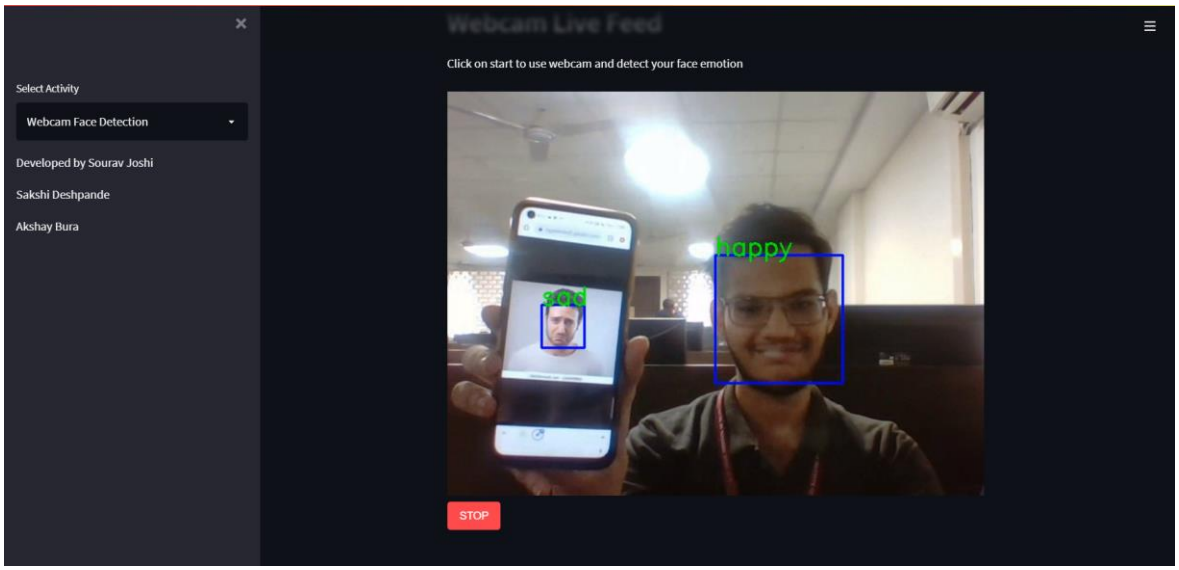

Fig 3. Happy Emotion

In Fig 4. we can see that our application is guessing the emotion of the face i.e Angry.

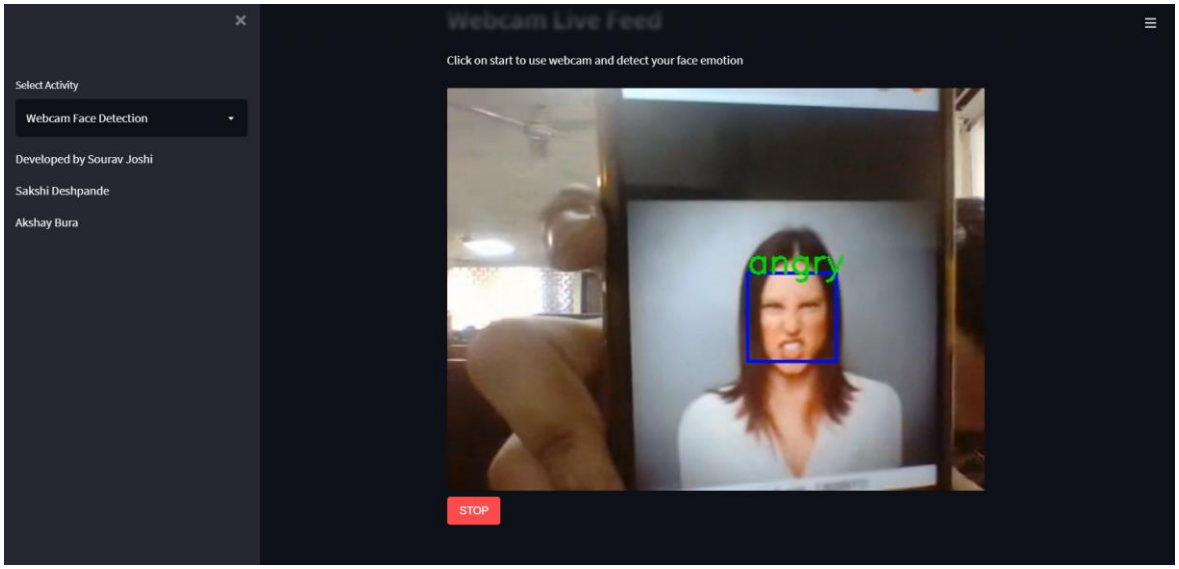

Fig 4. Angry Emotion

Code :

In below code we are training and validating the model using dataset.

```
# Train the model
history = model.fit(
    train_dataset,
    steps_per_epoch=len(Train_paths)//BATCH_SIZE,
    epochs=12,
    validation_data=val_dataset,
    validation_steps = len(Val_paths)//BATCH_SIZE,
    class_weight=class_weight
)
```

Using this code snippet we can start camera using button and detect the face emotion.

```
elif choice == "Webcam Face Detection":
    st.header("Webcam Live Feed")
    st.write("Click on start to use webcam and detect your face emotion")
    webrtc_streamer(key="example", mode=WebRtcMode.SENDRECV, rtc_configuration=RTC_CONFIGURATION,
                    video_processor_factory=Faceemotion)
```

Here we are loading the data and creating the model to guess the emotion of face.

```
# load model
emotion_dict = {0:'angry', 1 :'happy', 2: 'neutral', 3:'sad', 4: 'surprise'}
# load json and create model
json_file = open('emotion_model1.json', 'r')
loaded_model_json = json_file.read()
json_file.close()
classifier = model_from_json(loaded_model_json)

# load weights into new model
classifier.load_weights("emotion_model1.h5")

#load face
try:
    face_cascade = cv2.CascadeClassifier('haarcascade_frontalface_default.xml')
except Exception:
    st.write("Error loading cascade classifiers")

RTC_CONFIGURATION = RTCConfiguration({"iceServers": [{"urls": ["stun:stun.l.google.com:19302"]}]})
```

Chapter 9

Conclusion & Future Scope :

We have created an ML-Based model which can guess the emotions (such as Happy, Sad, Angry, etc) of the user. Our model uses the advantages of Neural Networks. This could be the starting step, for many of the emotion-based applications such as lie detector and also mood-based learning for students, etc.[7]
The proposed model has achieved a commendable result.[7]

- In the future, adding more data in each class in order to get more accurate results.[7]
- Saving data with name of person.[7]

In the future, we can try to develop the model more efficiently so that a more standard facial expression recognition system can be delivered.[7]

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