Emotion Recognition Feedback System using OpenCV

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Abstract–

This project is a real time Facial Emotion recognition system that follows the actual state of mind of the human. Human communicates their state of mind and in some cases what they need through their appearance. It very well may be a grinning face, or it tends to be the face loaded with outrage. Here and there words are not that strong as our looks. This venture comprises of models made through different calculations of machine as well as profound learning. It also includes some of the very powerful Python packages for creating applications that are constantly aware of human behaviour. Some libraries: TensorFlow, Keras, OpenCV, Matplotlib. Facial emotion recognition detects the emotions a person experiences through a webcam or CCTV footage of a face. This problem can be addressed with image classification as it helps the machine learn how to capture emotions from a webcam or camera. Gaining product feedback through emotion recognition helps the food industry learn customer feedback about products. And in the field of military, it can be useful. It can be very useful for identifying the people's behaviour at the border areas to find out the suspects between them. This project is an implementation of the circumstances. It mainly consists of two modules: (i)Filtering and achieve the model for the application using algorithms and (ii) Application for using the model using OpenCV to recognize the human facial expression.

Key Words: OpenCV, Real time Face Detection, Facial Emotion Recognition, Facial Recognition, Keras, TensorFlow.
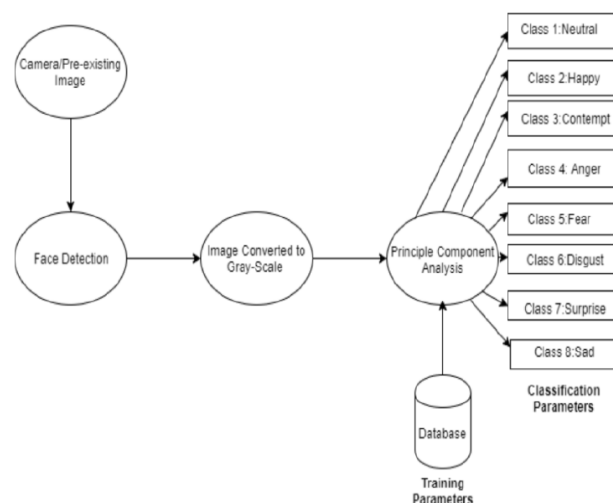
1.Introduction

Facial recognition is a very useful tool that has been actively researched in recent years. Facial recognition applications range from security cameras to emotion detection. Sentiment detection can be developed using Python OpenCV. Emotion detection or facial expression classification is a widely studied topic in the modern field of deep learning. Emotion detection OpenCV Python uses a camera to capture human emotions in real time. This is one of the advanced features of the machine learning process. Capturing human emotions with a camera is useful for a variety of research and analysis purposes. To analyze emotions in real-time using just Web camera and some lines of code is actually a big step towards Advanced Human Computer interaction. The perception of expression is made by using the machine learning concept. One can use the trained dataset to detect the emotion of the human being. For perceive the different emotions, first thing is needed for machine to train those different emotions, else can use a dataset already available on the

internet. OpenCV is an opensource library for computer vision, machine learning and image processing. OpenCV supports a wide range of programming languages such as Python, C++, Java, etc. By processing images and videos, it can identify objects, faces, and even human handwriting. It can integrate with various libraries, which are very streamlined libraries such as numpy, pandas, matplotlib, etc. It can also help you learn image processing from basic to advanced, such as working with images and videos, using a vast array of OpenCV programs and projects. OpenCV is one of the most popular computer vision libraries that presents the most basic and important OpenCV concepts in an intuitive way. OpenCV is an opensource initiative, to make contributions to the library, documentation, and tutorials. In further, we will talk through creating a Python program to detect the real-time emotion of a human being using the camera.

2. Literature Review

In paper [8], The authors have shown a Deep Learning alignment work, which is a vigorous face calibration procedure that is based on Convolutional NN. They have proposed Deep Alignment Network performs the face adjustments mostly depends on the whole face images in contrast to what recently face alignments techniques perform, which make it very accurate to immense fluctuations in both initializations and forehead poses. Using heatmaps which has landmark, and which transmits the detail of the locations of landmarks among DAN phases, it helped them to use face images instead of locally available marks which is extracted around landmarks. Extensive performance evaluation improves the ultramodern failure rate by a relatable limit more than 70% which were performed on two different challenges. In paper [9], The authors have shown the facial expression recognition system which is a real-world application and solves the phases occurred post changes made. At this stage, the authors created several new tests on the FER dataset and proposed a new "Regional Attention Network (RAN)" to indicate the importance of facial landmarks. They also demonstrated an

implementation of the "Region Associated Loss (RBLoss)" feature, which is used to increase focus on the most prominent areas. The authors also evaluated methods for collecting data sets and performed extensive studies on FER Plus and Affect Net. This paper proposes a method to obtain state-of-the-art results from various datasets including FER+, RAFDB, SFEW, and Affect Net.

Methodology

The data consists of a 48x48 pixel grayscale face image. These images were registered in 2013 with the face covering most of the center of the image and occupying the same position in each image. Kaggle ran a contest to classify this data set as one of the moods (0=angry, 1=hate), 2=fear, 3=joy, 4=sad, 5=surprise, 6=neutral). The fer2013 data set used in this project has two columns: "emotions" and "pixels". The "mood" column contains a number from 0 to 6 (inclusive) as described above for the emotions in the image. The second column has a row for each image. This string is a space-separated pixel value in string order. The data set only contains a "pixel" column and the task was to classify the sentiment column. The training sample consists of 28,709 examples. As a result of the study, Pierre-Luc Carrier and Aaron Courville made four of these data sets publicly available. Various implementations and comparisons have been made with models generated using different algorithms using different methods. This project demonstrates how this dataset can be further refined using

algorithms to focus more on important facial features and alignments. The percentage of accuracy predicted by the model gives you a better idea of what improvements can be made with multiple pre-processing iterations.

- ### Image Processing

Image processing techniques can be used to obtain magnified images and extract useful knowledge. This is a well-formed way to convert an image to a digital format and then do a number of things. This is a similar approach to signal processing where the input is a 2D image, a set of numbers between 0 and 255 representing the corresponding pixel

Libraries Installed

Numpy

NumPy, which stands for Numerical Python, is a library of multidimensional array objects and a set of subroutines for handling these arrays. NumPy allows you to perform mathematical and logical operations on arrays.

Keras

Keras is a deep learning Python library that can run on TensorFlow. It is designed to make research and development of deep learning models as fast and easy as possible.

TensorFlow

TensorFlow is an open-source machine learning framework for all developers. It is used to run machine learning and deep learning applications. To develop and explore exciting ideas in artificial intelligence, the Google team created TensorFlow. Because TensorFlow is built with the Python programming language, it is considered an easy-to-understand framework.

OpenCV

OpenCV is an open-source library for computer vision, machine learning, and image processing, which now plays an important role in real-time functions that are very important in modern systems.

Steps Followed to perform emotion recognition using OpenCV

1) Install all required libraries and use available data.

2) The data sets are grouped into two different directories. The first directory contains all expressions with label images and the second contains all information for checking expressions.

3) After running the dataset data images via Python code, all output images are sorted by expression and subsequent encoding order and stored in the check directory.

4) OpenCV allows you to define expressions using different types of classes.

5) The dataset is divided into a training set and a classification set. The training set is used to train emotion types by extracting information from a set of images, and the classification set is used to evaluate the performance of the classifier.

6) For best results, images should have the same properties, i.e., size.

7) Analyze the subject of each image, convert to grayscale, crop and save to catalogue.

8) Finally, compile the training test data and classify the classification set. Repeat this process to increase efficiency.

9) Then assign the ANN network and you will see a table with information about the layers and layer sizes, training model parameters.

10) The machine then trains and verifies on the model. The emotions can define are joy, sadness, fear, anger, surprise, disgust.

11) Epochs were set to 48 and got loss accuracy.

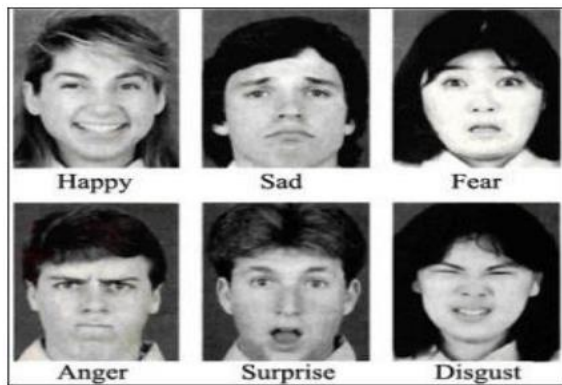A. Neutral. B. Happy. C. Anger. D. Disgust E. Surprise. F. Sad

Fig.4 Output of a sample image [9]

12) Finally, with Haar's cascading face classifier, the machine detects faces and their key features to help you better understand where by using webcam.

Future work

This can be very useful for recognizing the behavior of people in border areas to find the accused among them. The machine learning system for face recognition is particularly well suited for autism spectrum disorder (ASD) research, where people have developmental and long-term difficulties in assessing facial emotions.

Facial recognition is embedded in several available automotive systems that have been trained with machine learning. For example, in addition to the ability to understand if the driver is looking at the road, wearing a mask, or answering a phone call

3. CONCLUSIONS

Artificial intelligence can be used to solve interesting tasks like emotion detection, but this task was much more complex when using a large number of images. We humans, like our programs, sometimes make mistakes when recognizing someone's emotions. The optimal accuracy was almost 83%.

In this paper, we use Python 2.7, an OpenCV database, to recognize different types of human emotions and obtain interesting information about them.

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12. BIOGRAPHIES

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