Emotion Recognition Using ML

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Abstract— **In the fast moving modern world everything is changed to provide a better life for humanity. New developments make this as a reality. The importance of the automatic face detection and tracking system has increased asit is needed for video surveillance and new user interfaces. Face detection is a method of obtaining a face from an image that has certain characteristics in that image. Research on facial detection, facial recognition, facial tracking, placement restrictions are required. By providing a single image, the challenge is to get a face from that image. Face detection is a not an easy task because the face is not hard and changes in size, shape, color etc. With the amazing increase in the database of videos and images there is an astonishing need for automated understanding and testing of information by intelligent systems as manually it becomes too far away. Face plays a major role in social interaction in a society that transmits identity and emotions. Humans do not have the ability to pinpoint different faces than machines. Therefore, the automatic face detection system plays an important role in facial recognition. In this paper, we intend to Implement a real-time Face detection and emotion detection from high definition video using Python, OpenCV and Django. OpenCV libraries are used for face detection and tracking the head poses position. The experimental result computed by using computer vision OpenCV framework library.**

Keywords— Python; Django; OpenCV; WebCam

1. INTRODUCTION

Face detection and recognition technology used to identfy a person from a video or an image source. Face detection is a computer technology that determines the locations and sizes of a person's face in illegal (digital) images. It captures facial features and ignores anything else, such as buildings, trees, and bodies. Human face recognition is currently an active research site in the computer viewing community. Face-to-face detection is the first step in applications such asvideo surveillance, personal computer interface, face recognition and image data management. Detecting and tracking people's faces is a requirement for facial recognition and / or facial analysis, although it is often assumed that a normal facial image is available. In the program Face recognition in the 1960s was presented by Woodrow Wilson Bledsoe[1]. Bledsoe made a divisive device facial images by hand using what is known as a RAND tablet,a device that people can use to place horizontally and vertically connects to the grid using a pen similar to a removable pen electrical pulses. Since then the recognition system is constantly upgraded and improved, The technology is slowly and steadily growing widely used in daily life. Widely used to the legal profession and to the military[2].

In fact, the face recognition system was used to help verify the file Who is Osama bin Laden after his assassination in the U.S. The face recognition system is also widely used in device protection cell phones. In this paper, we suggest that face detection and vision system using python with an OpenCV package.

2. RELATED WORKS

Robust face detection and real-time play an important role in many application scenarios such as biometrics, frequency as part (or combined) and face recognition system. It is also used for video surveillance, personal computer interface and data management. Some recent digital cameras use autofocus face detection. Face detection also helps in selecting attractive regions for slideshow photos using Ken Burns pan-and-scale effect. Face detection finds the seller's interest. A webcam can be integrated with a television and detect any passing face. The system then calculates race, gender, and range of facial age. Once the information is collected, a series of ads specified for race / gender / age may be played[3].

In education sector, emotion recognition is a very important part of intelligent electronic learning systems. However, supporting the emotional side of students during learning activities is challenging and requires awareness of students' feelings[4]. The purpose of this situation is to evaluate educational resources, especially those that are designed for self-study. In grade and electronic education one of the key to success is the training of students to follow a givenlearning path. When a person fails to cope withinconsistency and attention, learning processes are stoppedor abandoned. One of the most commonly cited reasons fordropping out of school is: "Tired resources". In this case themonitoring of the student's interactions with the resources iscombined with monitoring his or her emotional state inorder to identify the components of the resources that arecausing boredom. That information can be used to removeweak points and improve the quality of the overall service. A study done for enhancing website usability, With thegrowth of the internet, service providers are collecting moreinformation about their users. Based on this data, content,layout and ads are displayed according to user profile.Adding information about users' feelings can provide moreaccurate personality models for users. Study shows two different situations, the first to examine how the feelings of webmasters affect their behavior on websites, and the

second to determine which emotions are triggered by the different types of online advertisements[5].

Study and analysis done for video games reveals that there are a number of factors that can affect a person's behavior during a game. They may be categorized into game-related features, such as increased monotony or familiarity with the game, and independent features linked to the current physical and mental state of the user player. The first group of reasons may be to some extent predicted or limited by the game designer but that is not possible for the reasons of another group[6].

This is why real-time recognition of player impact may be so important in the video game industry in the near future.

3. DESCRIPTION OF TOOLS

In this section, the tools and methodology to implement and evaluate face detection and tracking using OpenCV are detailed.

Open CV

OpenCV (Open Source Computer Vision Library) is a library of programming functions mainly aimed at real time computer vision, developed by Intel. The model of OpenCv is shown in figure 1. The library is cross-platform. It focuses mainly on real-time image processing[7].
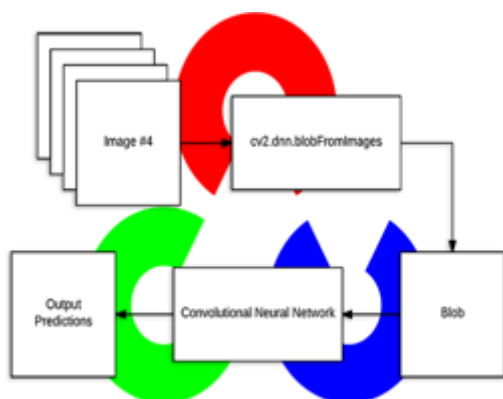
MODEL OF OPENCV

Figure 1

OPENCV processing

4. FACE DETECTION

Face detection is a computer technology that determines the locations and sizes of a human face in digital images that we can keep in a completely different order. It captures facial features and ignores anything like structure and body. A common example of face recognition occurs when we take pictures with our smartphones, and we quickly find a face in a photo. Face detection is different from facial recognition. Face detection only detects the presence of a face in an image while facial recognition involves identifying whose face as described in figure 2 [8].

Face detection is done using separators. Distinguishing is actually an algorithm that determines whether a given image is positive (face) or negative (not face). The separator needs training on thousands of facial and facial images. Fortunately, OpenCV already has two pre-trained face detectors, which can be easily used in the program.

Figure 2

Face Detection using OpenCV

5. CASCADING CLASSIFIERS

The cascade separator has several sections, where each class is a group of weak learners. These are weak learners are simple dividers called stumps of decisions. Each one the class is trained using a technique called boosting. Encouragement provides the ability to train the most accurate separation with taking a balanced measure of decisions made by the weak learners[9]. Finally, in the principal recognition module facial features from the new video are removed. After that those features are compared to a list of items maintained during training and the one with the best game. The name of the person being seen is also displayed. This the monitoring system fulfills the basic requirements for face detection and the recognition system, which also looks at costs to ensure the spread mode is as economical as possible[10]. In addition, it can be combined with real-time analysis high efficiency.

the separators are based on comparisons of skin histogram, eye and mouth detection. First, photographs of people are processed according to the pre-processing stages of Haar, almost without negative rejection of the human face but with some negative acceptance (false positives). Second, in order to eliminate this negatively accepted non-human face mask, a weak section based on the histogram of facial skin is used and most of the non-human face is removed[11].

Mouth detection classifier is applied to the remaining non-human face and the false positives are further reduced. With the help of OpenCV, the test results in images of people under different closures and lighting and a certain level of individual rotation and orientation, in both the training set and the test set indicate that the proposed algorithm is effective and achieves modern performance. In addition, it works because it is simple and easy to use[12].

6. STRCUTURE OF FACIAL FEATURE EXTRACTION

Face acquisition is a processing degree to mechanically find the face vicinity for the enter pictures or sequences. it may be a detector to discover face for each frame or simply come across face inside the first frame after which it tracks theface inside the the rest of the video sequence. to address large head movement, the top finder, head tracking, and pose estimation may be applied to a facial features analysis device[13].

After the face is placed, the following step is to extract and represent the facial changes resulting from facial expressions. In facial function extraction for expression evaluation, there are particularly kinds of techniques: geometric characteristic-primarily based methods and face- based techniques. Feature extraction are performed to determine the prediction of the algorithm. Some of the facialfeatures used for analysing the accuract of different algorithms include eyes, nose, and face.Different light has a profound effect on prominent and straight facial features, although the amount of definition varies greatly, but the variability of the feature is not very different. Compared to normalcy, the features of expressions are quite different. The reason may be that different expressions may cause facial distortion, and factors based on distance measurement have a greater impact, leading to greater variability[14]. Thegeometric facial features serves the form and locations of facial components (together with mouth, eyes, brows, nose, etc.)[15]. The facial additives or facial characteristic factors are extracted to shape a function vector that represents the face geometry[16]. With look-based methods, image filters, such as Gabor wavelets, are applied to either the whole-face or specific areas in a face photograph to extract a characteristic vector. relying at the different facial characteristic extraction techniques, the consequences of in-aircraft head rotation and unique scales of the faces can be removed through face normalization before the characteristic extraction or by way of feature representation earlier than the step of expression recognition.

7. COMPARATIVE STUDY FOR FACIAL EXPRESSION RECOGNITION SYSTEM

After the analysis of different methods available for the process of recognizing emotions. The study indicates the helpful classifications from an image can be extracted with the resource of image processing. The processing transforms image pixels to digital form and performs positive operations to extract useful classifications[Useful Classifications can be described as different emotions of a human face such as happy, angry, sad][17][18].

Classification is mentioned in figure 3. It is done after the image processing through several techniques, as follows:

- Image Acquisition-

The facial recognition is maximum common place for facial photograph acquisition, however colour pics are capable of conveying extra emotional information which includes blushing[19]. 2-D grey image of facial appearance scale popularity is maximum popular. In future coloration pics,

due to the low cost of colour picture gadget, they would choose to be the same[20][21]. Webcam and other devices with an operable camera can be used for image acquisition.

- Pre-Processing-

Preprocessing section improves input image upto the satisfactory requirements and locates processed data by noise reduction and pixel fluidity[22]. It gets rid of photo redundancy without the specifics of the image filtering and normalizing the picture which produces uniform dimensions and a circled photo is included in pre-processing.

- Segmentation-

Segmentation divides the image into critical factors. Image segmentation is a way of splitting the photograph at the foundations for texture, vertices and pixels into ongoing segments and automatic regions that match diverse items within the image[23].

- Function Extraction-

The removal of capabilities is probably regarded be a part of "interest." They covers shape, movement, shade, facial image texture. The meaningful image of understanding is extracted. compared to authentic photo extraction, the photograph element, which presents benefit in storage, is significantly decreased[24].
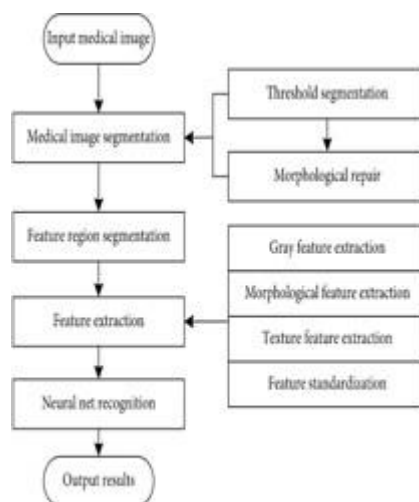
Function Extraction mechanism

- Categorization-

The classification technique parallels the extraction segment. The classifying stage defines, groups and allows to differentiate facial pics according to their respective distinguish segments. It is a dynamic manner because many elements can impact it [25][26]. This section may also be categorized as image feature selection stage, methods data extracted and grouped according to positive parameters.

8.　IMPLEMENTATION

OpenCV, Python 3.8, Django 3 and a webcam. PC preferably running windows, webcam w/usb interface, and webcam together.

OpenCV (Open Source Computer Vision Library) is a library of programming functions mainly aimed at real time computer vision, developed by Intel. The library is cross-platform. It focuses mainly on real-time image processing.

WEBCAM:
The PC's webcam to compute the face and motion in a video frame.

Django:
Django is a web-free and open-source framework based on Python that follows the pattern-building pattern of template-views (MTV). It is maintained by the Django Software Foundation (DSF), an American non-profit organization founded as a 501 (c) nonprofit.

9.　AREAS OF APPLICATION

In a quick and rapidly evolving technology era increase, a smart device that is aware human emotion needs to be advanced. The recognition of facial expressions is a lively place of studies with many software related application:

i). In psychological studies.
ii). Social robot system for emotion detection. system.
iii). Automatic system of advice.
iv). Identification of the mental condition.
v). Synthesis of face expression.
vi). e-learning feedback system.
vii). Private science. Medical practice.
viii). Mood Music.
ix). The consumer may actively provide suggestions on TV programmes, using interactivated TV applications.
x). Driving System warning.

10.　RESULT

A face emotion detection algorithm can get more than one result or there is only one face in the frame. In this case, image processing is done after removing the direct link to OpenCV libraries and SimpleCV Haar Classifier. If the output of the system gives more than one rectangle, indicating the shape of the face, the distance between the rectangles is calculated. If this distance is less than the predetermined limit, the rectangular scale will be calculated and set as the last position of the obtained face. In this paper we also use a face tracking system in Python language usingface emotion detection. This method is validated and systemlimitations are detected by checking and removing errors in our codes. And then, limited to Python performance, we go to OpenCV to check the speed of this face emotion tracking

program. We found that HAAR cascade algorithms are certainly upto the mark of getting almost accurate results for catching the facial expressions in a video frame.

11.　CONCLUSION

In this paper we proposed a system of facial emotion detection system and visualization using opencv. Here the pictures of the people data sets are defined and trained before detection. Haar cascade algorithm is used for face detection and emotion recognition detection within a video frame. In the future, as technology evolves, additional features in advance will be added to the system

12.　REFERENCES

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