Emotion Elicitation using Machine Learning Techniques

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ABSTRACT

Humans are capable of producing thousands of facial actions during communication that vary in complexity, intensity, and meaning. Facial expression recognition system requires overcoming the human face having multiple variability such as colour, orientation, expression, posture and texture so on. For human-computer interaction facial expression makes a platform for non-verbal communication. So, this project mainly depends upon human face as we know face reflects the emotion. In this work we have used an existing algorithm Local Binary Pattern Histogram of python and got good results. In this paper, comparison of our project work with the existing Emotion Recognition System has also been done.

Keywords: Emotion recognition, face recognition, deep learning

I. INTRODUCTION

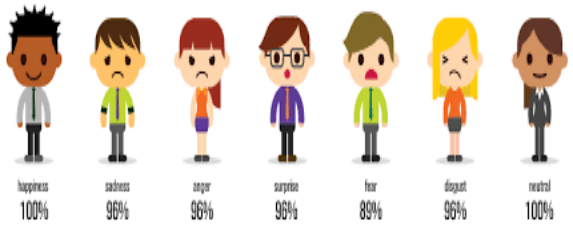
The human face plays a prodigious role for automatic recognition of emotion in the field of identification of human emotion and for interaction between human and computer for any real application. The emotions are effectively changeable so in real life application, detection of emotion is very challenging task. Human Emotion plays a vital role in a day-to-day activity. In communication purpose, to know how effective the role in delivering the topic and understanding capability for a person which comes in the form of expression before analyzing the situation. The expression delivery comes from brain which was previously seen or learnt situations in daily routine. This format is analyses from human brain but for computers to know the emotion, a pre-defined set of data is stored to analyze and recognize the emotion with its data trainers and graphical models to get the percentage of emotion.

At different kind of moments or time human face reflects different feelings/emotions. In addition to that, some facial expressions may be similar but indicates various meanings for different expression intensities. In order to capture the subtlety of facial expression in non- verbal communication, we used an existing algorithm (LBPH - Local Binary Pattern Histogram) which will be able to capture human emotions by reading or comparing facial expressions. This algorithm automatically extracts features and discriminate different facial expressions precisely also estimate expression intensity or percentage.

In this scenario, the machine learning algorithm (LBPH) is used to recognize emotion. This produces hierarchical representation of raw data with little pre-processing and produce the accurate results for the image emotion.

II. HUMAN EMOTIONS

Human Emotions are basically categorized as 5 types: Happy, Sad, Angry, Surprise, Neutral. Facial expression recognition system requires overcoming the human face having multiple variability such as color, orientation, expression etc. The computer system follows some etiquette to recognize the images which is expressed to interact with computer system.



Different Human Emotions

In spite of the difficulty of precisely defining, the emotion is omnipresent and an important factor in human life. People's moods heavily influence the way of communicating, acting according to the situation and reaction on state mind set. For example, a one-to-one interview process is conducted in online, the interviewer analyze the subjectivity of the candidate and the expressions was detected by 'AI' technology in the machine to check whether the candidate is fit and eligible for the job. The expressions are captured by the interviewer and way the candidate delivers is noted in this process. The proposed human emotion detection is very important in balancing the situations and routine comes in daily activities.

For the computer communication via machine learning process, the raw data of human emotions which is the information to analyze the given emotion stored in a file (.csv) format. To report the current emotion in different situations, the trainers are used to separate the human emotion pictures and for the given emotion the algorithm builds the model to explore data in number of iterations to get the percentage of image as evaluated and deployed it with accurate results.

The focus of human emotion is to improve and empower the situations faced by human-computer interactions. The

delivery of emotion which has perceptual effect, adaptive, psychological adjustments and goal oriented system behavior.

III. ALGORITHM

Step 1: Creating data set of faces

By using cv2 we create data sets and give numeric face id for each emotion.

Step 2: Training images

In this step we train the system with the given images and we use Local Binary Pattern algorithm for recognition of faces, Harcascade for face detection.

```
path = 'dataset'
recognizer = cv2.face.LBPHFaceRecognizer_create()
detector = cv2.CascadeClassifier("haarcascade_frontalface
_default.xml");
def getImagesAndLabels(path):
    imagePaths = [os.path.join(path,f) for f in os.listdir(path
)]
    faceSamples=[]
    ids = []
    for imagePath in imagePaths:
        PIL_img = Image.open(imagePath).convert('L') # con
vert it to grayscale
        img_numpy = np.array(PIL_img,'uint8')
        id = int(os.path.split(imagePath)[-1].split(".")[1])
        faces = detector.detectMultiScale(img_numpy)
        for (x,y,w,h) in faces:
            faceSamples.append(img_numpy[y:y+h,x:x+w])
            ids.append(id)
    return faceSamples,ids
```

Step 3: Recognition

After trained the system we do testing with the images from the given sample and take a new image and give it to the trained

```
for(x,y,w,h) in faces:
    cv2.rectangle(img, (x,y), (x+w,y+h), (0,255,0), 2)
    id, confidence = recognizer.predict(gray[y:y+h,x:x+w])
    if (confidence < 100):
        id = names[id]
        confidence = "  {0}%".format(round(100 -
 confidence))
    else:
        id = "unknown"
        confidence = "  {0}%".format(round(100 -
 confidence))
    cv2.putText(img, str(id), (x+5,y-
5), font, 1, (255,255,255), 2)
    cv2.putText(img, str(confidence), (x+5,y+h-
5), font, 1, (255,255,0), 1)
```

Step 4: Display detected images

After the recognizing the expression is done display the image with its expression details and percentage of expression that is present in the image.

Step 5: End

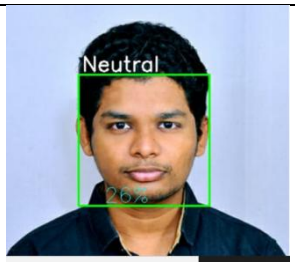
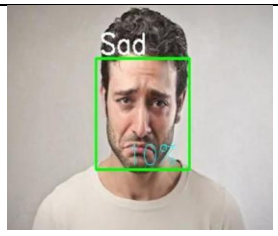
IV. METHODOLOGY

The first step is collection of dataset with contains different images with various expressions. An id was generated to each emotion/expression in the dataset available like for example 0 for angry, 1 for sad, etc. Then we train the model with the images having expressions. Local Binary Pattern Algorithm (LBP) was used for the recognition of faces. LBP algorithm makes the pixels of the image to a binary number vector which can be used to process on the data easily. With this we can represent the images as a simple data vector. 80% of the sample images are used to train the model and the remaining samples were used for testing the model. In training phase the model was trained based on the data vector that was made by the Local Binary Pattern Algorithm. After the training stage we test the model with the images from sample data. In testing phase we get the accuracy of the model. Based on that we can proceed with the model or we can train the model with some more sample images until we get the best accurate model. Then a new image was given to the system. The model processes the image and gets the expression from the image. Then it attaches the expression and its percentage to the image. Then final image was displayed.

RESULTS

Firstly in our program we should import the files which are stored with images and stored in csv files. After that, it resizes the image from 28 to 10 pixels. After it crops the mouth from the face, it converts the image into grayscale and RGB values. It flattened into a vector of length 280 with each entry representing the grayscale of a pixel. The compiler converts the array into training data and it is loaded in the program as files, neutral and a smiling face. After the image which is to be processed is kept in the image files and then the image name is given in the command prompt. When the image name is given it is processed by using the algorithm used in that the image is compared by the image sets which are neutral, sad, angry etc. After that the emotion of the image is detected and also the percentage of the emotion is detected.

Table 1: Recognizing the different emotions

Picture	Emotion description
	The picture represents Neutral emotion with 26%
	The picture represents Surprise emotion with 61%
	The picture represents Happy emotion with 33%
	The picture represents Sad emotion with 10%
	The picture represents Anger emotion with 23%

FUTURE WORK

Future improvements of emotion detection can be done by following practices. Firstly the data set sets should be more so that the accuracy will be increased in the detection of the emotion. The training the dataset should be done set wise, so that the results will be more accurate.

As in our project because of the time constraint lot more emotions are taken and detected although it is a risk and time taking process many more emotions should be considered and training for each and every emotion should be done to get more accurate results. Training separately increases the detection rate in future. As of in our project the training is not done separately for each and every emotion but it provided accurate results. Finally using large data set and training separately increases the rate of emotion detection in the network
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