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Emotion Detector

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ABSTRACT

This project is a method of recognition in real time that traces the human mood itself and to map out the human behaviour traits with their physiological features. Recognition of emotion is the phase of human emotion identification. In recognising the emotions of others, people vary widely in their precision. Usage of this technology is to help people with emotion recognition is a relatively nascent research area. In general, if several modalities are used in connection, the technology performs better. Most work has been performed to date to automate the identification of video facial expressions, audio spoken expressions, written text expressions, and physiology as measured by wearables. A real-time recognition framework was built in this project that traces the very mood of the individual using some of the libraries such as Keras, OpenCV, Tensor flow, SciPy, The Python Alternative To Matlab, etc. HOF and SVM were used to tackle the problem of recognition. At each point, optical flows calculate the rotation between two frames relative to an observer. For image recognition, the Deep Convolutional Neural Networks were used. It was concluded that the application of the proposed strategy was accurate and effective.

KEYWORDS: *Emotions, Automatic Recognition, Facial expression, Keras and Open CV HOF and SVM, Optical Flow, DCCN*

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INTRODUCTION

Human facial expressions are mainly divided into serval emotions. They are basic emotion: sad, happy, surprise, fear, disgust, anger and neutral. Our facial emotions can be expressed through activation of specific sets of facial muscles. These complex signal in an expression often contain an abundant amount of information about our state of mind. For example, Host of the function may use these metrics to evaluate audience interest. Healthcare department can provide better service by using additional information about patients' emotional state during treatment. Entertainment show producers can monitor audience engagement in events to consistently create desired content. Humans are well-trained in understanding the others emotions, in fact, at just 2 year old, babies can already tell the difference between happy and sad. But can technology do a better job than us in accessing emotional states? To answer the question, we designed a deep learning neural network that gives machines the ability to make inferences about human emotional states. In other words, we try to give them eyes to see what we can see.

The data set which was built by the students and each of them are recorded a video expressing all the emotions with no directions or instructions at all. Some videos have more body parts than others. In cases, videos have objects in the background even different light setups. We wished this to be as general as possible with no restrictions at all, so it could be a very good indicator of our main objective. The code detectfaces.py just spot the faces from the video and we saved this video in the dimension 240x320. Using this algorithm creates shaky videos. Thus we then stabilized all videos. This can be done via a code or online free stabilizers are also available. After we stabilized videos and ran it through codeemotionface.py. in this code we developed a way to extract features based on histogram of dense optical flows (HOF) and we used a support vector machine (SVM) classifier to tackle the recognition problem. For each video at each and every frame we extracted optical flows. Optical flows measure the motion relative at every observer between two frames at each point of them. Therefore, at each point in the image you will have two values that describe the vector representing the motion between the two frames: the magnitude and the angle. In this case, every videos is have a resolution of 240x320, each frame will have a feature descriptor of dimensions 240x320x2.

So, the last video descriptor will have a dimension of #framesx240x320x2. In order to make this video comparable to other inputs (because inputs of different length will not be comparable with each other), we need to somehow find a way to summarize the video into a single descriptor. We achieve conclusion of the video by calculating a histogram of the optical flows. This is, separate the extracted flows into categories and count the number of flows for each category mentioned. In order to obtain more details, we split the scene into a grid of s by s bins (10 in this case) in record the location of each feature, and then we classified the direction of the flow as one of the 8 different motion directions considered in this problem.

After this, we count for each & every direction the number of flows occurring in every direction bin. At last, we end up with an s by s by 8 bins descriptor per each frame. Now, the summarizing step for each& every video could be the

average of the histograms in each grid (average pooling method) or we could just pick the maximum value of the histograms is shown by grid throughout all the frames on a video (max pooling For the classification process, we are using support vector machine (SVM) with a non linear kernel classifier, created (discussed) in class, to recognize the new facial expressions. We also have taken into considered a Naïve Bayes classifier, but it is widely known that svm outperforms the last method in the computer vision field. A confusion matrix that can be made to plot results better.

The main purpose of this project is to develop Automatic Facial Expression Recognition System which can take human facial images containing some expression as input and recognize and classify it into five different expression classes such as: I. Neutral II. Angry III. Happy IV. Sadness V. Surprise.

Problem Statement

The classification of human expressions can be done easily to joy, depress, shock, impartial, anxiety, rage and disgust. By triggering unique sets of facial muscles, our facial emotions are conveyed. An expression can give us a lot more description than words in a single statement. The emotion detector will help us to recognize emotion which will help us to measure the details and services of the viewers. For example, to assess consumer demand, merchants can use these metrics. By using additional knowledge about the mental status of patients during therapy, healthcare providers may deliver improved support. In order to reliably generate desired content, entertainment producers should track audience interest in activities.

But in accessing emotional conditions, can machines do a better job than us? We built a deep learning neural network to address the issue, allowing computers the power to extract knowledge about our emotional states. A method was developed to recognize facial expression consists of the following:

1. To locate face (e.g. from an image; this step is also known as face detection) in the picture,
2. Features from the facial details were then extracted from the desired region (e.g. to detect the outer lining of the facial composites; this stage is referred to as the extraction of the facial feature),
3. The next step is used to analyse the action of face emotion or any differences in the deliverance of the features of face and group their details into different categories like movement of muscles of face such as frowning, anger, pleasure, rage, group of mood such as (dis)liking or ambivalence, etc. Experiments have been conducted to aim to create an Automatic Recognition System and to increase its efficiency for emotion detection.

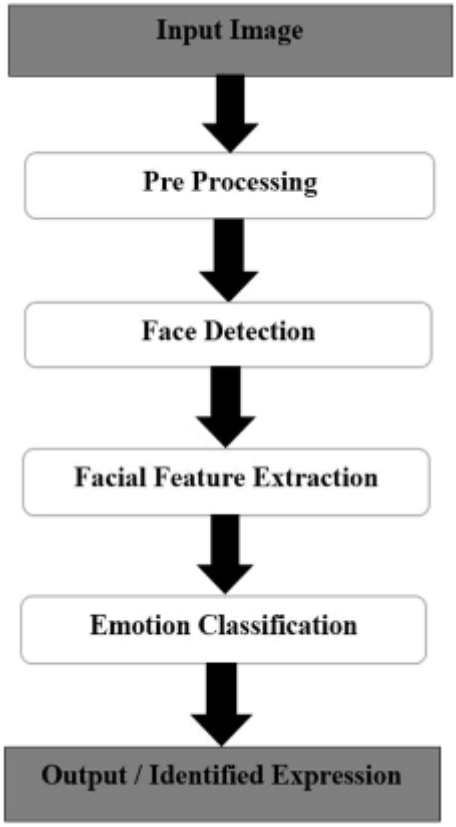


Figure 1: Flowchart of Problem formulation of our project

Algorithms Identification of Image Based Face.

For the identification of facial expressions, numerous methodologies have been established. The primary task to be done is feature extraction from the given images. To provide extraction of functionality after consideration of approaches.

A. Key Review of Components:

In most pattern recognition systems, Principal Component Analysis (PCA) is a classic instrument used in the appearance-based approach to dimensionality reduction and feature extraction. The basic PCA technique used in the method of face recognition is referred to as the approach to your own face. This transforms the face into a small set of essential features, the individual faces that are the main component of the learning image set. Recognition is obtained by projecting a new picture into the subspace of your own face.

B. Part Research Independent:

The extended version of the main principal components is Independent component analysis (ICA). This feature extraction approach offers increased performance over the main function component analysis.

C. Extraction for Face Recognition Linear Discriminant Analysis dependent function:

An usual technique used to decrease the dimensionality is Linear Discriminant Analysis; which is done by transforming the detailings from high to low dimension by removing the unwanted features. This application is majorly used for machine and deep learning systems.

D. Function Extraction using Vector Machine Support:

To extract discriminatory information from the training data, the Support Vector Machine (SVM) approach is used. It's a form of binary grouping. The support vector machine offers improved performance than the extraction of features based on key component analysis. Function extraction can be achieved using wavelet transformation on the help vector machine. A For this method, haar transformation may be the most suitable transformation. The Haar is applied on qualified positive and negative results.

E. Transformation of Successive Mean Quantization (SMQT):

Grouping of data and identification can also be carried out using a successive mean transformation of quantization and sparse network of window (SNOW) This is the extraction function created using the SNOW classifier.

F. Function extraction based on the Convolutional Neural Network with Gabor Filter:

An integrated classifier tool is convolutional neural networks. This uses an image's local receptive fields, their shared weights and sub-sampling to isolate and then merge characteristics in a distortion-invariant format. The function extractor is generated through the learning process.

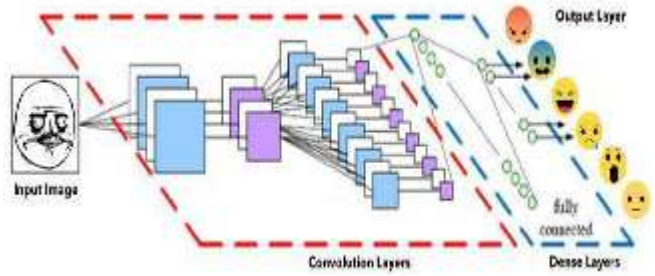
CONVOLUTION NEURAL NETWORK (CNN)

The techniques of deep learning and artificial intelligence are evolving as an advancement in the area of facial recognition research and its related applications. To learn the pattern of data with several stages of feature extraction, these approaches add multiple processing layers. A dominant deep learning approach has become the Convolutional Neural Network for face recognition.

In accordance with the convolutional network, AlexNet, VGGNet, GoogleNet, ResNet network architecture is available to maximise system performance. A statistical model for solving the problem of optimization used to classify and distinguish images is a convolutionanleural network. It is meant to consider developments. The identification of patterns requires numerical knowledge that responds to images, messages, voice signals, etc.

CNN is analogous to a general network of neurons. They are made up of neurons used for image recognition that have weights and biases. The neurons are called convolutional neurons in the convolutional neural network. The generalised convolutional network layout consists of the convolution layer, the pooling layer and the flattening and completely convolutional output layer of output. The convolutional neuron layer takes the reference picture of the dot product.

The network expresses itself as a single distinguishable score function. The neural network convolution operation is responsible for searching for the patterns present in images. CNN's main parameter is the size of the filter. The pooling layer is used to reduce computation, which will decrease the spatial image size, is another important parameter in the convolutional network. The most important factor for converting input into output via neural networks is the activation function. The Sigmoid functions are called the activation function.



ALGORITHM

Phase one:- Collection of the image data package. (We use the FER2013 archive of thirty five thousand eight hundred and eighty seven which was edited prior, forty eight by forty eight photographs with grayscales were present each labelled with one or the other emotion of the six types i.e. rage, disgust, terror, satisfaction, sorrow, surprise, and neutrality.

Phase two : Prior processing of image

Phase three : To detect image of the faces

Phase four : Transformation of detected faces into grayscale pictures.

Phase five : This phase assures that image can be inserted as a (1, 48,48) numpy array into the input layer.

Phase six : Passing the numpy array into the layer of Convolution2D.

Phase seven : Feature maps are created by Convolution.

Phase eight : The MaxPooling2D pooling approach the detailing of the diagram by using a two by two dimension of window, which includes the whole values.

Phase nine : The reverse and forward propogation of neural network was organized on the values of pixel during preparation.

Phase ten : For each emotion type, the Softmax function expresses itself as a chance.

This design viewed us the in depth probabilities of each facial expression of human and its composition.

Database:

Kaggle Facial Expression Recognition Competition was the database used for this design. Forty eight by forty eight pixel grayscale pictures were used an input source. The facial expressions of the images were inserted in a dynamic manner so that it can be zoomed in and in each image the equal space is utilized. Main target is to classify every emotion into one of the different emotion. (0=Angry, 1=Disgust, 2=Fear, 3=Happy, 4=Sad, 5=Surprise, 6=Neutral) based on the emotion displayed in the facial expression.

28,709 examples compose of the instruction package. The dataset included three thousand five hundred eighty nine

instances of the common test for the leader board; other illustrations were also composed for the last set of data to state the champion of the adversaries.

The emotion labels used were:

- Zero to four five nine three label images were used for the expression of furious
- One to five four seven label images were used for the expression of displease
- Two to five one two one label images were used for the expression of horror
- Three to eight nine eight nine label images were used for the expression of joy.
- Four to six zero seven seven label images were used for the expression of depression
- Five to four zero zero label images were used for the expression of shock
- Six to six one nine eight label images were used for the expression of unbiased or neutral

Figure2: Different emotions which are to be detected

Results

The emotion detector build by the software processed the following results of the input applied as the result.

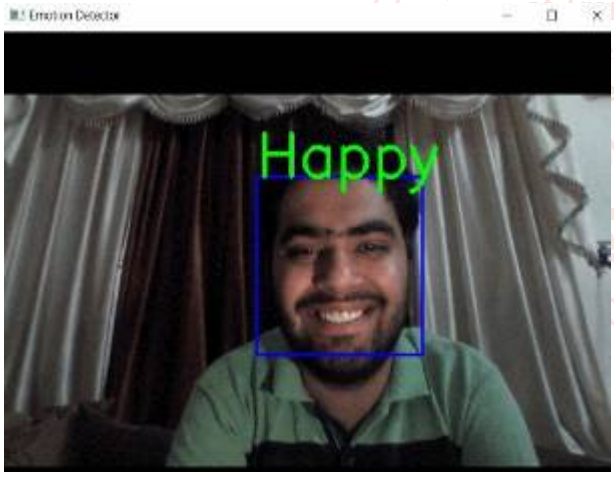


Figure 3: Output of the happy emotion detected.

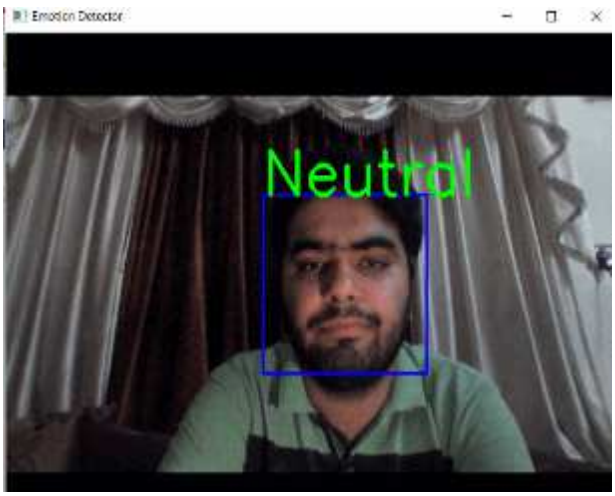


Figure 4: Output of the neutral emotion detected

Figure5: Output of the sad emotion detected

Figure 6: Output of the angry emotion detected

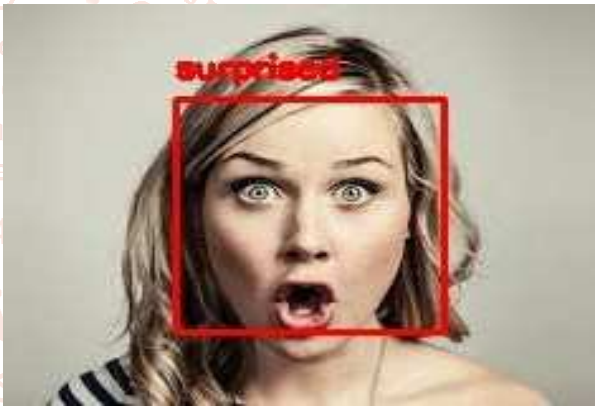


Figure 7: Output of the surprise emotion detected

Conclusion

In this research study the behavioural characteristics of people were mapped with the physiological features of biometric which is indulged in facial expressions. A base matching protocol for this system was developed in correlation with features of human face by using geometric structures for expressions like joy, sorrow, anxiety, rage, surprise and neutral. The behavioural component of this system, as a property base, relates to the mindset behind various expressions. The property base was raised and hidden features were exposed in terms of algorithmic genes. In the field of biometric protection, the gene training collection tests the expressive individuality of human faces and gives us an efficient design. Invention of the modern biometric-based asymmetric cryptosystem with features such as hierarchical community authentication removes the use of password& smartcards as opposed to earlier cryptosystems.

For all other biometrics systems, it needs special hardware support. This study gives us an insight to a new way to an

attractive field of asymmetric biometric cryptosystems in order to overpass the problems related to security codes and smart cards. The analysis of the data from the research reveals physiological characteristics are effectively identified by hierarchical safety structures in geometric shape identification.

Future Work:-

A neural network is a complex structure there is no existence of a simple form for its operation. Each problem requires an unique construction of network links and many trails and miscalculations to receive the desired precision. So the existence of Black Box Algorithms as neural nets developed.

An accuracy of almost 70 percent was obtained from the project which was concluded to be a better model when compared to the earlier architecture design models. In specific areas; however, we need to change, such as—

- Amount of convolutional layers and configuration
- Number and setup of dense layers.
- Percentage dropout in dense layers

But we could not go further into dense neural networks because of the lack of a highly configured system as they are slower to progress in this stream when we try to pursue it in the coming time.

In order to make the model more and more precise, it was trained to insert more quantity of database sets in system, but was not a success because of the obstructions which was faced due to the resources, so work must be conducted in order to minimize the miscalculations for the future work and to increase its efficiency.

With the exploration of new methods it is becoming easy to adjust to detect the variances in the facial expressions, which will lead us to know the patterns of problems of face and detect it in depth and classify it. The optimal fusion of colour was dealt with more details to explore it in near future. Further analysis can be carried out in the direction of the gene allele corresponding to the geometric variables of facial expressions. To complete the needs of different security models such as crime detection records, governmental confidential security breaches, etc the evolution of facial pattern structure was meant to be studied with relation to their genetic characteristics.

References:

[1] Robust Real-Time Face Detection, International Journal of Computer Vision 57(2), 137–154, 2004

[2] Facial expressions of emotions: an old controversy and new finding discussion", by P. Ekman, E. T. Rolls, D. I. Perrett, H. D. Ellis, Pill Trans. Royal Soc. London Ser. B, Biol. Sci., 1992, vol. 335, no. 1273, pp. 63-69.

[3] Going Deeper in Facial Expression Recognition using Deep Neural Networks, by Ali Mollahosseini1, David Chan2, and Mohammad H. Mahoor1 Department of Electrical and Computer Engineering, Department of Computer Science, University of Denver, Denver, CO.

[4] Journal on Convoluted Neural Network by IIIT, Hyderabad.

[5] Journal on Artificial Intelligence by Prof. M. K. Anand, 2014.

[6] Journal by Ghuangjhow University on Image Processing.

[7] VIOLA JONES FACE DETECTION EXPLAINATION by Rahul Patil.

[8] Project_Report_On_FACIAL_EXPRESSION_RECOGNITION_USING_IMAGE_P ROCESSING

[9] A literature survey on Facial Expression Recognition using Global Features by Vaibhavkumar J. Mistry and Mahesh M. Goyani, International Journal of Engineering and Advanced Technology (IJEAT), April,2013[http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.645.5162&rep=rep1&typ e=pdf]

[10] 10.Convolutional Neural Networks (CNN) With TensorFlow by Sourav from Edureka [https://www.youtube.com/watch?v=umGJ30-15_A]

[11] A Survey on Facial Expression Recognition Techniques by Swati Mishra (Chhattisgarh Swami Vivekanand Technical University, Department of Computer Science & Engineering, Raipur Institute of Technology, Mandir Hasaud, Raipur, Chhattisgarh, India) and Avinash Dhole(Assistant Professor, Department of Computer Science & Engineering, Raipur Institute of Technology, Chhattisgarh Swami Vivekanand and Technical University, Mandir Hasaud, Raipur, Chhattisgarh, India) , International Journal of Science and Research (IJSR),2013 [https://pdfs.semanticscholar.org/e241/25e4e9471a33ba2c7f0979541199caa02f8b.pd f]

[12] ecognizing Facial Expressions Using Deep Learning by AlexandruSavoiu Stanford University and James Wong Stanford University [http://cs231n.stanford.edu/reports/2017/pdfs/224.pdf]

[13] Predicting facial expressions with machine learning algorithms by Alex Young , Andreas Eliasson , Ara Hayrabedian , Lukas Weiss , Utku Ozbulak[https://github.com/utkuozbulak/facial-expression-recognition]

[14] Wikipedia- Artificial Neural Netwok& Convoluted Neural Netwok

[15] Neeta Sarode et. Al./ (IJCSE) International Journal on Computer Science.

[16] Facial Expression Detection Techniques: Based on Viola and Jones algorithm and Principal Component Analysis by Samiksha Agrawal and Pallavi Khatri, ITM University Gwalior (M.P.), India, 2014.

[17] Project_Report by Udacity, INDIA on Image Processing, 2013