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Facial Expressions Detection Using CNN & RNN Algorithms

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Abstract- Human Face expression Recognition is one of the most powerful and challenging tasks in social communication. Generally, face expressions are natural and direct means for human beings to communicate their emotions and intentions. Face expressions are the key characteristics of non-verbal communication. This paper describes the survey of Face Expression Recognition (FER) techniques which include the three major stages such as preprocessing, feature extraction and classification. This survey explains the various types of FER techniques with its major contributions. The performance of various FER techniques is compared based on the number of expressions recognized and complexity of algorithms. Databases like JAFFE, CK, and some other variety of facial expression databases are discussed in this survey.

Keywords- Facial expression recognition, Feature extraction, Deep learning, Convolutional neural network, Recurrent neural network.

I. INTRODUCTION

Facial expressions or emotions are means of conveying non-verbal feelings or sentiments of a person. Facial expression recognition (FER) is a method to recognize expressions on one's face. We see numerous techniques available today to detect various human face expressions like angry, happy, sad, neutral, disgust, surprise, fear and few more which are difficult to be implemented. We see numerous techniques available today to detect various human face expressions like angry, happy, sad, neutral, disgust, surprise, fear and few more which are difficult to be implemented. Many applications like human-computer interaction (computer responding/interacting with humans after analyzing what human feels), computer forensics (in the case of lie detection), pain detection, the field of education (i.e. distance learning where teachers determine whether the student understood the course), games and entertainment (for asserting user experience) find its base in facial expression recognition systems. Many applications like human-computer interaction (computer responding/interacting with humans after analyzing what human feels), computer forensics (in the case of lie detection), pain detection, the field of education (i.e. distance learning where teachers determine whether the student understood the course), games and entertainment (for asserting user experience) find its base in facial expression recognition systems.

II. AIM & OBJECTIVE

To recognize the facial expressions using deep learning algorithms.

We have been motivated observing the benefits of physically handicapped people like deaf and dumb. But if any normal human being or an automated system can understand their needs by observing their facial expression then it becomes a lot easier for them to make the fellow human or automated system understand their needs.

III. EXISTING SYSTEM & ITS LIMITATIONS

The Existing System was done by using different datasets such as Japanese Female Facial Expression (JAFFE), FER, CMU MultiPIE, Lifespan, MMI, FEED where the images are processed based on the pose.

LIMITATIONS

- Initially the web cam takes the images.
- This image must be a frontal image with proper Illumination of light, frontal oriental of face, but no facial hair, moustache, goggles, spectacles included. So, This Can't Determine exact Emotion

IV. PROPOSED SYSTEM & IT'S ADVANTAGES

In this paper, we propose We proposed to include deep learning algorithms such as Convolutional neural network (CNN), Recurrent neural network (RNN) so that the respective image can be trained by both algorithms and compare the accuracy of result emotion and displays.

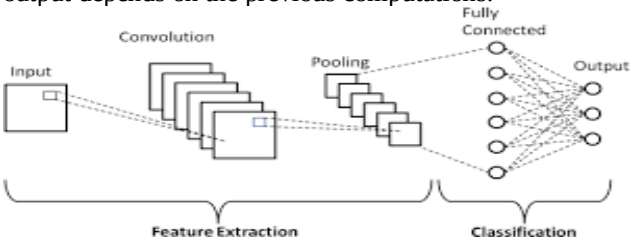
ADVANTAGES

- In this proposed system explains the automatically detects important feature without any human Supervision.
- Analyze the Inter-channel correlation and Illumination Consistency for Natural Images which may not hold after the color transfer.
- Using digital Image processing, so time consume is save

V. STUDY OF THE SYSTEM

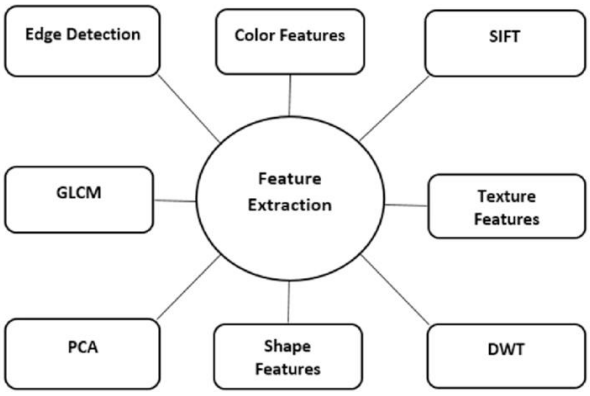
CNN & RNN

CNN includes convolutional layers, sub-sampling layers and fully connected layers. Convolutional layers are usually characterized by the kernel's size. Sub-sampling layers are used to increase the position invariance of the kernels. The main types of sub-sampling layers are maximum-pooling and average pooling. RNN is a neural network designed for analyzing streams of data by means of hidden units. In some of the applications like text processing, speech recognition and DNA sequences, the output depends on the previous computations.



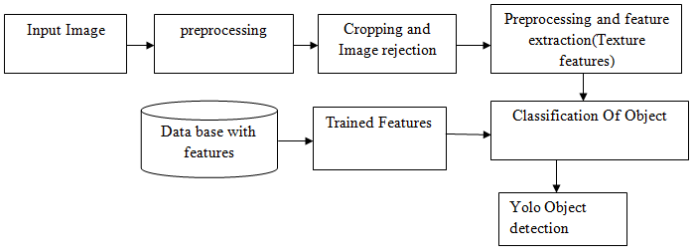
Feature Extraction

Feature extraction is a part of the dimensionality reduction process, in which, an initial set of the raw data is divided and reduced to more manageable groups. So when you want to process it will be easier. The most important characteristic of these large data sets is that they have a large number of variables. These variables require a lot of computing resources to process. So Feature extraction helps to get the best feature from those big data sets by selecting and combining variables into features, thus, effectively reducing the amount of data. These features are easy to process, but still able to describe the actual data set with accuracy and originality. technique of extracting the features is useful.



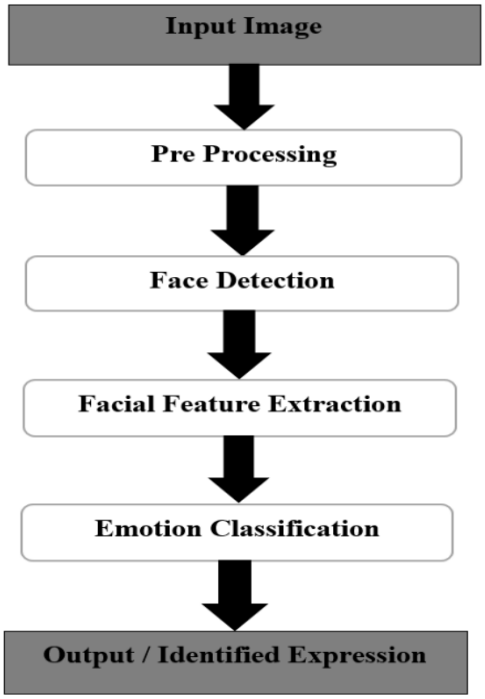
YOLO

YOLO algorithm employs convolutional neural networks (CNN) to detect objects in real-time. As the name suggests, the algorithm requires only a single forward propagation through a neural network to detect objects. This means that prediction in the entire image is done in a single algorithm run. The CNN is used to predict various class probabilities and bounding boxes simultaneously. The YOLO algorithm consists of various variants. Some of the common ones include tiny YOLO and YOLOv3.



VI. SYSTEM ARCHITECTURE

The complete working procedure of the project.



VII. SYSTEM DESIGN

System design shows the overall design of system. In this section we discuss in detail the design aspects of the system.

METHODOLOGY INVOLVED IN THIS PROJECT

Image Acquisition

Images used for facial expression recognition are static images or image sequences. Images of face can be captured using camera**.**

Face detection

Face Detection is useful in detection of facial image. Face Detection is carried out in training dataset using Haar classifier called Voila-Jones face detector and implemented through OpenCV. Haar like features encodes the difference in average intensity in different parts of the image and consists of black and white connected rectangles in which the value of the feature is the difference of sum of pixel values in black and white regions.

Image Pre-processing

Image pre-processing includes the removal of noise and normalization against the variation of pixel position or brightness.

a) Color Normalization

b) Histogram Normalization

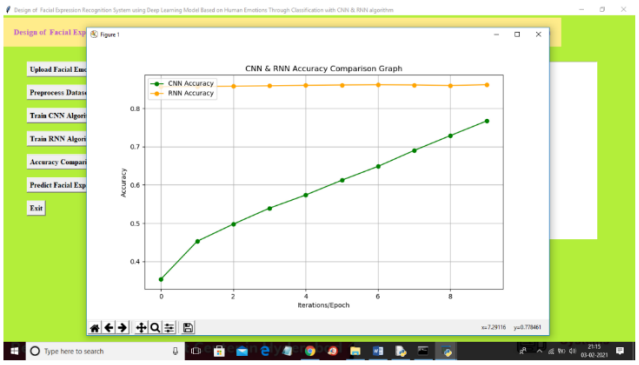
Feature Extraction

Selection of the feature vector is the most important part in a pattern classification problem. The image of face after pre-processing is then used for extracting the important features. The inherent problems related to image classification include the scale, pose, 17 translation and variations in illumination level [6]. The important features are extracted using LBP algorithm which is described below:

Support Vector Machines

SVM is widely used in various pattern recognition tasks. SVM is a state-of-the-art machine learning approach based on the modern statistical learning theory. SVM can achieve a near optimum separation among classes. SVMs is trained to perform facial expression classification using the features proposed. In general, SVM are the maximal hyperplane classification method that relies on results from statistical learning theory to guarantee high generalization performance. Kernel functions are employed to efficiently map input data which may not be linearly separable to a high dimensional feature space where linear methods can then be applied. SVMs exhibit good classification accuracy even when only a modest amount of training data is available, making them particularly suitable to a dynamic, interactive approach to expression recognition

THE RESULTS



LITERATURE SURVEY

Many researchers and developers have opted for deep networks such as Convolutional Neural Network (CNN), Deep Belief Network (DBN) and Recurrent Neural Network (RNN) in the past and continue to research in the field of image processing and video processing.

Subarna B. and Daleesha M Viswanathan:

He proposed a deep convolutional spatial neural network (DCSNN) which is trained on FER-2013 and JAFFE (JAFFE is an acronym for Japanese Female Expression Database) and tested it in live webcam for real-time face expression recognition. The

primary step of face detection is done with Viola Jones algorithm using haar features. This DCSNN is made up of three convolution, two pooling, one fully connected and a SoftMax layer with Rectified Linear unit (ReLu) activation function to classify the expressions using the probability function. In this paper they have shown DCSNN as an alternative solution to the traditional FER methods.

Qian Li :

He have used Orthogonal Tensor Marginal Fisher Analysis (OTMFA) on geometric maps for 3D face expression prediction. In this system they have extracted five geometric 2D maps to derive low dimensional tensor subspaces using OTMFA. Each map is trained and tested on multiclass SVM classifiers and the output obtained by each of these classifiers is aggregated for final recognition of expression. Experiment was conducted on BU-3DFE database to achieve an average accuracy of 88.32% and 84.27% which is comparable with the state-of-the art networks.

Nehemia Sugianto :

He had carried out research on measuring customer satisfaction in video surveillance at the airport using deep Residual Network (ResNet50). Viola Jones algorithm was used for detecting faces from surveillance videos. Since most of the passengers carry only neutral and happy faces, to obtain a balanced dataset was a challenge and hence opted for transfer learning to categorise the emotions in three categories (positive,negative and neutral). Their proposed technique demonstrated an accuracy of 91.41%, 85.34% and 83.10% on CK+, Jaffe and AffectNet dataset.

SOFTWARE REQUIREMENTS

Python 3.7.0

LIBRARIES:

pip install numpy==1.18.1
pip install pandas==0.25.3
pip install matplotlib==3.1.3
pip install keras==2.3.1
pip install tensorflow==1.14.0
pip install h5py==2.10.0
pip install opencv-python==4.2.0.32
pip install scikit-image

VIII. CONCLUSION

The facial expression recognition system presented in this research work contributes a resilient face recognition model based on the mapping of behavioral characteristics with the physiological biometric characteristics. The physiological characteristics of the human face with relevance to various expressions such as happiness, sadness, fear, anger, surprise and disgust are associated with geometrical structures which restored as base matching template for the recognition system. The behavioral aspect of this system relates the attitude behind different expressions as property base. The property bases are alienated as exposed and hidden category in genetic algorithmic genes. The gene training set evaluates the expressional uniqueness of individual faces and provide a resilient expressional recognition model in the field of biometric security. The design of a novel asymmetric cryptosystem based on biometrics having features like hierarchical group security eliminates the use of passwords and smart cards as opposed to earlier cryptosystems. It requires a special hardware support like all other biometrics system.

REFERENCES

- Subarna B and Daleesha M Viswanathan, “Real Time Facial Expression Recognition Based On Deep Convolutional Spatial Neural Networks” International Conference on Emerging Trends and Innovations in Engineering and Technological Research (ICETIETR) 2018
- Recognizing Facial Expressions Using Deep Learning by Alexandru Savoiu
- Stanford University and James Wong Stanford University [http://cs231n.stanford.edu/reports/2017/pdfs/224.pdf]
- Bindu Verma and Ayesha Choudhary, “A Framework for Driver Emotion Recognition using Deep Learning and Grassmann Manifolds” 21st International Conference on Intelligent Transportation Systems (ITSC) 2018
- 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.
- A literature survey on Facial Expression Recognition using Global Featuresby
- 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&type=pdf]
- Deep Learning Simplified by Sourav from Edureka [https://www.youtube.com/watch?v=dafuAz_CV7Q&list=PL9ooVrP1hQOEX8BKDplfG86ky8s7Oxbzg