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Improved Convolution Neural Network for Image Vision Applications

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ABSTRACT

Human's express more through their body language and face than through words. It is natural and most powerful, emotional tool of expression. The recognition of facial expression is a difficult task. Various people show the same expression in a different way. The environment in which the expression is to be detected also adds extra factors, such as brightness, background, pose as well as other objects in the surroundings. Hence, the facial expression recognition is still a challenging problem in computer vision. The solution to this problem can be proposed as facial expression recognition that uses a combination of Convolutional Neural Network and specific image pre-processing steps. It described the innovative solution that provides efficient face expression and deep learning with convolutional neural networks (CNNs) has achieved great success in the classification of various face emotion like happy, angry, sad and neutral. A variety of neuron-wise and layer-wise visualization methods were applied using a CNN, trained with a publicly available from given image dataset. So, it's observed that neural networks can capture the colors and textures of lesions specific to respective emotion upon diagnosis, which resembles human decision-making.

Keywords — Facial Expression, Tensorflow, Deep Learning, Convolutional Neural Networks.

I. INTRODUCTION

Study of facial expression has gained significant interest in the development of the human machine interface since it offers a normal and efficient way of human communication. Many areas of use related to the face and its gestures include personal identification and access control, videophone and teleconferencing, forensic technology, contact with people and machines, electronic detection, cosmetology, etc. But the performance of the face detection certainly affects the performance of all the applications. Many methods for detecting human face in photographs have been suggested, which can be divided into four categories: knowledge-based methods, feature-based methods, template-based methods and appearance-based methods. These techniques can't solve all face detection problems

including posture, tone, orientation and occlusion when used separately. Hence, working with several sequential or concurrent methods is safer. Most of the methods of facial expression recognition recorded to date rely on the identification of six main categories of expression such as: joy, sorrow, anxiety, rage, disgust and resentment.

A Facial expression is the visible manifestation of an individual's affective state, cognitive activity, intent, personality, and psychopathology and plays a communicative role in interpersonal relationships. It is easy to classify human facial expressions into 7 basic emotions: happy, sad, surprise, fear, anger, disgust and neutral. Our facial emotions are conveyed by stimulating different sets of facial muscles. Such signs in an expression, often subtle and complex, sometimes contain an array of knowledge about our state of mind. An essential aspect of the normal human-machine interfaces may be the automatic recognition of facial expressions. It can also be used in the behaviorial studies and in clinical practice. It has been researched for a long time and has achieved the development in recent decades. Although much progress has been made, it remains hard to recognize facial expression with a high precision due to the complexity and diversity of facial expressions. Daily basics human emotions are commonly recognized by characteristic features, which are displayed as part of a facial expression. For example, pleasure is unquestionably related to a grin or an upward lift of the corners of the mouth. Certain feelings are often defined by other deformations which are characteristic of a particular expression. Study of automated identification of facial expressions addresses issues concerning the depiction and categorization of static or complex aspects of these face pigmentation deformations.

II. RELATED WORK

Haifeng Zhang, Wen Su4 and Zengfu Wang, 2019[1] in their research show that the facial expression recognition is strongly related to the person's identity. It observed a network of expressions-identity fusion to resolve the significant differences in facial expression recognition between subjects. The model is designed to learn identity-related features and expression-related features together through two branches with the same feedback of the image expression. In addition, it defined that the use of identity-related features greatly improved facial expression recognition efficiency.

Minjun Wang, Zhihui Wang and Shaohui Zhang, 2018[2] used convolutional neural network architecture used in deep learning to identify facial features and used a Soft max classifier to conduct facial expression recognition. The algorithm used in this paper does not require human intervention in directed learning, and offers an automated method of extraction of features so that the effect is better defined. It carried out experiments on JAFFE and CK+ database and compares it with other methods. The experimental results show that this method is indeed more effective than other hand-extraction facial feature recognition methods. If there are enough examples for training the network will be able to learn very good classification features. On the contrary, if not enough samples are trained then convolutional neural networks may not be able to quickly find links between samples as artificially defined features in order to achieve a good effect of classification.

Ali Rehman Shinwari, Asadullah Jalali Balooch and Ala Abdulhakim Alariki, 2019[3] carried out experiments against the two datasets of faces reflecting considerable facial expression and illumination. From the experiments conducted, it was found that the LBPH algorithm is more resilient to lighting factor in general; while the facial expression factor has been shown to be more robust with LDA. With this work it is now clear that the classical facial recognition algorithm does not do so well against the effects of lighting. Thus, deep learning algorithm needs to be tested with different types of face data sets available against this challenge. Face recognition algorithms help computer devices to identify human

faces automatically and have been adopted by many big tech firms.

III. EXISTING SYSTEM

Nowadays facial recognition is used in a variety of applications in the real world. Notwithstanding its significance, the method of face recognition also involves many problems, such as shifts in face expressions, posture alterations, occlusions, and lighting. Face is an incredibly important part of the human body that is used primarily for the purpose of identification. A facial expression is a means of nonverbal communication which plays a vital role in the interchange of experiences. The value grows exponentially for hearing impaired individuals where facial expression is the only way to communicate. The face area is further separated into characteristics local and global. Due to different cultures, facial expressions vary from person to person, inborn capacity can develop from their forefathers, or more specifically because of individuals ' unique facial muscle behaviour. To judge and examine the outer appearance of the face is used as facial expressions and the physiognomy evaluation of one's interpersonal feeling. The activity of facial muscles is regulated during face recognition using parameterisation coding schemes based on actions of the muscles. There are two simple parameterisation schemes (FACS) and (FAPS). As the facial muscles contract and loosen with the presence of feelings on the forehead, the facial expression is visually assessed. Data is stored and can be obtained in the form of square pixels in most applications but advanced image processing enables the use of hexagon data to increase image quality. For contrast, rectangular pixels have certain disadvantages in image processing compared to hexagonal images. According to medical research, eyes have roughly spherical shape while spherical hexagonal pixels allowvisualization of the object's quality by enhancing the edges of an image. The main incentive for the use of surface hexagon in this paper is to segment the diagram into three parts as upper triangle, middle rectangle and lower triangle. No one had used hexagon up till now to treat facial expressions. Most research has been done not on the hexagonal grid or tessellation but on the hexagonal surface which is the outer hexagonal face boundary which covers all applicable local and global facial features. Note the image has not been transformed to a hexagonal format. The main contribution to the use of hexagonal form is to split the face into three parts, and the main reason for splitting the face is to find the varying area with any particular facial expression. FACS and FAPS are used as an intermediate frame in this paper to build the Hexagon model of Six Simple Facial Expressions. It didn't focus on increasing the identification rate and assessment accuracy of facial expression intensity.

IV. PROPOSED FRAMEWORK

It was intended to create a deep learning methodology to recognize the face expression, so that a person with less technical experience could still use this effectively. To predict face expression, it proposed program. It shows about our methodology's experimental analysis. Samples of more pictures are gathered comprising of various classes including joyful, upset, sad etc. For each level, specific number of images are collected which have been divided into images from the database and input images. The primary characteristics of the image are focused on the features directed towards shape and texture. Recent success in tasks such as object detection by convolutional neural networks (CNNs) extends to the problem of facial expression recognition. We will provide an outline of our issue in the following sections to group the photographs of human faces into discrete categories of emotions. Many existing facial expression recognition (FER) systems use standard machine learning and extracted features which, when applied to previously unseen data, have no significant output.

We implemented three different classifiers from scratch:

A baseline classifier with one convolutional layer
A CNN with a fixed size of five convolutional layers
A deeper CNN with a parameter number of convolutional layers, filter dimensions, and number of filters.
For each of these models, we tuned parameters including learning rate, regularization, and dropout.
We also experimented with using batch normalization and fractional max-pooling and implemented multiple classifiers using fine-tuning with variations on the number of layers retained, the number of layers back propagated through, and the initial network used.

Methodology:

The facial expression recognition system is implemented using convolutional neural network. The block diagram of the system is shown in following figures:

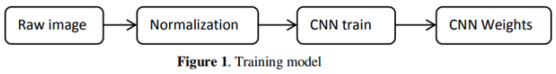

Figure 1. Training model

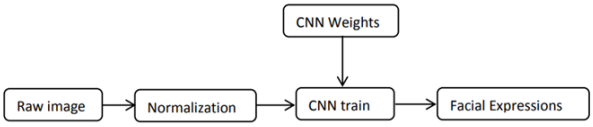

Figure 2. Testing model

During training, the system received training data with their respective expression label comprising gray scale images of faces and learns a set of weights for the network. The training stage took a picture with a face as the data. Thereafter, intensity normalization is applied to the image. The normalized images are used for training on the Convolutional Network. To ensure that the training performance is not influenced by the order in which the examples are viewed, validation dataset is used to pick the final best set of weights from a series of trainings conducted with samples provided in different orders. The performance of the training stage is a series of weights with the training data attaining the best result. The machine obtained a gray-scale image of a face from the test dataset during the simulation, and generated the expected expression using the final weights of the network acquired during the training. The output is a single number describing one of the seven basic expressions. The advantages our model provides is that it increases throughput while reducing subjectivizes arising from human experts in detecting the face expression and studies face expressions that are natural non-verbal emotional communication method.

V. CONCLUSION

In convolution neural network is implemented to classify human facial expressions i.e. happy, sad, surprise, fear, anger, disgust, and neutral and we addressed the task of facial expression recognition. It classified the image of faces into any of seven discrete emotion categories that represent universal human emotions and experimented with various techniques, such as fine-tuning and fractional max-pooling.

VI.REFERENCES

[1] . Haifeng Zhang, Wen Su4 and Zengfu Wang, “Expression-Identity Fusion Network for Facial Expression Recognition”.
[2] . Minjun Wang , Zhihui Wang and Shaohui Zhang, “Face Expression Recognition Based on Deep Convolution Network”.
[3] . Ali Rehman Shinwari, Asadullah Jalali Balooch and Ala Abdulhakim Alariki, 2018 “A Comparative Study of Face Recognition Algorithms” under Facial Expression and Illumination.
[4] . Ali Rehman Shinwari, Asadullah Jalali Balooch, Ala Abdulhakim Alariki, Sami Abduljalil, “A Comparative Study of Face Recognition Algorithms under Facial Expression and Illumination” at the International Conference on Advanced Communications Technology(ICACT).
[5] . Hivi Ismat Dino,Maiwan Bahjat Abdulrazzaq, “Facial Expression Classification Based on SVM, KNN and MLP Classifiers” at the International

Conference on Advanced Science and Engineering (ICOASE).
[6] . Kaun Li,Yi Jin,Muhammad Waqar Akram,Ruize Han and Jiongwei Chan, “Facial expression recognition with convolutional neural networks via a new face cropping and rotation strategy.
[7] . https://medium.com/@jsflo.dev/training-a-tensorflow-model-to-recognize-emotions-a20c3bcd6468.
[8] . https://www.researchgate.net/publication/305483977_Facial_Expression_Recognition_with_Convolutional_Neural_Networks_Coping_with_Few_Data_and_the_Training_Sample_Order.
[9] . https://medium.com/datadriveninvestor/real-time-facial-expression-recognition-f860dacfeb6a
[10] . https://research.google/tools/datasets/google-facial-expression/.

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