



A Review on Facial Expression Recognition using OpenCV Python

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ABSTRACT—

These Human facial expressions bring numerous statistics visually in preference to articulate. Facial expression reputation performs a crucial function within side the vicinity of human-gadget interaction. Automatic facial features popularity gadget has many packages including, however now no longer confined to, human conduct understanding, detection of intellectual disorders, and artificial human expressions. Recognition of facial features through pc with excessive popularity price continues to be a tough task. Two famous techniques applied often within side the literature for the automated FER structures are primarily based totally on geometry and appearance. Facial Expression Recognition usually performed in four-stages consisting of pre-processing, face detection, feature extraction, and expression classification.

In this project we applied various deep learning methods (convolutional neural networks) to identify the key seven human emotions: anger, disgust, fear, happiness, sadness, surprise and neutrality.

Keywords – feature extraction, image processing, OpenCV, Convolutional Neural Network

I. Introduction

“2018 is the year when machines learn to grasp human emotions” --Andrew Moore, the dean of laptop technology at Carnegie Mellon. With the arrival of contemporary-day generation our goals went excessive and it binds no bounds. In the present era a huge research work is going on in the field of digital image and image processing. The way of progression has been exponential and it is ever increasing. Image Processing is a substantial location of studies in modern-day global and its packages are very widespread. Image processing is the sector of sign processing in which each the enter and output alerts are images. One of the maximum essential utility of Image processing is Facial expression recognition. Our emotion is revealed by the expressions in our face. Facial Expressions performs a vital position in interpersonal communication. Facial expression is a non-verbal medical gesture which receives expressed in our face as in keeping with our emotions. Automatic popularity of facial features performs a crucial position in synthetic intelligence and robotics and consequently it's far a want of the generation. Some application related to this include Personal identification and Access control, Videophone and Teleconferencing, Forensic application, Human-Computer Interaction, Automated Surveillance, Cosmetology and so on. The objective 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 seven different expression class such as :

- I. Neutral
- II. Angry
- III. Disgust
- IV. Fear
- V. Happy
- VI. Sadness
- VII. Surprise



Related Work

S Marek Kowalski, Jacek Naruniec, Tomasz Trzcinski, The authors have shown a Deep Learning alignment work, which is a vigorous face calibration procedure that is based on Convolutional NN. They have proposed Deep Alignment Network performs the face calibrations mostly depends on the whole face images in contrast to what recently face alignments techniques perform, which make it very accurate to immense fluctuations in both initializations and forehead poses. Using heat maps which has landmark, and which transmits the detail of the locations of landmarks among DAN Phases, it helped them to apply face pixel in place of regionally to be had marks that's extracted round landmarks. Extensive performance evaluation improves the ultra-modern failure rate by a relatable limit more than 70% which were performed on two different challenges.

Ali Mollahosseini, Behzad Hasani, and Mohammad H Mahoor, The authors have defined the system "Affective Computing" as to develop systems, devices and mechanisms those of which are recognizable, interpretable, and which imitates a person affects through various attributes such as how he/she looks, the depth and modulation in his/her voice, and biological signals he/she may have. They have discussed about several network architecture driven models in their literature to shed lights on emotive facial expressions: 1) explicit, wherein the emotion is fetched from an emotive-associated class inclusive of FER datasets that have six primary human feelings in it. 2) Extent, where a numerical value is taken from a simultaneous face expression scale in images which are valence and arousal.

Kai Wang, Xiaojiang Peng, Jianfei Yang, Debin Meng The authors have shown the facial expression recognition system which is a real world application and solves the phases occurred post changes made. The authors have generated the several new tests over FER datasets on these phases and proposed a new "Region Attention Network (RAN)" which itself depicts the significance of the facial landmarks. They further shown the implementation of a "Region Biased loss (RB-Loss)" function that is used to strengthen the high attention weight for regions which are the most salient. The authors also evaluated their method on the collection of their datasets and made the extensive studies on FER Plus and Affect-Net. The work proposed the method which achieves the ultra-modern results on different datasets which includes FER+, RAF-DB, SFEW, and Affect-Net.

Ivona Tautke, Tomasz Trzcinski, Adam Bielski, The authors have made their outlook on an effort in progress technique for the facial expression recognition which enables the system to get much from the facial landmarks. The findings that are figured on the JAFFE-dataset which suggested some signs for a place for the development and more precision. The authors have made their overview saying that the proposed method has strong potentials that can outperform the currently proposed methods.

B. Hasani and M. H. Mahoor, The authors propose a Convolutional Neural Network technique which is a 3- Dimensional for FER in frames of videos. This version develops a 3-D Inception-ResNet layers observed via way of means of a unit known as LSTM that concurrently grasps the relations of spatial within images of faces and the temporal instances among different frames of the video. Facial curve dots are also used as samples to their network design which focus on the instances of facial landmarks rather than some noted facial patches that won't be beneficial and may not be able to generate facial expressions significantly.

Daniel Llatas Spiers, There is a research conducted by the author to categorise the Facial feelings over the static facial photographs with the assist of deep mastering techniques. The results that were achieved were non-futuristic, and slightly better than other methods including the characteristics engineering. It means that eventually Deep Learning systems will be able to remove this problem given an ample amount of the labelled tuples. Characteristics engineering is not that essential, image pre-processing reduces the inconsistencies of the classification. That's why it increases the visibility and the quality on the input image. In these days facial emotion detection software program consists of the use traits engineering. A finding that is totally dependent on the characteristic learning that does not seem near yet because of the major restraint and that shows the absence of a wide-ranging dataset of reactions. With the presence of a bigger dataset, systems that have a larger ability which is used to learn structures that could be applied. Thus, emotion classification could be attained with the help of deep learning approaches.

Sivo Prasad Raju, Saumya A and Dr. Romi Murthy, the authors have proposed an architecture where convolutional neural network (CNN) are trained to classify facial emotions/expressions. The authors have used Japanese Female Facial Expression (JAFFE) dataset of facial emotion images for training CNN in order to achieve good accuracy during training phase. Concept of Hybrid Vehicle Employing of CNN has been used for detecting drowsiness or alertness of the drivers in real time.

Deepesh Lekhak, the author has proposed a system of programmed facial Expression Recognition to perform detection and location of faces landmarks in a muddled scene, set of facial movements extraction and facial emotions classification. This model is developed using Convolutional NN which is totally dependent based on a network design called "Le-Net", Kaggle facial expression (FER2013) dataset with seven facial expression class labels which includes happy, sad, surprise, disgust, fear, anger & neutral.

Jie Hu, Li Shen, and Gang Sun, the authors have worked on the channel link and in which have proposed a fresh design unit, termed as "Squeeze and Excitation (SE)" block which tries to set right features channel wise by manipulating channel since they are independent. This paper has showed that chunks of patches can be loaded together to form SE-Net architecture to generalize extremely effectively across different datasets. "Squeeze and Excitation" Networks has formed the foundation of ILSRVC classification submission.

han Li and Weilong Deng, the authors have provided a complete survey on a design which is deep "Facial Expression Recognition (FER)" which includes databases and algorithms that features selection of data acceptance and evolution designs for these sets of data. The authors have reviewed some already constructed Deep Neural Network Models and related training modules.

II. Future Work

It is important to note that there is no specific formula to build a neural network that would guarantee to work well. Different problems would require different network architecture and a lot of trial and errors to produce desirable validation accuracy. This is the reason why neural nets are often perceived as "black box algorithms."

In this project we got an accuracy of almost 70% which is not bad at all comparing all the previous models. But we need to improve in specific areas like-

- Number and configuration of convolutional layers
- Number and configuration of dense layers
- Dropout percentage in dense layers

But because of loss of exceedingly configured device we couldn't cross deeper into dense neural networks as the system gets very slow and we will try to improve in these areas in future.

We would also like to train more databases into the system to make the model more and more accurate but again resources becomes a hindrance in the path and we also need to improve in several areas in future to resolve the errors and improve the accuracy.

Having examined techniques to cope with expression variation, in future it may be investigated in greater intensity approximately the face type hassle and foremost fusion of shadeation and intensity information. Further study can be laid down in the direction of allele of gene matching to the geometric factors of the facial expressions. The genetic belongings evolution framework for facial expressional device may be studied to suit the requirement of different security models such as criminal detection, governmental confidential security breaches etc.

III. Conclusion

In this case, while the version predicts incorrectly, the suitable label is regularly the second one maximum in all likelihood emotion. The facial features popularity device provided on this studies paintings contributes a resilient face popularity version primarily based totally at the mapping of behavioral traits with the physiological biometric traits. The physiological traits of the human face with relevance to numerous expressions consisting of happiness, sadness, fear, anger, surprise and disgust are associated with geometrical structures which restored as base matching template for the recognition system. The behavioral issue of this gadget relates the mind-set at the back of one-of-a-kind expressions as belongings base. The belongings bases are alienated as uncovered and hidden class in genetic algorithmic genes. The gene education set evaluates the expressional area of expertise of person faces and offer a resilient expressional popularity version within side the subject of biometric security. The layout of a singular uneven cryptosystem primarily based totally on biometrics having capabilities like hierarchical group safety gets rid of the usage of passwords and clever playing cards rather than in advance cryptosystems. It calls for a unique hardware assist like several different biometrics system. This studies paintings guarantees a brand new route of studies within side the area of uneven biometric Cryptosystems that is fantastically perfect so as to cast off passwords and clever playing cards completely. Experimental evaluation and have a look at display that the hierarchical safety systems are powerful in geometric form identity for physiological traits.

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