HUMAN EXPRESSION ANALYSING SYSTEM USING CNN

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Abstract: A key requirement for developing any innovative system in a computing environment is to integrate a sufficiently friendly interface with the average end user. Accurate design of such a user-centered interface, however, means more than just the ergonomics of the panels and displays. It also requires that designers precisely define what information to use and how, where, and when to use it. Facial expression as a natural, non-intrusive and efficient way of communication has been considered as one of the potential inputs of such interfaces. The work of this thesis aims at designing a robust HUMAN EXPRESSION ANALYSING SYSTEM USING CNN by combining various techniques from computer vision and pattern recognition. Expression recognition is closely related to face recognition where a lot of research has been done and a vast array of algorithms has been introduced. HEA can also be considered as a special case of a pattern recognition problem and many techniques are available. In the designing of an HEA system, we can take advantage of these resources and use existing algorithms as building blocks of our system. So a major part of this work is to determine the optimal combination of algorithms. To do this, we first divide the system into 3 modules, i.e. Preprocessing, Feature Extraction and Classification, then for each of them some candidate methods are implemented, and eventually the optimal configuration is found by comparing the performance of different combinations. Another issue that is of great interest to facial expression recognition systems designers is the classifier which is the core of the system. Conventional classification algorithms assume the image is a single variable function of a underlying class label. However this is not true in face recognition area where the appearance of the face is influenced by multiple factors: identity, expression, illumination and so on.

1. INTRODUCTION

Emotion recognition of a human being plays in important role in developing heartful relationships with others. As the emotions keep changing based on the situation, circumstances, the instantaneous recognition of right emotion would help to communicate effectively with each other. Facial expressions communicate non-verbal cues felt by brains, captured either in photos or videos can be approximated. Emotion Recognition through facial expressions can play a significant role in the field of social communication, law enforcement, and human machine interactions. Detecting emotions from photos or video is a simple operation for the human eye, but it's a tough proposition for machines, and it necessitates a variety of image processing approaches for feature extraction. This can be accomplished using a variety of machine learning algorithms. Any machine learning recognition or classification involves first training algorithms, then testing them on an appropriate dataset, and ultimately presenting a user-interface for easy usability. There are different methods and approaches for emotion Recognition. Emotion Recognition is done through speech. The parameters of speech like pitch, fluency, etc..helps in emotion recognition. Electroencephalography, skin resistance measures, blood pressure, heart rate, eye activity, and motion analysis are the most common procedures. In this paper, emotions are recognized using facial expressions. Facial features that are extracted are eyebrow raise distance, upper eyelid to eyebrow distance, inter eyebrow distance, upper eyelid to lower eyelid distance, top lip thickness, lower lip thickness, mouth width, mouth opening, visibility of upper teeth, lower teeth, forehead lines eyebrow lines, nose lines, chin lines and nasolabial lines. This paper presents a brief introduction of facial expression in section I. Section II includes related work, section III contains proposed methodology. Results are discussed in section IV. Finally, section V contains the conclusion of the proposed methodology. The objective of this project is to develop Automatic Human Facial Expression Analyzing 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. Sad, II. Fear, III. Neural, IV. Happy, V. Angry, VI. Disgust VII. Surprise.

Fig 1.1 Sad Fig 1.2 Scared Fig 1.3Neutral Fig 1.4 Happy

Fig 1.4 Angry Fig 1.5 Disgust Fig 1.6 Fear

2. LITERATURE SURVEY

2.1 Face Emotion Recognition using CNN Authors: Boddepalli Kiran Kumar , [2023] Facial expressions show a universal range of emotions that we all experience. Facial recognition technology has been implemented in a variety of applications that call for more security or private data. Facial emotion detection can be used to analyse facial expressions of grief, joy, surprise, fury, and terror to ascertain a person's emotional state. For marketing objectives, accurate face emotion recognition and detection is essential. The bulk of businesses rely on the responses that customers have to all of their goods and services. Based on their emotional reaction to a photograph or video taken by an artificially intelligent system, it is possible to detect whether or not a customer is satisfied with a product or service. Many machine learning techniques, including Random forest and SVM, have been used in the past to measure sentiment from altered photographs. For instance, advances made feasible by deep learning have led to substantial gains in computer vision in recent years. A convolutional neural network (CNN) model can be used to identify facial expressions. Both training and testing objectives are served by this dataset.

2.2 "Facial Emotion Recognition using Deep Convolutional Neural Network". Authors: Pranav, Suraj Kamal, C. Satheesh Chandran, M.H. Supriya. [2023] The rapid growth of artificial intelligence has contributed a lot to the technology world. As the traditional algorithms did not meet the human needs in real time, Machine learning and deep learning algorithms have gained great success in several applications like classification systems, recommendation systems, pattern recognition etc. The main focus of this work is to make a Deep Convolutional Neural Network (DCNN) model that classifies 5 different human facial emotions. The model is trained, tested and validated using the manually collected image dataset. The model has comparable training accuracy and validation accuracy which convey that the model has a best fit and is generalized to the info. The model uses an Adam optimizer to reduce the loss function and it is tested to have an accuracy of 78.04%. The work can be extended to find out the changes in emotion using a video sequence which in turn can be used for different real time applications such as feedback analysis, etc.

2.3 " Face Emotion Recognition Using CNN ". Author: Xu, H., et al. (2021): This research proposed hierarchical transformer architecture for facial expression recognition, leveraging hierarchical attention mechanisms to capture both global and local facial features effectively.

2.4 "Facial Emotion Recognition using Deep CNN". Author: Wang, Z., et al. (2020): This meta-analysis focused on deep transfer learning for facial expression recognition, summarizing the state-of-the-art techniques and identifying trends and challenges in the field.

2.5 "Emotion Recognition Based On CNN". Authors: G. Cao, Y. Ma, X. Meng, Y. Gao And M. Meng. [2019] Neural network is a statistical learning model inspired by biological neural networks. This paper attempts to use the EEG signal from the DEAP data set to classify the emotion of the themes, this data set represents the emotional classification research. Then the principal component analysis is employed to scale back the dimension of the pre-processed EEG data, therefore the main emotional EEG features are obtained. Then the accuracy of the classification of the training samples and therefore the test samples is tested by the CNN algorithm, and therefore the other classification methods are compared to get the nerves. In this paper, the neural network model is used to induce the subjects' emotion through the short music film stimulation material, and the user's emotion is classified from the EEG signal. As an advanced machine learning technique for emotion classification, the neural network is considered as a machine used to simulate the way in which the brain performs a specific task. This study provides considerable classification accuracy, which is better than the previous research. It is important to prove that the neural network can be used as an effective classifier for EEG signals.

2.6 "Human Face Expression Recognition Based on Deep Learning-Deep Convolutional Neural Network" Authors: Lu Lingling liu . [2019] In recent years, with the rapid and effective development of deep learning (DL) and deep convolution neural network(DCNN), the traditional facial expression recognition(FER) technology is difficult to satisfy the requirements of accurate human computer interaction, automatic fatigue driving monitoring, intelligent and efficient classroom and other amusive tasks. The deep convolutional neural network with more optimized characteristics is needed in facial expression recognition, so the proportions above can be improved. In this paper, compared with the existing deep convolutional neural network optimization in facial expression recognition, these shortcomings are studied in this paper.

The training dataset named fer2013 is used to train convolutional networks. The final results show that the method used in this paper can have a good effect on facial expression recognition.

3. EXISTING SYSTEM

Human Emotion Analysis has become an important issue in many applications nowadays. In recent years, the research on human facial emotion analyzing has become extensive. The aim of human facial emotion analyzing is to help identify the state of human emotion (eg; neutral, happy, sad, surprise, fear, anger, disgust, contempt) based on particular facial images. The challenge on facial emotion analyzing is to automatically recognize facial emotion state with high accuracy. Therefore, it is challenging to find the similarity of the same emotion state between different people since they may express the same emotion state in various ways. As an example, the expression may vary in different situations such as the individual's mood, their skin color, age, and environment surrounds. The acronym for Human Emotion Analysis (HEA) is different in every paper, such as Facial Emotion Recognition and Human Emotion Analysis. Generally HEA is divided into three major stages as shown in Figure 1: (i) Face Detection, (ii) Feature Extraction, and (iii) Emotion Classification. At first stage, which is a preprocessing stage, an image of a face is detected and facial components of the face will be detected from the region. The facial components can be an eyes, brows, nose, and mouth. In the second stage, an informative feature will be extracted from different parts of the face. In the last stage, a classifier need to be trained before been used to generate labels for the Emotions using the training data.

4. PROPOSED SYSTEM

The input of the neural network is made up of X1, X2, and X3. The offset node, also called the intercept term, is at position +1. The input layer of the neural network is located in the left-most column of this neural network model, and the output layer is located in the right most column. A hidden layer that is completely connected to both the input layer and the output layer makes up the network model's middle layer. The training sample set does not reveal the values of every node in the network model. We can see from this neural network model that it has a total of three input units, three hidden units, and one output unit. Using nl to represent the number of layers in the neural network, we can see that this neural network has three layers. The first layer can be expressed as Ll, followed by the neural network's L1 output layer, whose output layer is Lnl. This neural network has the following parameters is the connection parameter between the jth cell of layer 1 and the I th cell of layer l+1, and bi l is the offset of the I th cell of layer 1+1. Set ai (l) to represent the output value of the first few cells in this layer in the neural network model. Let 1 represent this layer and I represent its first few cells. IOP Publishing IOP Conf. Series: Earth and Environmental Science 170 (2018) 032110 doi:10.1088/1755-1315/170/3/032110 3 1234567890 """ 2nd International Symposium on Resource Exploration and Environmental Science We can use the formula hw,b(x) to determine this neural network's output given the set of parameters W and b. Equation illustrates how forward propagation is calculated.

SYSTEM ARCHITECTURE

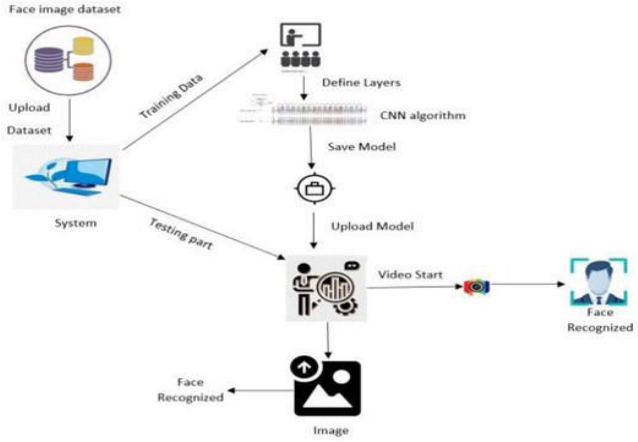

Fig1: System Architecture

5. UML DIAGRAMS

1. CLASS DIAGRAM

Class diagram is a static diagram. It represents the static view of an application. Class diagram is not only used for visualizing, describing, and documenting different aspects of a system but also for constructing executable code of the software application. Class diagram describes the attributes and operations of a class and also the constraints imposed on the system. The class diagrams are widely used in the modeling of object oriented systems because they are the only UML diagrams, which can be mapped directly with object-oriented languages. It is also known as a structural diagram. Class diagram contains • Classes • Interfaces • Dependency, generalization and association.

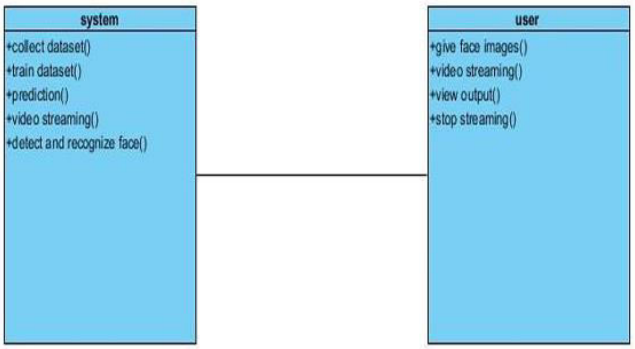

Fig 5.1 shows the class diagram of the project

2. USECASE DIAGRAM:

A use case diagram in the Unified Modeling Language (UML) is a type of behavioral diagram defined by and

created from a Use-case analysis. Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors, their goals (represented as use cases), and any dependencies between those use cases. The main purpose of a use case diagram is to show what system functions are performed for which actor. Roles of the actors in the system can be depicted

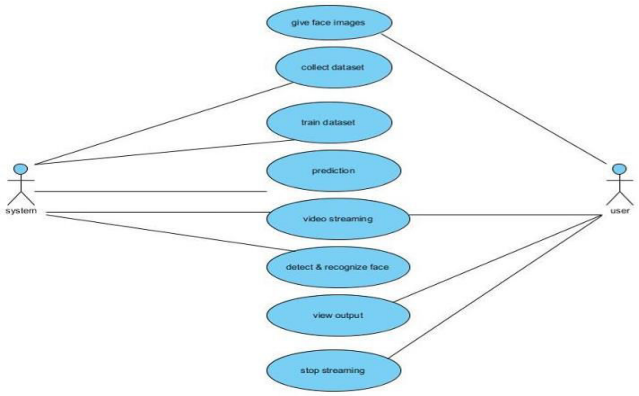

Fig 5.2 shows the Use case Diagram

3. SEQUENCE DIAGRAM:

A sequence diagram simply depicts interaction between objects in a sequential order i.e. the order in which these interactions take place. We can also use the terms event diagrams or event scenarios to refer to a sequence diagram. Sequence diagrams describe how and in what order the objects in a system function. Sequence diagrams are used to formalize the behavior of the system and to visualize the communication among objects. These are useful for identifying additional objects that participate in the use cases. These diagrams are widely used by businessmen and software developers to document and understand requirements for new and existing systems.

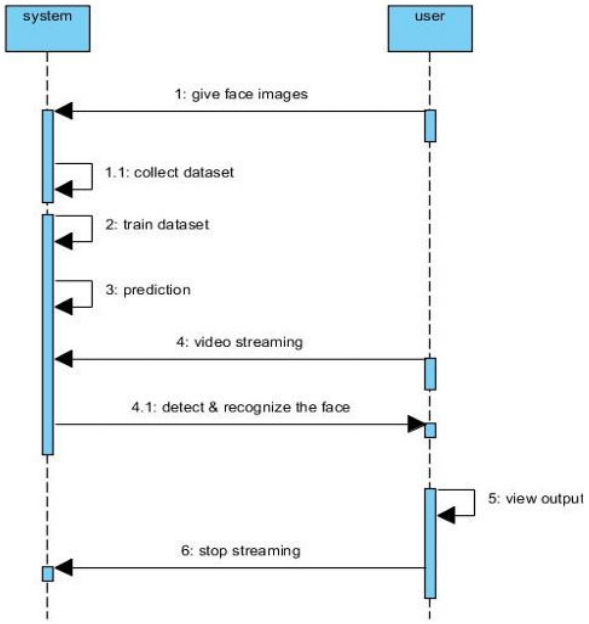

Fig 5.3 Shows the Sequence Diagram

6. RESULTS

6.1 Output Screens

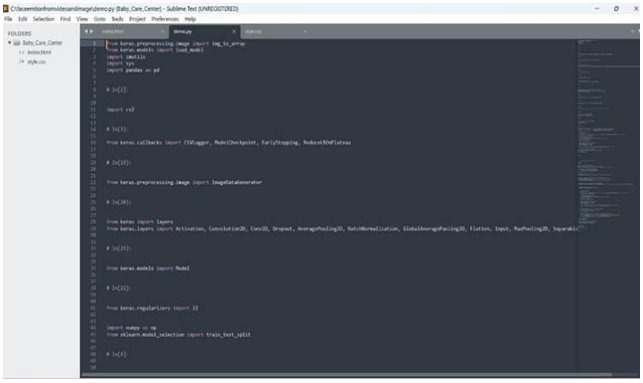

Fig 6.1 Run Source Code

Fig 6.2 Prediction result neutral

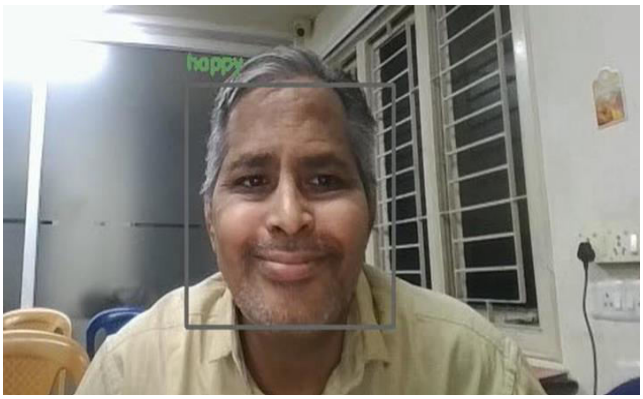

Fig 6.3 Prediction result happy

Fig 6.4 prediction result surprised

7. CONCLUSION

Here we developed the two types of methods like image and video based by using CNN algorithm. Once after trained the dataset results were tested by uploading image and also video streaming with face inputs. In this case, when the model predicts incorrectly, the correct label is often the second most likely emotion. 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. This research work promises a new direction of research in the field of asymmetric biometric cryptosystems which is highly desirable in order to get rid of passwords and smart cards completely. Experimental analysis and study show that the hierarchical security structures are effective in geometric shape identification for physiological traits.

FUTURE SCOPE

To improve the model's accuracy and predictability in the future, we should think about training it on a lot of data. The facial expressions can be recognized by machines with the aid of this process. 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 trail 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 90% which is not bad at all comparing all the previous models. But we need to improve in specific areas like o number and configuration of convolutional layers. o number and configuration of dense layers. o dropout percentage in dense layers. But due to lack of highly configured system we could not go deeper into dense neural network 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 more depth about the face classification problem and optimal fusion of color and depth 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 property evolution framework for facial expressional system can be studied to suit the requirement of different security models such as criminal detection, governmental confidential security breaches etc….

8. REFERENCES

[1] Xu, H., et al. (2021) , Face Emotion Recognition Using CNN. This research proposed hierarchical transformer architecture for facial expression recognition, leveraging hierarchical attention mechanisms to capture both global and local facial features effectively.

[2] Wang, Z., et al. (2020). Facial Emotion Recognition using Deep CNN. This meta-analysis focused on deep

transfer learning for facial expression recognition, summarizing the state-of the-art techniques and identifying trends and challenges in the field.

[3] D. C. Ali Mollahosseini and M. H. Mahoor. Going deeper in facial expression recognition using deep neural networks. IEEE Winter Conference on Applications of Computer Vi- sion, 2016..

[4] Haghpanah, M. A., Saeedizade, E., Masouleh, M. T., & Kalhor, A. (2022, February). Real-time facial expression recognition using facial landmarks and neural networks. In 2022 International Conference on Machine Vision and Image Processing (MVIP) (pp. 1-7). IEEE.

[5] S. H. . A. G. . A. Routray., "A real time facial expression classification system using local binary patterns," in Intelligent Human Computer Interaction (IHCI), 2012 4th International Conference on., pp. 1–5, 2012..

[6] Modi, S., & Bohara, M. H. (2021, May). Facial emotion recognition using convolution neural network. In 2021 5th international conference on intelligent computing and control systems (ICICCS) (pp. 1339-1344). IEEE.

[7] Pham, L., Vu, T. H., & Tran, T. A. (2021, January). Facial expression recognition using residual masking network. In 2020 25Th international conference on pattern recognition (ICPR) (pp. 4513-4519). IEEE.

[8] Zhang, K., Li, Y., Wang, J., Cambria, E., & Li, X. (2021). Real-time video emotion recognition based on reinforcement learning and domain knowledge. IEEE Transactions on Circuits and Systems for Video Technology, 32(3), 1034-1047.

[9] Gilderlane Ribeiro Alexandre, José Marques Soares, George André Pereira [2020],Systematic review of 3D facial expression recognition methods , Thé Pattern Recognition 100, 107108, 2020.

[10] Emmanuel Dufourq [2020],A survey on factors affecting facial expression recognition based on convolutional neural networks ,Conference of the South African Institute of Computer Scientists and Information Technologists 2020, 168-179, 2020.

[11] H Dino, Maiwan Bahjat Abdulrazzaq, SR Zeebaree, Amira B Sallow, Rizgar R Zebari, Hanan M Shukur,Lailan M Haji [2020],Facial Expression Recognition based on Hybrid Feature Extraction Techniques with Different Classifiers , TEST Engineering & Management 83, 22319-22329, 2020.

[12] Liu Sijia, Chen Zhikun, Wang Fubin, et al. Multi-angle face recognition based on convolutional neural network [J]. Journal of North China University of Technology (Natural Science Edition), 2019, 41 (4): 103-108.