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Expression Analysis System

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Abstract*: *Expression is the most basic personality trait of an individual. Expressions, ubiquitous to humans from all cultures, can be pivotal in analyzing the personality which is not confined to boundaries. Analyzing the changes in the expression of the individual can bolster the process of deriving his/her personality traits underscoring the paramount reactions like anger, happiness, sadness and so on. This paper aims to exercise Neural Network algorithms to predict the personality traits of an individual from his/her facial expressions. In this paper, a methodology to analyze the personality traits of the individual by periodic monitoring of the changes in facial expressions is presented. The proposed system is intended to analyze the expressions by exploiting Neural Networks strategies to first analyze the facial expressions of the individual by constantly monitoring an individual under observation. This monitoring is done with the help of OpenCV which captures the facial expression at an interval of 15 secs. Thousands of images per expression are used to train the model to aptly distinguish between expression using prominent Neural Network Methodologies of Forward and Backward Propagation. The identified expression is then be fed to a derivative system which plots a graph highlighting the changes in the expression. The graph acts as the crux of the proposed system. The project is important from the perspective of serving as an alternative to manual monitoring which are prone to errors and subjective in nature.

Keywords*: *Backward Propagation, Expression Analysis, Expression Analysis System, Forward Propagation, Neural Networks, Open CV.

I. INTRODUCTION

The human population on this planet is massive and so is the language and culture they inhibit. The one thing that is common amongst all the individuals, irrespective of the language they speak or the culture they follow, is the expression they have in various scenarios. Smile is the universal language (expression) of joy, crying for sadness, frown for anger and so on.

The expression that a person possesses in varying scenarios is directed towards the behavior of the person. For instance, let's consider the example of a very basic human tendency of helping others. If an old blind lady on the road is asking for the help to an absolute stranger and the guy has a smile on his face and tenderness in expression then it depicts that he is generous, on the other hand if he frowns with furious expression then he is arrogant. One situation cannot predict the nature of the individual, however, a set of observations in various scenarios certainly provides accuracy.

People living in the information era, are having lots of doubts in the personality of other individuals. Trust and humanity are on stake. In such a state of affair, the expression analysis system will help a person to get the overview of the behavioral pattern of the other. For illustration, consider that while the parents are out to work in order to meet the financial demand of the hour and their child is at home with nanny, the installed expression analysis system will help them monitor the child and also get the behavioral/personality trait of the nanny. Looking at the graph of the result generated, the parents can decide the suitability of the person and the level of trust they can invest in her. The project aims at doing this using Machine Learning and Neural Network technologies, which operate on large data sets in order to guarantee the accuracy of the result generated. This paper indents to provide a thorough survey of the various factors that constitute towards the development of the system. The sections are organized as follows. Section II and III highlight the Problem Statement and Literature Survey respectively. The Proposed Methodology and Advantages are discussed upon in Section IV followed by the Conclusion in Section V.

II. PROBLEM STATEMENT

Determining the personality of a person has its own set of challenges such as authenticity, fallaciousness, ostentatious behavior, etc. These factors have a significant impact on the accuracy of the result. To overcome these challenges, as advised by psychologists, constant monitoring for over 45 minutes is the plausible solution as faking reality is only possible for 30 minutes at the best. Designing a system that is not just dependent on the responses to survey and a system capable of monitoring an individual for a considerable amount of time is cardinal.

III. LITERATURE REVIEW

Here we will elaborate the aspects like the literature survey of the project and what all projects are existing and been actually used in the market which the makers of this project took the inspiration from and thus decided to go ahead with the project covering with the problem statement. Literature review helps us analyze the past innovations related to the project and also help ameliorate them. Understanding the literature review assures the better implementation of a project by minimizing discrepancies.

Related Work

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[1] An emotion recognition system based on facial expressions, hand gestures and body postures were presented. The GER system can determine Anger, Happiness and Fear with accuracies of 75% and that there increasing the number of hand gesture and body posture combinations in the SCFG increases the system's degree of generalization for new combinations.
Tested together with FER system, for Anger, Sadness and Fear, the GER system improves the standard FER with up to 5% suggesting hand gestures and body postures contain emotional information that cannot be acquired from facial expressions. For Happiness and Surprise the recognition rate increase is not high, hence hand gestures and body postures for these emotions do not add new features compared to facial ones[1].
[2] Apart from these methods, several existing detection algorithms based on deep learning and classification models based on CNN to evaluate the teaching state of teachers are used. From the experimental results, the angle of the classroom in the picture and illumination have a certain impact on the detection. And when the classroom is large and the platform is far away from the camera, the detection is not easy too. The Resnet152 model based on the Faster R-CNN detection algorithm has the highest accuracy. The Inception-v2 model based on Faster R-CNN is second. But the efficiency of the two is very low, it is difficult to meet real-time requirements. The YOLO model is very efficient, although the accuracy rate is lower than the previous two, but the efficiency comparison accuracy loss is still worth a certain degree[2].
[3] Additionally, a new method to analyze facial expressions was proposed. Different from previous work, the aim was at exploring the commonalities among the expressions by discovering the common and specific patches. A two-stage sparse learning model was proposed to learn the locations of these patches based on the prior knowledge of facial muscles. A multiscale face division strategy was employed to obtain facial patches with different coverage area and eliminate the side effects from fixed patch size. The effectiveness of these patches was evaluated by facial expression recognition. Extensive experiments show that common patches can generally discriminate all the expressions, and the recognition performance can be further improved by integrating specific patches. More comprehensive patches can also be selected out to achieve better performance by using multiscale patch division strategy. The learned location information of these patches also confirms the location knowledge of facial muscles in psychology[3].
[4] In the view of the fact that the universal recognition rate is not high in the current human-independent experiments, an expression recognition algorithm based on the texture fusion features and geometric expressions and HOSVD i.e. High – order Singular Value Decomposition is used. This further separates the expression features that are not related to humans using HOSVD and excludes individual differences. The experiments prove that the algorithm can effectively extract expression features and the recognition rate is high[4].
[5] A computationally efficient facial expression recognition system is also proposed for accurate classification of the six universal expressions. It investigates the relevance of and how different facial patches in the helps in recognition of different facial expressions. All major according to a study are present on active regions on face that are extracted and are responsible for the face deformation to produce an expression. The location and size of these active regions are already predefined. This system not only analyses the active patches but also determines the salient areas on face where the features that discriminate for various expressions. Using the appearance features from these salient patches, the system also works for the one-vs-one classification task to determines the expression based on majority vote. In addition, a facial landmark detection method is described which detects some facial points accurately with less computational cost. Expression recognition is carried out using the proposed landmark detection method as well as the recently proposed CLM model based on DRMF method[5].

IV. PROPOSED SYSTEM

The proposed system deals with the analysis of change in the expression of an individual in varying scenarios and thereby, laying a graph about his personality traits which in turns gives a report of the overall personality or behavioral pattern of that individual.

The facial expressions can be analyzed as a complex pixeled structure which can be predominantly demarcated into three distinct colors namely blue, green and red. These pixeled structures can be vectorized and fed into a Neural Network model to train the model into bifurcating the images based on expression. The model trains itself by determining the most accurate weights and biases which in turn result in a model that precisely recognizes the expression of the individual.

The model is created by feeding a dataset comprising of 600 images per expression resulting in around 3000 varied images. This diverse and augmented dataset will ensure the accuracy of the expression recognized by the model. The series of recognized expression will further be used to deduce the personality traits by plotting the expression v/s scenario graph which will foreground the expression that an individua accounted in various scenarios.

A CCTV camera will be employed to monitor the individual throughout. This camera will be responsible to capture the images at periodic intervals and feed those images to the model which will predict the expressions.

A. Working Model Flow

A) Model Training
Step 1: The Datasets are collected in bulk by Bing Image Downloader and are stored distinguish folders, as per different expression.
Step 2: The Datasets are then used in making Model.
Step 3: By providing datasets the model is trained and hence accuracy is increased. And thus, this model can be used to detect the different expression of an individual.
B) Running the model.

Step 4: The Subject is set in front of the Camera and after a particular interval the image of the subject is captured and then stored in a database with timestamp.
Step 5: The Captured Image in the database is then passes through using Machine learning algorithm and with the help of trained model the expression is detected and finds out the type of expression. And thus, stored in the database with timestamp.
Step 6: As per the different expression and timestamp, a personality graph is made. Which is stored in database and can be viewed on user interface.
Step 7: With the Personality graph datasets, another trained model is used to analyze and finds out the match personality of Subject adopted for a particular time. The results are shown on user interface.

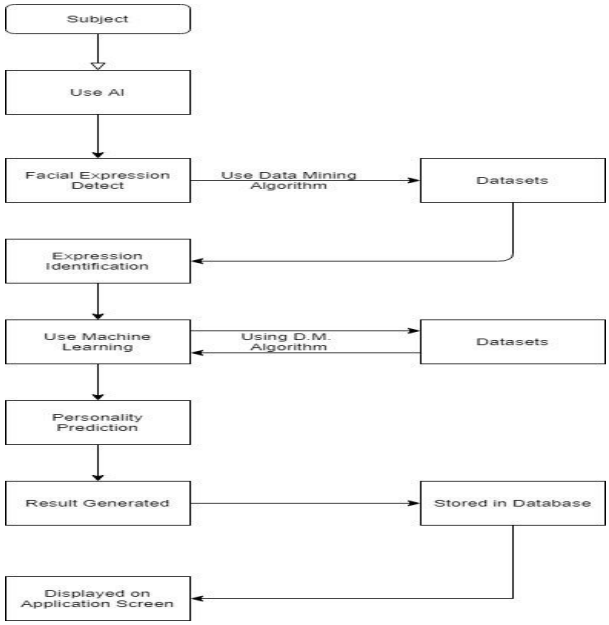

Fig. No. 4.1 Overview of the System

The flowchart provided, illustrates the flow of the intended proposal toward implementing the methodology.

V. ADVANTAGES

- In army selection, the expression of the people can be under constant monitoring which will give a report about the fitness of the individual in the army.
- People who are mentally unstable or impulsive can be examined beforehand, thereby ensuring safety of others.
- Human monitoring other human is subjective and erroneous, this system can thereby eliminate that error.
- Will help in reducing crime rate, if implemented regularly in multiple places.

VI. CONCLUSION

In this work, we have proposed a system which will help us predict or interpret the type of personality of any person. The personality of the person will be predicted using the following factors: facial expression, hand gestures and body postures. The constant surveillance of the individual under observation provides amply of images to interpret the expression and draw conclusion on the personality. The conclusion is accurate owing to the graphical representation of the expressions read by the Neural Network model which is trained using *thousand*s of images per expression. Furthermore, the application of the system will help to ensure that any person is not of any kind of threat to the society. It will also aid in minimizing the crimes in the country.

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AUTHORS PROFILE

Riya Kalburgi is a BE-IT student at Shree L.R. Tiwari College of Engineering, Mira Road and is expected to graduate in May 2021. Her research area and domain of interest includes Artificial Intelligence, Neural Networks and Deep Learning. Owing to the proclivity for Artificial Intelligence, she is applying for Master's in Computer Science specializing in Artificial Intelligence in Fall 2021. She has worked on projects like Predicting Life Expectancy, Twitter Sentiment Analysis etc. which have kindled her inclination towards the field. Riya aims at understanding Artificial Intelligence through her formal education and mature the field's nascent applications.

Punit Solanki is a final year student from Shree L.R. Tiwari College of Engineering and is anticipated to graduate as Information Technology Engineer in May 2021. His domain of interest and research are Cloud Computing, Software development and Web development. Punit has done certification on courses such as cross platform mobile app development and advance python programming. He has also partaken in various global competitive programming contests. He has worked on projects such as Automatic Pet Feeder in the field of IOT and java-based Event Management System, he has successfully along with his team developed and deployed a website for his college's coding committee. Punit aims to become an excellent programmer and learn different technologies to find better and innovative solutions.

Rounak Suthar is a BE-IT student at Shree L.R. Tiwari College of Engineering, Mira Road and is expected to graduate in May 2021. His research area and domain of interest includes Artificial Intelligence, Data science and Web Application development. He has done Online Certification in Data Science with python. He has worked on projects like Accounting Application of Employees for a company in Java, using frameworks like Struts and Hibernate. Rounak aims at learning more about Web application and linking any application and hosting it on particular web domain with the better user interface, so that it can be accessed anywhere at any time.

Saurabh Suman is an Assistant Professor in the department of Information Technology at Shree L.R. Tiwari College of Engineering. His educational background includes BTech and MTech in Computer Engineering. Currently, he is pursuing his PhD. Prof. Saurabh Suman has a teaching experience of 10 years. His research area is IoT and Computer Networks. Not only has he acquired numerous certifications in the above-mentioned fields but also, he has organized several competitions, seminar and webinars to disseminate the knowledge of IoT and Computer Networks.