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"A Real-Time Emotion Recognition from Facial Expression Using Conventional Neural Network Architecture"

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Abstract: Facial recognition has become popular due to its wide application area. With the advancement in deep learning, facial recognition has become an important part of the business world. It has been well studied since the 1960s; but it is still a difficult task for business analysts. Emotional cognition is used to perceive one's emotions. Different techniques have been developed to identify individual emotions from static images and data sets. Face testing is to find any abnormalities and ensure that they match his interests. It has many applications in different fields such as education, online commerce, health and security. In our work, we present a method that uses facial information as input to identify emotions. It predicts whether the person is happy, sad or surprised and shows it too. We use Tensor Flow and OpenCV to prepare models using data from the internet.

Keywords:

Face Recognition, Biometric Identification, Image Processing, Face Detection, Opencv, Tensor Flow.

I. INTRODUCTION

Aims to give us an accurate picture of what a person looks like in the outside world when they are suffering. This view is correct and is tightly identified with the person's internal state, and since thoughts are determined by a particular point of view, the observer can control other states of people in the world to help him or respond to his appearance [1]. Doctors look for things like this in mental health centres to help them create treatment plans for patients. Therefore, it is important to understand the understanding of emotions, the purpose of specific emotions, and various emotions in decision making, treatment, psychology, school books, and teaching sites. Face recognition is used to recognize appearance. This is the most difficult or problem in computing. Since it is difficult to prepare a model, the model should be used for happiness, anger, sadness, anxiety pressure, surprise, etc. One needs to know the difference between emotions. [2]. The main purpose of human intelligence is to determine the user's intentions based on some given information. Thought is an event that lasts a few seconds. Emotional state refers to the person's current state (arousal, mood, or personality). The set goals can be achieved through different variables in the information model. The approach looks at the different stages of creating a taxonomy, such as collecting data and extracting behaviour, creating training through data collection and taxonomy application. In our study, we believe that the use of computer cameras as input devices will lead to the realization of emotions based on various conceptual models, as shown in Figure 2. This method provides detailed information and analysis of the analysis process because different data can provide important information. Points eliminating errors for each entry. The purpose of this study is

to provide face-to-face education as a method that will enable students to understand the entire distance learning process. This study presents a model for sensory research with three stages: visual search, extraction, and sensory classification, as shown in Figure 1.

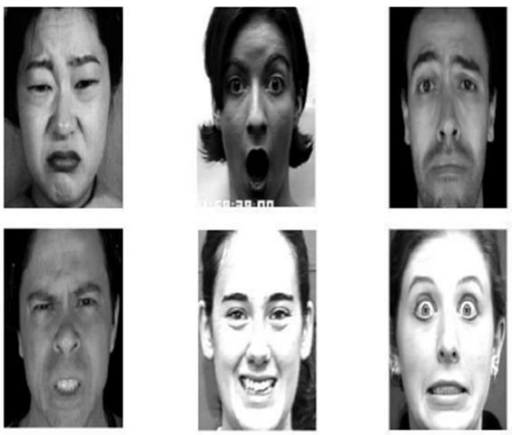

Figure 1: Sensory Research with Three Stages

There is no such clear definition of understanding human emotions. We measure body temperature, pulse, electrocardiogram, etc. to understand whether we are healthy or whether our brain is in temporary discomfort. We use many methods to check. Importantly, this prediction depends on differences in the effectiveness of people's affective judgments of their emotions. The article explains some ideas for recognizing this phenomenon. For some time now the body name 68 face foci are located on the main edge and the rest of the system uses the angle based on the dynamic AAM model for the foci. It will not be possible to get the full features in most runtimes. Shawn submitted a study using the LBP for approval. Here, link analysis is performed using the link vector machine SVM classifier, which supports LBP values. For international use, bodybuilders draw the eye position, which is unacceptable in most studies. Larry released CERT, the Computer Expression Recognition Toolbox. CERT does not allow face images that use Gabor's single classifier to detect the main face and use SVM and different techniques of MLR command to describe the result. Lyons proposed a framework for encoding movies that includes binning for class expansion and 2D Gabor wavelets for highlight extraction. This process obviously requires financial and labor effort. Deep Convolutional Neural Network DCNN framework is widely used to extract features in images. DCNN uses multiple layers to achieve precise learning. The content given here is used to make this channel, which ensures that the main content used in different processes of the organization is up and down in the image file. Programs based on convolutional neural networks have been proposed to recognize appearance, such as the model proposed by Kazoo. But they often use other face datasets to train their models. For example, Google uses deep focus for wide view to remove the main face that does not require extensive preparation, but this model is often used to prepare very small image [3].

II. LITERATURE REVIEW

M. R. Mahmood et al. [1] an effective technique of classification and feature selection for Face Emotion Detection from sequence of face pictures has been proposed by using decision-making board, a random forest, radial bias, MLP, SVM, KNN and MLP techniques. The Accuracy was 94.23%. Advantages of the proposed system was supporting a consistency- assessment of various controlled algorithms to identify face emotion based on limited chi-square characteristics.

M. B. Abdulrazaq et al. [2] Effective method for Face Emotion dataset and classify number of facial images has been proposed by using Decision Tree, SVM, KNN, Random Forestry, radial basis functions and MLP techniques. The Accuracy was 94.93%. Advantages of the proposed system was Concentrating on the usage of a minimal amount of assets, it concentrates at identification the exactness of six classifiers based on the Reliever-F techniques for function attributes.

M. Wu. et al. [3] To achieve effective modality fusion approach was proposed by using Fuzzy-Fusion based two-stage neural-network (TSFFCNN) techniques. The accuracy was SAVEE = 99.79%, eN TERFACE'05=90.82%, AFEW=50.28%. Advantages of the proposed system was, the function in which every modal data provide to expression investigation is strongly im- balanced is supported well by TSFFCNN.

H. I. Dino et al. [4] The eight basic emotions of human facial to be investigated in this paper, by using Naïve Bayes, decision tree, Naïve Bayes, decision tree, KNN and MLP algorithms, which provides Provided FER by comparison method based on three methods of Characteristics choose: co-relation, gains ratio, and information gain to examine the max outstanding features of facial pictures.

T. T. Q.Le et al. [5] To improve the impromptu recognition of face micro- expression by world wise extrication method by hand has been proposed by using CNN utilizes for the recognition of micro expressions in critical images requested. The output was CASMEI=78.5%, SMIC=67.3%, SAMM=66.67%. The techniques were Comprehensive as well as effective but plane technique analysis as well as classification of ME.

Liu et al. [6] To permit a particular function to take input from the action units' features (AUs) (eyes, nose, eyebrows, eyes, nose, mouth) has been proposed by using CNN as well as RNN. The result of the proposed work was Dataset CK+ is 99.54%, Oulu CASIA MM is 88.33%, AffectNetis 87.06%. Experiment result indicate that the SAANet is improved rapidly in comparison to other trained techniques.

W Chen et al. [7] Select the difficult research of the facial, the result finds and suggest that the method is more or less achieved than state of the art techniques and A strain and Spatial-Temporal Focus Module (STCAM) has been proposed. The result was CK+ =99.08%, CASI=89.16%.

N Perveen et al. [8] To achieve the growth of normal emotion captured from different
region of the facial. Dynamic kernel based facial expression representation technique was used to achieve the result of BP4D=74.5%, For any emotion detection method based on measurement time and a dynamic kernel is an essential selection.

G Wen et al. [9] To perform better dynamic features, learning -Enlarge the capacities between practice from easy confused features, by using -a newly DNN for face emotion – a new loss features is proposed to enhanced the gap between samples with 86.47% of result. The neural-network construct will preserve the loss of gradients.

L. Deng et al [10] To improve the accuracy of effective method for Face Emotion dataset and classify number of facial images, by using CNN video Face Emotion Recognition technique with the accuracy CK+ =94.39%, MMI= 80.43%, AFEW =82.36%. It avoid the consequences of facial emotion features and adapt and gain max important of identification as well as generalization.

III. PROPOSED METHODOLOGY

In this study, DCNN features were used for automatic face detection. Google image search will be used to complete the project. The first step will involve facial recognition of one of the above documents. Preliminary correction using OpenCV21. Feature extraction using Caffe is performed by Caffe on a graphics processing unit (GPU). Image Net 15 is used to write faces into a convolutional neural network architecture for object detection. Image Net uses eight layers. In this study, only the first five sets were used to record the first five characters.

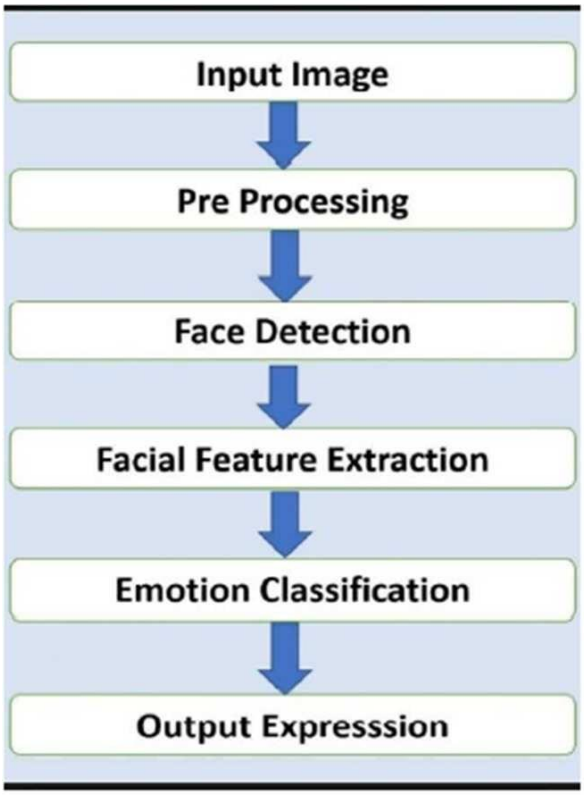

Figure 2: Classification Process

Recognize the face in each picture, identify the face. (256 × 6 × 6) provides features for cropped faces and prints a face label before the data for each image according to the input result size 9216 (256 × 6 × 6) POOL5 vectors multiplied by on and left. -Single output cross-validation with SVM classifier for face recognition [4].

A. TensorFlow

TensorFlow was developed by the Google team for research and development purposes. It is an open framework. The main applications of tensor flow are machine learning and deep learning [5]. TensorFlow is built on the Python programming language. It is one of the simplest techniques used in machine learning. It is a mathematics library created using different programs. The core of tensor streaming is deep neural networks. Keras is also a framework built using tensorflow2. It is also written in the python programming language. TensorFlow uses data flow graphs to create deep neural networks. It creates multilayer neural networks using data flow graphs. The main applications of tensor flow are classification, inference and prediction.

B. Open CV

Open CV was launched in 2000. It is an open-source library that anyone can contribute to improve their applications. Today, Open CV is used in computer vision, imaging and machine learning. Python, Java etc. It supports many programming languages such as. It is used to create static and dynamic images to recognize the presence of faces or objects in the image. Open CV is open source Haar Cascade is used to train classifiers. It is a machine learning search engine used to find objects in images and videos. In this way, a large number of good and bad images are used to train the classifier model and only features need to be extracted. It is one of the best search tools used today. In this model, multiple positive and negative images are used to create a bracketing function, and then the bracketing function is used to capture objects in other images. Haarcascade_frontalface_default.xml – there is Haarcascade used to find the frontal face. You can find this Hal Cascade online. The HAAR stage can detect traces of the crime scene.

IV. PYTHON

Python is a general-purpose programming language. It was created by Guido van Rossum in 1991. Supports Wind0ws, Linux and macOS. The lyrics are simple and easy to understand. It is a language-oriented programming language with dynamic semantics. It is known for its simplicity, readability and low maintenance cost. It is a translation language. Since it is not assembly, it is faster than other programming languages. It throws an exception when an error is detected, so it is easy to catch the exception. It supports program modularization and code reusability. A large number of built-in modules, packages and libraries are already available, which makes it even more so. Nowadays, developers choose Python as their coding language because of all the advantages it has. The Python library is free and available on all major platforms. Python is used to develop web applications, game development, machine learning and artificial intelligence. There are many Python libraries and frameworks available and can be used directly for development.

Research into understanding human faces and expressions has many aspects:
a) Computer analysis
b) Emotional intelligence
c) Lie detector
d) Airport security

Use this model to identify five categories of human facial features. If the input is stimulated, the output may also be stimulated, or the output may depend on the webcam input value [6]. It will distinguish communications that do not require external devices. It runs on a simple computer and does not require a high-end computer. Preparing the model to see the view is intuitive and standard. This is just an improvement project because it does not require any other external equipment. It will use a simple webcam model for input and use the computer screen for output. The yield will be displayed in a square coloured box with a reflection in the right corner. He first opened the CV to understand the face, then found a way to convert the RGB image to a dark image. Thanks to this process, the picture becomes ready to understand the hearing of the face.

Now, while the model is being trained to adopt the appropriate face, an additional step is to cut the image into smaller pieces. Motivation for the value of being a personal model. We use CNN model to prepare the model. To build this model, we use tensor flow as a tool to provide high-quality results for each high prediction. In this study, we use some special methods to create patterns that will store patterns in the data using the Python language to support facial recognition. Facial recognition and identification has become the most widely used biometric technology in recent years. He started using facial features in biometric systems. The facial recognition problem is all about the face. Face detection is further classified into image and real face detection. In this face detection project, we will try to detect faces in static images using different images. The first facial recognition system was described in [1].; Marker elements are used to create vector features [8].

This is also commonly used in cameras to recognize multiple events in a single frame. Social networking sites like Facebook also use facial recognition to identify and identify faces in photos. There are many technologies available for face detection that allow the face to be accurately recognized.

V. USING PYTHON FOR FACE RECOGNITION

The problem with early implementation of the algorithm is that overtraining results in images. When the image resolution is higher and the image size is larger, the input image must be larger than 6×6 resolution, and the classifier incorrectly detects many non-face objects and rejects mouths and faces. Eye classifier and skin classifier. We will use haar cascade and MTCNN to generate data about cropped faces; Most importantly, the face dataset contains images of only one person. Let's learn how the face test should be done.

A picture will have many different sides and we will not know their location. Instead of looking at all the images, we will see the face in a small window, scrolling to reveal a larger image. We will check whether the image is detected at every point in the image. Once the face can be recognized, we record the position of the face and move it to another location, called a sliding window classifier [9]. Face detection often uses algorithms to determine whether an image is positive or negative; This means whether the image has a face or not. More precisely, these algorithms are trained on huge databases containing thousands of face images. Once the algorithms are trained, they can answer the next question. First of all, whether there is a face in the picture; Second, if there is a face in the picture, where is that face? If there is a face in the image, the algorithms will answer the question by placing bounding boxes around the visible face.

VI. RESULTS AND ANALYSIS

We examined CNN and ResNet50 models to recognize facial features using deep learning. The results show that we can get a good result compared to other Kaggle competition data. As shown in Figure 4. We continue to improve this model by creating a hybrid model to combine the results of the two neural networks. With the migration application, we achieved 67.2% accuracy on the Kaggle dataset and 78.3% accuracy on the KDEF dataset. For reference, as shown in Figure 3, the winner of the Kaggle Facial Expression Recognition Challenge achieved 71.2% accuracy, and 10 finalists achieved at least 60% accuracy.

Facial Recognition Applications

Facial recognition has many applications in understanding human behaviour and emotions, psychology, etc. It has many applications such as. Facial expressions are an important part of nonverbal communication and play an important role in understanding human behaviour.

Facial recognition could be used to track people at airport gates. Age, gender, males, etc. of the target group. It can be used in marketing research to understand the group's reaction to a product or concept. Today, Facebook and Google use various algorithms to recognize faces with up to 98% accuracy. Customer dissatisfaction, customer satisfaction, etc. in the communication sector. Can be used as measurement. [7].

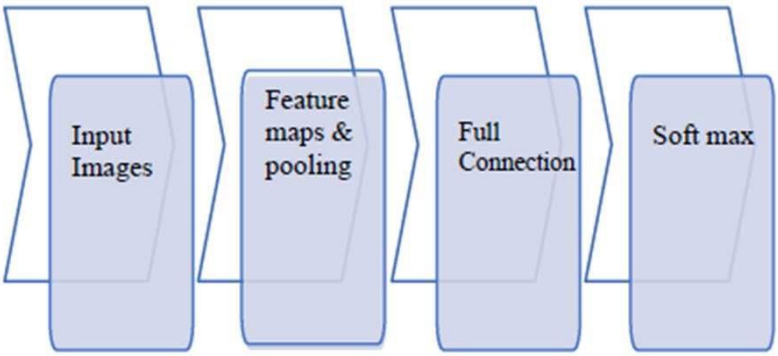

Figure 3: FER's CNN process

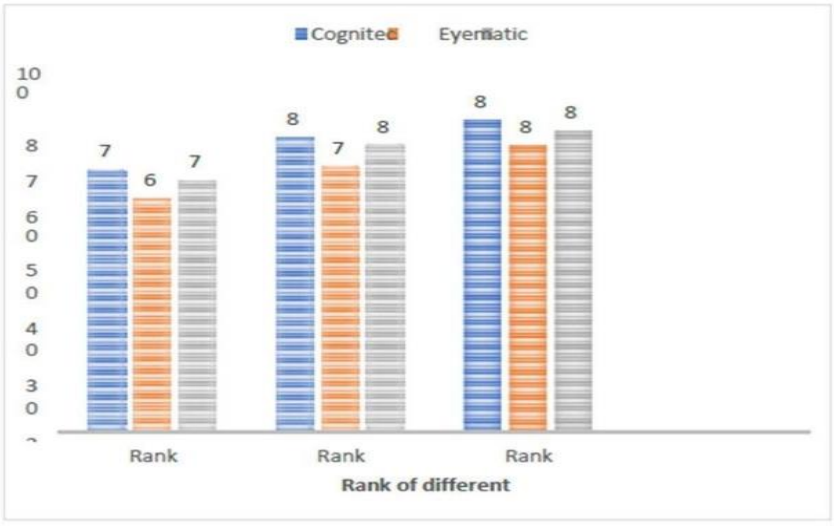

Figure 4: Data

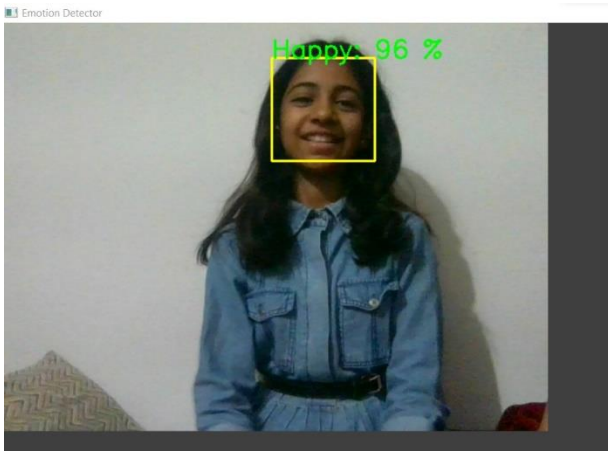

Figure 5: Real Time Image of Happy Emotions

Figure 6: Real Time Image of Stress Emotions

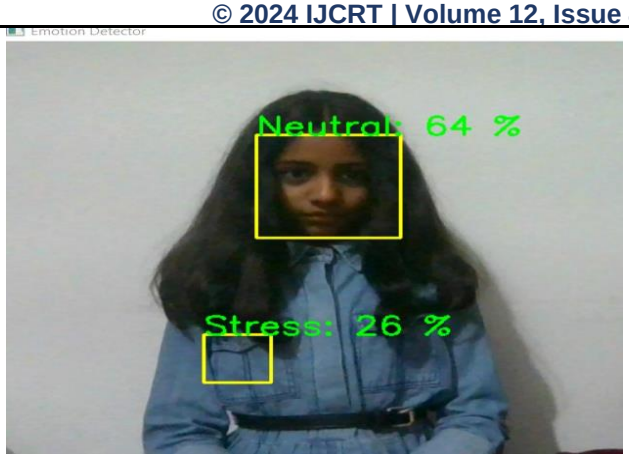

Figure 7: Real Time Image of Neutral Emotions

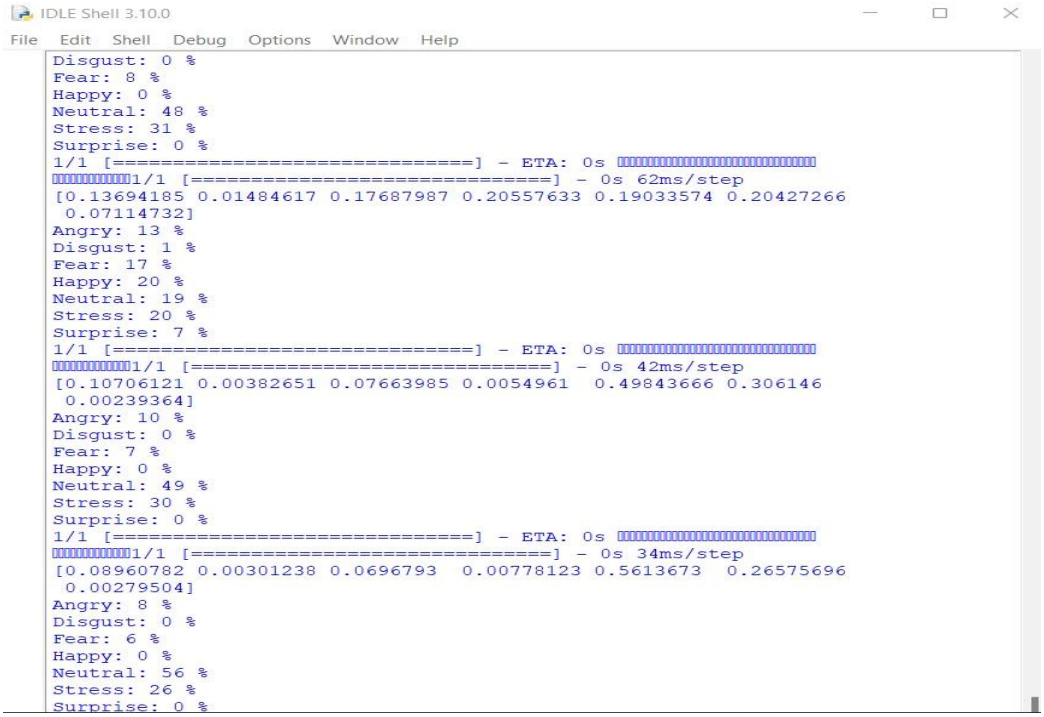

Figure 8: Displaying Output with Count of different Emotions

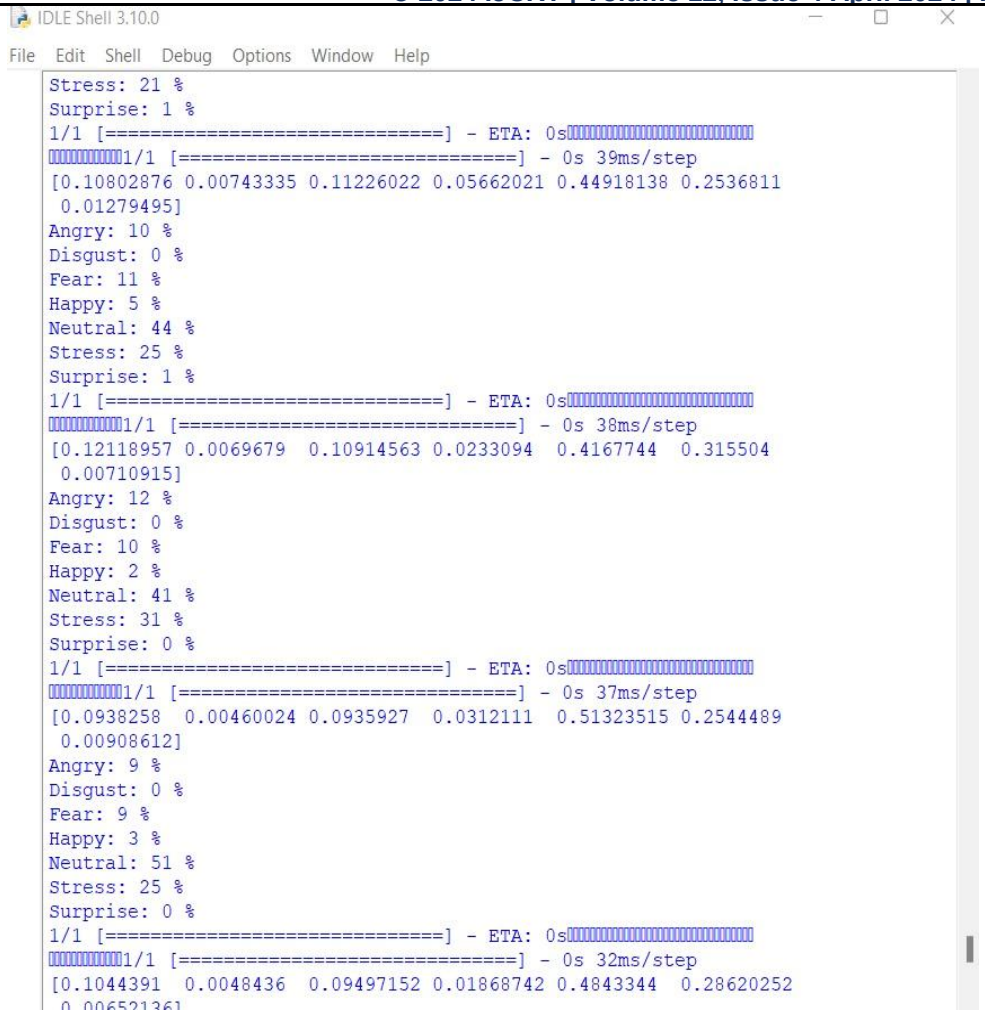

Figure 9: Displaying Output with Count of different Emotions

VII. CONCLUSION

The facial recognition system proposed in this research project provides a facial change model based on a behavioral map with physical biometric features. Physical features of the human face, happiness, sadness, fear, anger, surprise, disgust, etc. It is associated with good geometric patterns that work as matching patterns for the individual, with various expressions.

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