

Machine Learning based Image Processing for Stress Detection

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Abstract: The topic of stress is these days a really necessary one, not solely in analysis however on social life generally. People are more and more attentive to this downside and its consequences at many levels: health, social life, work, quality of life, etc. This resulted in an exceedingly vital increase within the explore for devices and applications to live and manage stress in period of time. Recent technological and scientific evolution fosters this interest with the event of new strategies and approaches. The survey has been taken for these new strategies for stress assessment, focusing especially on those who are suited to the workplace: one amongst today's major sources of stress. The most motive of our project is to discover stress exploitation vivid Machine learning and Image process techniques. Our system is an upgraded version of the recent stress detection systems that excluded the live detection and also the personal counselling however this method includes of live detection and periodic analysis of workers and police work physical as well as mental stress levels in his/her by providing them with correct remedies for managing stress by providing survey kind sporadically. Our system chiefly focuses on managing stress and creating the operating atmosphere healthy and spontaneous for the workers and to induce the simplest out of them throughout operating hours.

Keywords: ANN classifier, image processing, supervised machine learning.

1. Introduction

Stress Management system is important to detect stress level, because it disturbs our day-to-day lifestyle. The World Health Organisation (WHO) says, "Stress is the mental health problem affecting the life of one in relationship, causing depression and finally commitment of suicide. In this situation, counselling will be provided for the person to overcome from stress. But this process is time consuming and not accurate. Stress cannot be avoided but certain measures can be taken to prevent stress. Though certain organisations provide mental health related schemes to their people, but the problem is severe and it is not easy to control. Stress patterns of various people has been studied to provide a solution for this problem. According to the study, high percentage of all the diseases are caused due to stress. Mainly, cardiovascular diseases, diabetes, asthma, migraine headaches, skin disorders, epilepsy and sexual

dysfunction are mainly caused by stress. Stress has three different stages and effects. Firstly, Subjective effects where it comprises of guilt, shame, anxiety, etc., Secondly, it's the visible changes where the person's behaviour is changed completely due to stress. Thirdly, mental illness where it causes impaired judgement, rash decisions, forgetting things and this stage is the most severe of all. In the current situation, due to stress people are not happy and having mental pressure. This pressure may be emotional, physical or even mental. Stress can also be caused due to superiority and inferiority complex. Due to this he/she cannot do anything well. Stress can be constructive also, where it keeps you active, engaged and keeps yourself motivated. Whereas the destructive stress makes you dull, sad, inactive, idle and makes you feel lonely. Stress can be divided into two types. The first one is the short-term stress, where it can overcome when the situation changes. The second is the long term or chronic stress which is most dangerous. This type of stress may be caused due to hereditary genes, which ends a people's life. Many researchers mainly focused on the stress detection caused by the anxiety, grief, low self-esteem and other mental health problems. But studies prove that stress can also be due to thinking ability and physical health. The only way to overcome stress is to accept the stress and lead a happy life by overcoming it. Previous works were mainly based on Digital Signal Processing by considering certain medical parameters. And certain works were based on eye closure and head movement. But these readings are not sufficient and not efficient in real world. So, machine learning techniques and the image processing techniques are used to detect the stress patterns and to predict the stress levels. The person's image is captured while he/she is working in a desktop via webcam and this captured image serves as the input in the process of image processing. The image is now converted to the definite dimensions and then it is transformed into the grey scale image (i.e., into the digital form). The eye and the mouth region alone is extracted and from the reading of the eye and mouth region the stress levels are predicted. The method of image processing usually involves three steps. Firstly, capturing the image and importing them. Secondly, converting the image into various

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forms through certain algorithms and the final step is the output image where the parameters are measured. After the completion of image processing, Machine learning which is an application of artificial intelligence (AI) play a major role in this stress detection. The algorithm used is the Artificial Neural Network (ANN) Then the coding for the feature extraction is done in the MATLAB software. And then the data's are trained to the mathematical model based on the previous datasets. After the analysis, if the person is under stress the popup showing that "Person under stressful condition" is displayed. If the person is normal then the "Normal" message is displayed in the popup. Thus, by this method the stress level of the person can be detected.

2. Need of Work

Stress is termed as associate degree initial stage of depression. stress will be associated with finance, work, relationships etc. In corporate world workers square measure unaware of stress leading conditions whereas operating. it's forever ascertained largely in It workers chronic stress is commonly unnoticed. corporations use to offer a survey kind to the workers to fill and then use to predict stress supported that kind. it absolutely was not solely time intense however required wad of efforts as forms wherever distributed manually. Stress Detection System allows workers with header up with their problems leading to stress by preventative stress management solutions that is bothered with eliminating stress and improving worker health. In our work we've got designed a system which can capture pictures of the worker based on the regular intervals and so the tradition survey forms are going to be given to the worker. this may cut back the manual efforts and time. This structure technique will be wont to facilitate improve worker stress by diagnosis through our specially designed questionnaires.

3. Objectives

- To predict stress in a person by the symptoms calculated by monitoring.
- To analyse the stress level in the people.
- To provide solutions and remedies for the person to recover his/her stress.

4. Methodologies

Image Acquisition: In image processing, it is defined as the action of retrieving an image from some source, usually a hardware-based source for processing. It is the first step in the workflow sequence because, without an image, no processing is possible. This is an inexpensive method and we can obtain high-resolution images with high precision control. The image acquisition subsystem is mainly composed of hardware, and its main function is to capture rail images in real-time.

Preprocessing: Image pre-processing is the name for operations on images at the lowest level of abstraction whose aim is an improvement of the image data that suppress undesired distortions or enhances some image features important for further processing. It does 9 not increase image

information content. Its methods use the considerable redundancy in images. Neighbouring pixels corresponding to one object in real images have the same or similar brightness value and if a distorted pixel can be picked out from the image, it can be restored as an average value of neighbouring pixels.

Resizing Image: Resizing is necessary when you need to increase or decrease the total number of pixels, whereas remapping can occur when you are correcting for lens distortion or rotating an image. Zooming refers to increase the quantity of pixels, so that when you zoom an image, you will see more detail. Interpolation works by using known data to estimate values at unknown points. Image interpolation works in two directions, and tries to achieve a best approximation of a pixel's intensity based on the values at surrounding pixels.

Colour Conversion: The luminance of a pixel value of a grayscale image ranges from 0 to 255. The conversion of a colour image into a grayscale image is converting the RGB values (24 bit) into grayscale value (8 bit). Various image processing techniques and software applications converts coloured image to grayscale image.

Face Region Detection: This is the very first module in which the face is segmented from the input image that is initially from the image, this image will be given as input for segmenting the face. The partial segmentation of the image by selecting the appropriate threshold is based on dividing the image into the background and foreground classes. Thresholding is primarily concerned with selecting an appropriate threshold according to image histogram. That is, the value of thresholding or border as the brightness intensity is considered as the basis of the division and the brightness intensities greater and less than threshold is equal to 1 and zero respectively. The purpose of face detection is to minimize the error rate in identifying facial expressions. The importance of this part is to measure the position of the eyes, the mouth and the head.

Image processing Algorithms: YCbCr Colour Space The purpose of face detection is to minimize the error rate in identifying facial expressions. The importance of this part is to measure the position of the eyes, the mouth and the head. YCbCr, Y'CbCr, or Y Pb/CbPr/Cr, also written as YCBCR or Y'CBCR, is a family of color space used as a part of the color image pipeline in video and digital photography systems. Y' is the luma component and CB and CR are the blue-difference and red-difference chroma components. Y' (with prime) is distinguished from Y, which is luminance, meaning that light intensity is nonlinearly encoded based on gamma corrected RGB primaries. Algorithm for converting an RGB image to YCbCr image Formula used for convert an RGB pixel to YCbCr pixel is as follows:

$$Y=0.299R+0.5879G+0.114B$$

$$Cb=-0.169R-0.331G+0.5B$$

$$Cr=0.5R-0.419G-0.081B$$

Life ANN Algorithm: A neural network is a series of

algorithms that endeavors to recognize underlying relationships in a set of data through a process that mimics the way the human brain operates. In this sense, neural networks refer to systems of neurons, either organic or artificial in nature. Neural networks can adapt to changing input; so the network generates the best possible result without needing to redesign the output criteria. The concept of neural networks, which has its roots in artificial intelligence, is swiftly gaining popularity in the development of trading systems.

the aspects of your, including your thinking ability and physical health. To reduce riskiness from being stress and affected with its adverse effects, it is crucial to detect such emotions and take certain actions to relax them. In this work, a stress detection system based on the analysis of the facial expression has been developed. The eye and mouth region are extracted and analyse the features to classify stress by using Artificial neural network. The main advantage of this project is to extract feature to improve accuracy.

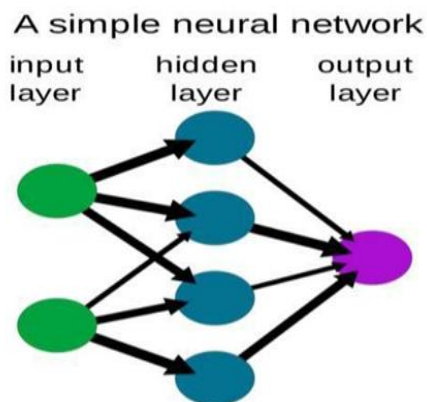


Fig. 1. Neural network architecture

Algorithms in ML: In machine learning and statistics, classification is the problem of identifying to which of a set of categories (subpopulations) a new observation belongs, on the basis of a training set of data containing observations (or instances) whose category membership is known. An example would be assigning a given email into "spam" or "non-spam" classes or assigning a diagnosis to a given patient as described by observed characteristics of the patient (gender, blood pressure, presence or absence of certain symptoms, etc.). Classification is an example of pattern recognition. In the terminology of machine learning, classification is considered an instance of supervised learning, i.e. learning where a training set of correctly identified observations is available. The corresponding unsupervised procedure is known as clustering, and involves grouping data into categories based on some measure of inherent similarity or distance.

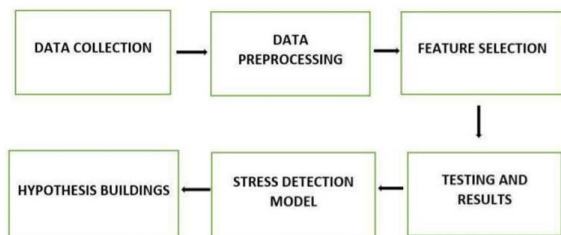


Fig. 2. Block diagram

This is the required architecture for the proposed system. Most of the researchers focused on detecting stress involved in a person, which causes in a person several emotional problems like anxiety, grief, low self-esteem and other mental health problems. Recent studies have shown that stress can also affect

5. Results

The parameters of the normal person is taken with help of eyes and mouth dimensions. For the normal person, the threshold value of 10 has been set and it is compared with the other person's threshold value. The threshold value of a person is obtained by the dimensions of eye and mouth region. If the person's threshold value is changed other than 10 then the person is stressed otherwise the person is normal. In the above image, the person's threshold value is 10. So the above person is normal and the message showing "Normal" is displayed as an output.



Fig. 3. Image of normal person

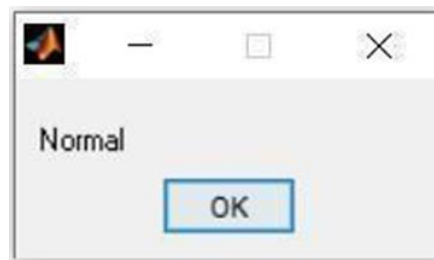


Fig. 4. Output of the normal person

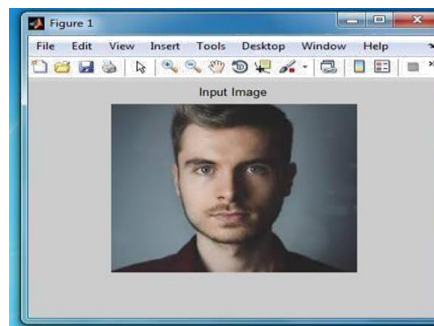


Fig. 5. Image of stressed person

The image of the person is captured and it is uploaded in the MATLAB file and the code is made to run.

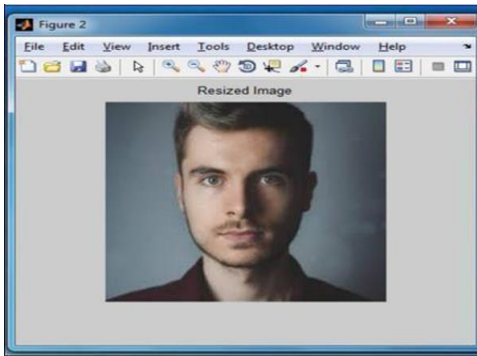


Fig. 6. Resized image

Here, the image is resized to the default dimension of 250 pixels' height and 250 pixels width, because every picture captured may be of different dimensions.

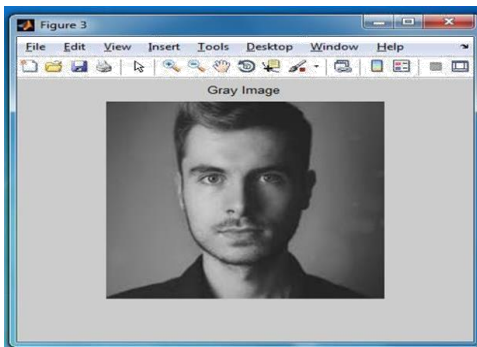


Fig. 7. Gray image

In this step, the image is converted into the gray scale image. Here, the white regions are considered as 0's and the black regions are considered as 1's.

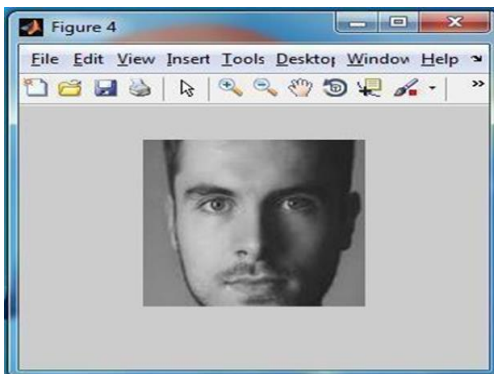


Fig. 8. Face region extraction

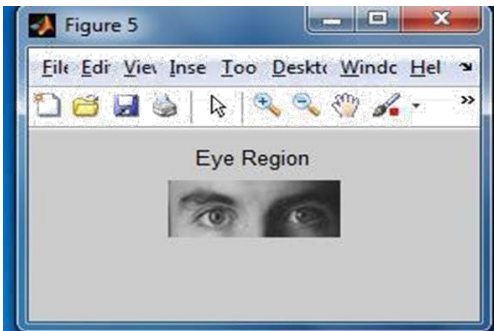


Fig. 9. Eye region extraction

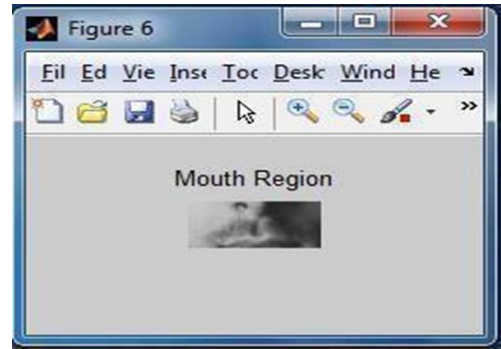


Fig. 10. Mouth region extraction

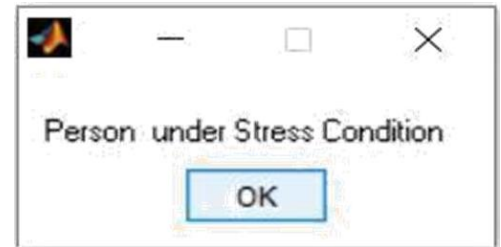


Fig. 11. Output message of the stressed person

FEATURES	NORMAL PERSON	STRESSED PERSON
Threshold value	10	Varies from 10

In the case image, the person's threshold value is changed from 10 so the output message showing "Person under Stress Condition" is displayed. From this we can conclude that the person is in stress or not.

6. Conclusion

Thus, the pictures square measure captured and pre-processed from traditional image to grey image. These pictures square measure used for the options detection and analysis. The extracted parameters square measure coded within the MATLAB package that is that the part of unattended machine learning to sight the extent of stress. Stress Detection System is meant to predict stress within the staff by observation captured pictures of genuine users that makes the system secure. The image capturing is completed mechanically once the evidence user is logged in supported it slow interval. Finally, the desired output is obtained and verified. Then the system can analyse the strain level by victimisation machine learning algorithms that generates the results that square measure additional economical.

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