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Touch Less Heart Rate Count from Facial Video and Covid Detection using Machine Learning

Sonal Mahajan[1], Shruti Pansare [2], Anjali Shinde[3], Aniket Pawar[4]

[1]BE, Department of Computer Engineering, NBN Sinhgad School of Engineering, Ambegaon BK, Pune, Maharashtra, India.
[2]Assistant Professor, Department of Computer Engineering, NBNSSOE, Pune, India

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Abstract: *Nowadays, due to current pandemic situation of covid – 19 lot of people are facing problems such as doctors are not treating them well. Many doctors are afraid of treating a patient suffering from covid. Even if a person has minor symptoms of cough and cold are not getting good treatment. To overcome this problems in medical field we are here with an application to detect heart rate. Many devices do exist but because of the current pandemic these devices needs to be sanitized and clean up with proper precautions. Many people also suffer with skin diseases and have infection. To deal with such situation we are here with touch less HR detection. Here main idea is to detect the HR of a person from color variation in the facial skin due to cardiac pulse. Then calculate its frequency by using fast fourier transform algorithm and predict the heart rate. If HR is greater than that of normal person then we will check covid. If the result is positive then we can treat the patient.*

Keywords: **Covid detection, Heart Rate Detection, skin diseases, FFT (Fast Fourier Transform) algorithm, Cardiac Pulse.**

1. INTRODUCTION

The heart rate of a person is number of times our heart beats. It is very important factor as it tells us assessment of stress level, if a person is normal or not. Exercise helps in maintaining a good heart rate. If we check heartbeat of a person who exercises daily and a person who has stress a huge difference will be observed. Society especially youngsters are habitual to eat junk food. This is also cause of heart risk chances. Patient suffering from covid has a greater risk of getting an attack. An application easily available to measure heart beat is very useful. In addition to this instead of using contact devices we can use no contact device which uses video processing to avoid spreading of infection from one patient to other.

This paper presents the idea of developing a real time Heart Rate monitoring system using a webcam of a laptop computer and detecting covid. The heart rate is obtained through facial skin color variation caused by blood circulation. Three different signal processing methods such as Fast Fourier Transform (FFT), Independent Component Analysis (ICA) and Principal Component Analysis (PCA) have been applied on the color channels in video recordings and the blood volume pulse (BVP) is extracted from the facial regions. If the HR is greater than that of normal person then we will detect covid using Naïve Bayes algorithm. This application will be very useful to reduce the influence of spreading of any disease in future

2. Methodology

The idea of touch less physiological parameters monitoring has come from the cardiovascular system of human body. In 1995, the first noncontact health monitoring system was investigated which used camera images in order to extract physiological parameters using color variation of the skin. But that idea implementation was not up to mark and had variation results, they reported only a graph of heartbeats and also failed to show any correlation with reference ECG (Electrocardiogram) signals. In 2005, thermal camera was used and the authors found some interesting fact between stress and blood flow. In 2006 RR (Respiratory Rate), HR and BVP (Blood Volume Pulse) were possible to extract simultaneously using a camera. They captured images of a part of the patient's skin and then the changes in the average image brightness of the region of interest (ROI) are measured for a short time. They used MATLAB custom functions for filtering and spectral analysis. Finally, they could able to extract HR and HRV (Heart Rate Variability). In 2013 an algorithm to extract HRV using a remote eye tracker was invented. HRV was estimated from the relative distribution of energy in the low frequency bands based on pupils. Now we are working on a technique in which we will use face detection algorithm to detect face and predict heart rate to detect covid.

For Covid detection the text is unstructured so it is needed to be refined such that machine learning can be done. Various steps are being followed in this phase the text is being

cleaned by removing unnecessary text. Punctuation is being done such that the data is refined in a better way.

Naïve Bayes and Support Vector Machine algorithm is use for the detection of covid. After fetching data compare with dataset and generate report.

3. System Architecture

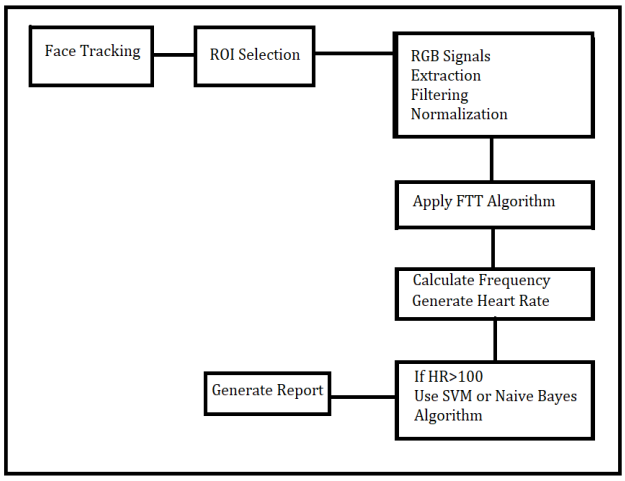

Figure – 1: Heart Rate and Covid detection system

4. Working of System

Reading Image Frames – When we play a video we are able to see series of images these images are broken into frames and frames are broken into pixels. In this project we will use frames to detect heart rate. We will read the amount of time required to read frames of three colours red, green and blue. While reading frames resolution should remain same.

Face Tracking – After successfully reading frames it will track face from image or video using face detection algorithm. We are using OpenCV library inbuilt functions for accessing camera from our device.

Region of Interest Selection – A region from our face will be selected such that all frames are properly and easily extracted. Frames are broken into pixels and they are tracked using boosted cascade classifier. Coordinates of face are located and region is selected.

RGB Signals Extraction – From each region of interest frames are calculated of all three colours red, green and blue. In first phase average of all colour values is calculated and in second phase individual colour values are calculated.

Signal Detrending – It involves purification of image such as removing effects, climatic condition such as temperature using normalization, filtering, etc.

Calculate Frequency – Now we use FFT algorithm on the data. This can be done in two ways real time and offline images. Frequency is calculated using counting the number of peaks obtained by the frames. Amount of time required to count them is 'T'. Number of peaks formed is 'P'.

Therefore Frequency=P/T

Print HR – It is calculated by multiplying frequency with 60. We use MATPLOT library for printing peaks formed by frames.

Therefore HR= 60 * Frequency

Enter Symptoms – A region is provided for text area here person enters the symptoms and by clicking on submit button data processing and text fetching is done by machine learning algorithm.

Text Fetching– Text fetching is done by using machine learning algorithms and then that data is compare with data set and generate report**.**

Generate Report -Multinomial naive Bayes algorithm is used to extract and compare values between text and dataset. On the basis of report reading of image frames is done.

5. Algorithm in Proposed System

Multinomial naive Bayes- No of text occurrence in given and calculate its count and frequency.

tf//idf technology- This use to convert sentence into vector and calculate frequency**.** tf term frequency=no of repeated word/total no of words in sentence **i**df invert document calculate frequency/repeated word.

FFT (Fourier Fast Transform) - We have many algorithms but we used FFT due to its accuracy and easy implementation. FFT is used to calculated frequency of moving images. To detect heart rate at real time we use FFT algorithm.

6. Testing Environment –

During project test is done on:

- Processor – Intel(R) Core (TM) i7-7500 CPU @2.70 GHz 2.90GHz

- RAM – 8.00 GB

7. Future Scope

Even after pandemic this application will be useful for those people who have skin diseases. It will reduce the cleaning work and will also save time. It also has a good accuracy predicted and a handy application which is easy to access. It has no disadvantages. In future if after pandemic it will be useful for patients who have skin related diseases. It will ensure infection should not spread from one person to another and can help in reducing further transformation from one person to another.

8. Conclusion

A real time noncontact based HR extraction method using facial video and detect covid which is easy to implement, low cost and comfortable for real time applications. Here, the main idea is to extract HR from the color variation in the facial skin due to cardiac pulse and then detect covid if HR is greater than that of normal person. Implementation has been done using a simple webcam in indoor environment with constant ambient light. Further we can also remove or clean images using various techniques like filtering to obtain accuracy.

9. References

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