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# Heartbeat Rate Monitoring System by Pulse Technique

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***Abstract:*** ***It's a non-contact method to measure someone's heart rate, as we will calculate it using simple webcam or even phone's camera. It will ease to care about your health as we are heading towards an age where everyone is concerned about their health and elevated or abnormal heart rate that can be fatal or serious at least so having a machine that measure your heartbeat is rather expensive and our goal is to use our current resources to measure one's heartrate without additional cost.***
***Keywords: PPG (Photoplethysmogram), HR (Heart rate), BPM (Beats per minute), HB (Heart beat)***

## I. INTRODUCTION

In Today's scenario, more and more people are having cardiovascular diseases as they work in a sitting environment and lack of exercise with poor eating habits all these factors lead to heart diseases and increase the number of deaths per year.

It also effects one's psychological behaviour like happiness, anger, mood, sadness but mainly it effects the heart and its functioning and to live a proper healthy life we should be able to know about our body but many equipment that are used to measure heartbeat is expensive and not available at many places or even available 24/7 so this project is going to use webcam to take live snapshots of your face and by calculating the variation in colours that your forehead undergoes it will determine the HB.

It's working starts with heart pounding the blood through the veins and that flow of blood changes the intensity of colours on your body, a simple camera or webcam will take the live video and will focus on your forehead and then takes live snapshots of your forehead, changing the image or separating it into RGB but only green image is responsible for calculating your heart rate, webcam will detect slight changes in green colour that is impossible to see through a naked eye. Our main goal is to provide a system that can measure your heart rate using consumer grade camera. After calculating blood pressure and heart rate we will display it on the camera app itself in real time.

A web pulse monitor is a personal monitoring system that allows one to measure/display heart rate in real time. It is largely used to gather heart rate data while performing various types of physical exercise. Medical heart rate monitoring used in hospitals is usually wired and usually multiple sensors are used.

Consumer heart rate monitors are designed for everyday use and do not use wires to connect. Firstly, we detect the face of the patient and then using physiological signal like Photoplethysmogram (PPG) we will calculate Heart Rate using predefined formulas and algorithms taken from research material given below.

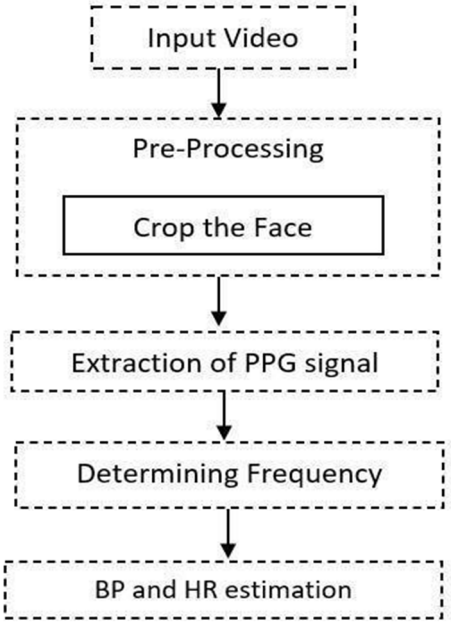
## II. LITERATURE SURVEY

*1)* Current machinery to monitor Heart Rate are bulky and require professional training to use them.
*2)* This equipment often costs ridiculous amount of money for just specific task that is monitoring HR.
*3)* Most of the patient do not have the access to traditional monitoring systems and they have to go to a medical centre for check-up.
*4)* Traditional monitoring systems are required to set up again and again in contrast to our system which can give continuous results in real time.
*5)* In large healthcare organizations, nurses are required to check the heart rate of the patient which causes inefficiency and chaos which may result in inaccurate data as well and using this system we can reduce the amount of delay and inefficiency caused by large number of professionals.
*6)* As we are dealing with a pandemic, this would be a brilliant idea to use a no-contact service to measure your heartrate without going to medical hotspots.

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## III. METHODOLOGY




### *A. Technical Approach*

Heart rate detection mainly consists three parts, in the first part it focuses on the facial region in the frame of the video, as face is the portion where we can detect the heart rate successfully with this method. Second, the region of interest(ROI) i.e. forehead where the bouncing box must be chosen And last, the PPG signal must be extracted where the change in the colors within the ROI within that time and analyzed to determine the frequency within the heart rate range i.e. 60 to 100 beats per minute.

### *B. Face Detection Approach*

Face detection by using Haar cascades is a machine learning based approach in which a cascade function is trained with a set of input data. We have a library named OpenCV which already contains many pre-trained classifiers for the face, eyes, and forehead. The detection of the faces works only on grayscale images. So it is important to convert the color image to grayscale, here we are using Face cascade and Eye cascade so, then we find a list of coordinates for the rectangular regions where faces were found. Similarly, we detect the eyes coordinates to draw the rectangles in our video frame.




This face recognition algorithm is applied to the frame in the video and outputs a bounding box for each face it detects. To maintain consistency across frames, if there is no face detected in frame ,the face from the previous frame is used, if there is multiple face detected in the frame, the face that is nearest to that frame is used.

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### *C. Region of Interest Selection (ROI)*

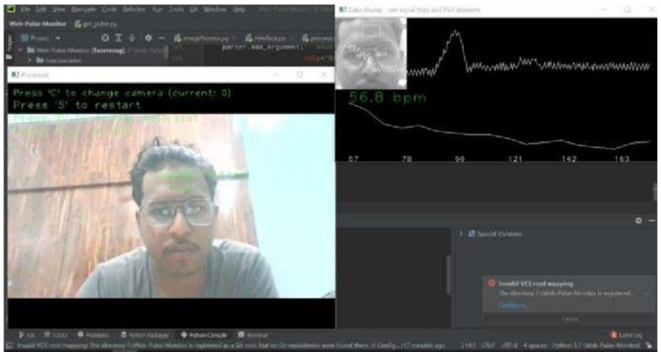
Since the face bounding box found using face detection algorithm contains the background pixels in addition to the facial pixels, an ROI (Region of Interest) must be chosen from within the rectangular bounding box. As the bounding box is basically within the face region according to height of the face but outside according to widthwise. So basically, this method is used for excluding the outside part and background pixels, but some region of face will occur like some hairs at the corners of bounding box.

We must modify the bounding box found in the face detection. To ensure that bounding box includes all face pixels but excludes some hair pixels (so that hair will be considered as background), a bounding box that was approx. 80% (width) of the original box and 20% (height) of the original box.

### *D. Heart Rate Detection*

Once we achieve ROI for the frame in the video then we can begin to extract the rate from the color image data i.e. person's face. A face video of the subject is recorded (in ambient lighting conditions) by keeping the camera at about half meter distance from the face in the video. The video is recorded for the duration of one minute, while the subject is asked to sit still without the eyes closed. The PPG signal is extracted using only the face region of the video and excludes any extra portion in the video frames. It measures the amount of light absorbed in living tissue it detects the change of blood volume by the photoelectric technique. As when the heart circulates blood through your arteries and veins, the light absorbed by your skin changes by measurable amounts. Consumer camera record the images in values of red, green, blue i.e. (RGB) with data from the green channel delivering data that makes it possible to measure heart rate.

Hemoglobin in the blood has an absorption peak for green light, so when the heart pushes the blood into arteries near the skin, more green light is absorbed and less is reflected.



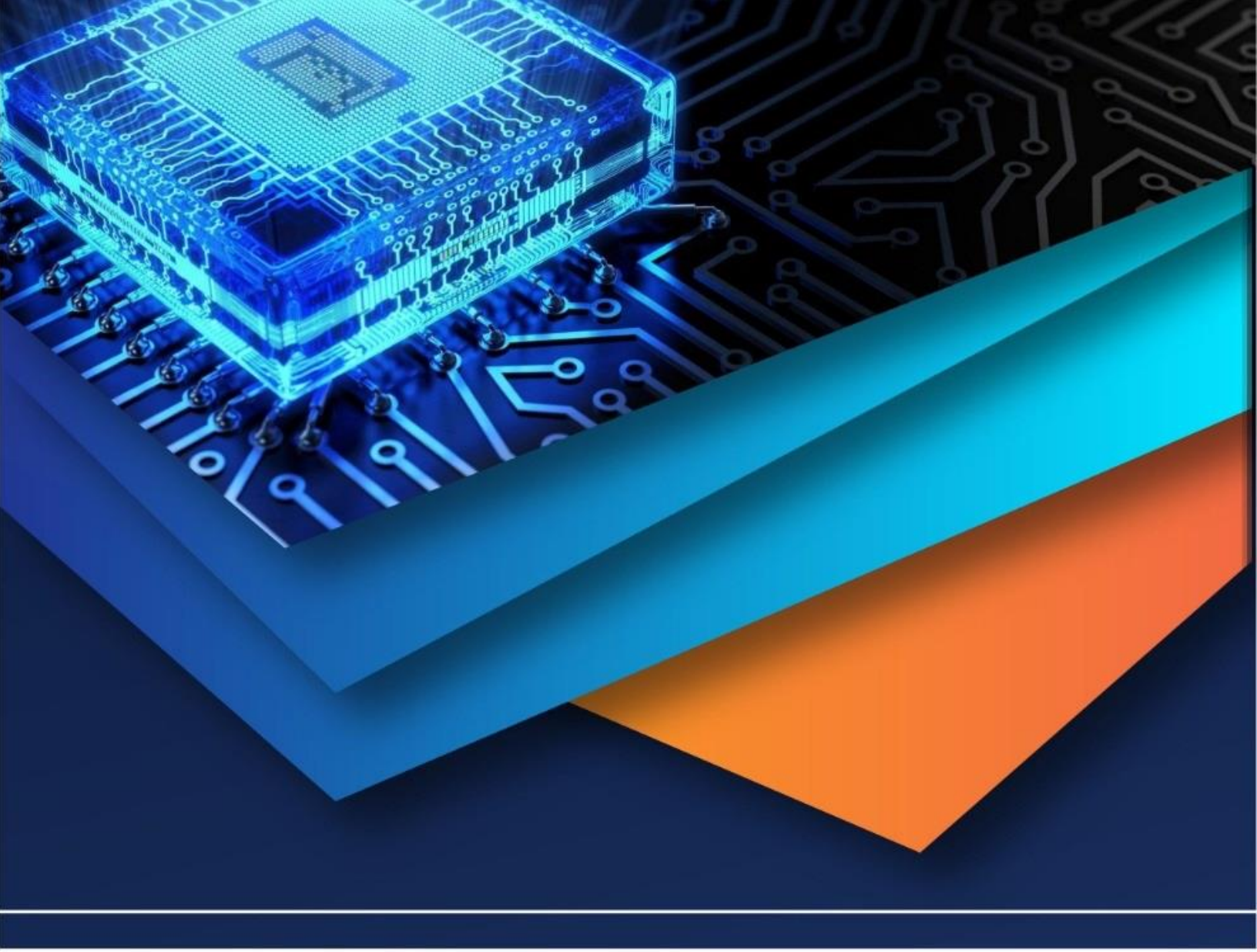

## IV. CONCLUSIONS

This WEB PULSE MONITOR can be used by the various health organizations to keep regular monitoring on patients and for less complexity purpose, we can also use this as contact less measurement of heart rate that would be helpful in times like corona virus.

We have seen that heart rate may be measured in regular colour video of a person's face. We observed heart rate errors of 3.4 - 0.6 bpm for videos of still faces and 2.0 - 1.6 bpm for videos with movement. Since the calculated heart rate was consistently lower than the reference in all videos and with small standard deviation, it is possible that the base error is due to a miscalculation in video frame rate or finger pulse sensor sample rate. Future studies could use a medical-grade pulse monitor to ensure that the reference heart rate is as accurate as possible. If it is determined that there is truly always a consistent offset between the reference and the calculated heart rate as observed in this study, a calibration step could be used to remove the bias.

## REFERENCES

[1] Shervin EMAMI, Valentin Petruț SUCIU "Facial Recognition using OpenCV" (https://www.researchgate.net/publication/267426877_Facial_Recognition_using_OpenCV)
[2] H. Rahman, M.U. Ahmed, S. Begum, P. Funk "Real Time Heart Rate Monitoring From Facial RGB Colour Video Using Webcam" (http://www.ep.liu.se/ecp/129/002/ecp16129002. pdf).
[3] Monika Jain, Sujay Deb, A V Subramanyam "Face video based touch less blood pressure and heart rate estimation" (https://www.researchgate.net/publication/312487122_Face_video_based_touchless_blood_pressure_and_heart_rate_estimation)
[4] Kaushal Kanakia, Saurabh Patil, Sujay Sabnis, Vedant Shah "Emotion and heart rate detection using image processing" (https://www.ijser.org/researchpaper/Emotion- Heartbeat-Detection-using-Image-Processing.pdf)
[5] GitHub (https://github.com/prouast/heartbeat)



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