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**Heartbeat Detection using Webcam**

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**LITERATURE SURVEY**

Cardiovascular diseases are becoming more prevalent in society today as a result of long hours of work, a lack of exercise, and bad eating patterns, which raises the number of fatalities each year. We need to have a good understanding of our bodies in order to live healthy lives. This project will utilise a webcam to take live pictures of your face and calculate the variation in colours that your forehead combines in order to measure heartbeat because many pieces of equipment that are used to test heartbeat are expensive, not always available, or even available 24/7.

Your heart starts the process by pushing blood through your veins, which changes how intensely the colours on your body are. The sole image that is used to determine your heart rate is the green one, which is captured using a simple camera or webcam while focused on your forehead. A webcam can catch subtle changes in green that a false beard makes impossible to see. Our main goal is to create a device that measures your heart rate using a consumer-grade camera.

The camera will compute blood pressure and heart rate in real time and then display the results. In hospitals, several sensors and connected heart rate monitors are frequently used. A self-monitoring tool that allows for real-time heart rate measurement and the display is called an online pulse monitor. It is mainly used to record heart rate data while performing different kinds of physical exercise. You can visualise your face as it pulses in real time thanks to this project. It can detect your pulse and estimates how many times your heart beats every minute.

Sr no.	Name of Research paper and year	Author name	Algorithm used	Advantages/ Disadvantages	Accuracy
1.	Face video-based touchless blood pressure and heart rate estimation (2016)	Monika Jain Sujay Deb A.V. Subramanyam	1. Principal component Analysis 2.KLT Face detection algorithm 3.Peak detection algorithm 4. Parameter extraction algorithm	<b>Advantages-</b> 1. A touchless approach that predicts BP and HR using the face video-based PPG. 2. Continuous hypertension monitoring outside of medical clinics by using a consumer-grade camera. 3. The method's accuracy complies with the Association for the Advancement of Medical Instrumentation, which indicates no significant difference between BP and HR predicted. <b>Disadvantages-</b> 1. PPG signal may get degraded due to constraints like weak peripheral perfusion of the subject. 2. PPG signal may also get degraded due to the time taken by the camera to adjust the focus. 3. Error margin may increase due to the quality of the camera.	<b>SBP-</b> 94.81% <b>DBP-</b> 95.71%
2.	Heart Rate Measurement Using Face Detection in Video (2018)	Carmen Nadrag Vlad Poenaru George Suci	1. Voila Jones Face detection algorithm 2.)The AdaBoost learning algorithm. 3. Principal component analysis (PCA) 4. Independent Component Analysis (ICA) 5. Fast Fourier Transform (FFT)	<b>Advantages-</b> 1. Reduced processing power is needed and allows better scaling. 2. The problem of solving multiple-subjects heart rate monitoring and making a mobile implementation to become feasible. 3. Has reduced computational time, as it uses both face detection and object tracking. <b>Disadvantages-</b> 1. Errors of ~3% were detected, but it is hard to calculate the real error rate, as the monitors exhibit intrinsic Errors. 2. The tests were done on a person from the European continent and two from the Indian subcontinent only so errors might increase with different people from different continents.	97.3%

3.	Heartbeat Rate Monitoring System by Pulse Technique	Bhanu Pratap Surabhi Gautam Naimishi Gupta Saloni Gupta	1. The face recognition algorithm 2. Parameter extraction algorithm 3. Principal component analysis (PCA)	<b>Advantages-</b> 1. Consumer heart rate monitors are designed for everyday use and do not use wires to connect. 2. Use a no-contact service to measure your heart rate without going to medical hotspots. 3. To maintain consistency across frames, if there is no face detected in the frame, the face from the previous frame is used, if there are multiple faces detected in the frame, the face that is nearest to that frame is used. <b>Disadvantages-</b> 1. Heart rate errors of 3.4 - 0.6 bpm for videos of still faces and 2.0 - 1.6 bpm for videos with movement. 2. Base error is due to a miscalculation in the video frame rate or finger pulse sensor sample rate.	96.6%
4.	Real-Time Heart Rate Monitoring From Facial RGB Color Video Using Webcam (2016)	H. Rahman M.U. Ahmed S. Begum P. Funk	1. Principal component analysis (PCA) 2. Independent Component Analysis (ICA) 3. Fast Fourier Transform (FFT) 4. Non-contact HR monitoring algorithm 5. Joint approximate diagonalization of Eigen matrices (JADE) algorithm	<b>Advantages-</b> 1. This technology has significant potential for advancing personal health care and telemedicine. 2. Research progressing during the last decade focuses more on noncontact-based systems which are simple, low-cost and comfortable to use. 3. The thermal image signal can yield quantitative information about blood flow velocity, respiratory function etc. <b>Disadvantages-</b> 1. Monitoring of HR often involves high costs and complex applications of sensors and sensor systems. 2. They used camera images in order to extract physiological parameters using a colour variation of the skin. But their approaches did not report quantitative results; they reported only a graph of heartbeats and also failed to show any correlation with reference ECG signals. 3. A main drawback of the system for use in personal health care, telemedicine and real-time applications such as driver monitoring is that they are not real-time and they did not show how much time the system extracts physiological parameters	96.5%

5.	Software for real-time heart rate detection using a standard webcam	Maximillian F. Xavier Otavio A. Dias Eduardo Peixoto	1. Independent Component Analysis (ICA) 2. Fast Fourier Transform - FFT 3. Face detection algorithm	<p><b>Advantages -</b></p> <ol style="list-style-type: none"> <li>1. An unharmed, simple and cheap method of obtaining an individual's heart rate in real-time.</li> <li>2. Reduces the amount of cabling needed since it involves only a simple camera and an average computer.</li> <li>3. In the case of newborn babies or burn victims, where physical contact is an obstruction, this can estimate a subject's pulse through non-contact means.</li> </ol> <p><b>Disadvantages -</b></p> <ol style="list-style-type: none"> <li>1. Even after the application of the derivative filter, the image is noisy, as well as the trace FFT is noisy.</li> <li>2. The noise is random, appearing at different frequencies in different FFTs.</li> <li>3. Improvement is needed in the appliance of filters to minimize noise caused by ambient light.</li> </ol>	87%
6.	Measuring Heart Rate from Video (2016)	Isabel Bush	1. Independent Component Analysis (ICA) 2. Haar Cascade Classifiers, specifically the OpenCV Cascade Classifier 3. AdaBoost learning algorithm 4. Face detection algorithm 5. Gaussian Mixture Models (GMMs) using GrabCut	<p><b>Advantages -</b></p> <ol style="list-style-type: none"> <li>1. Aids telemedicine.</li> <li>2. Does not require any special equipment.</li> <li>3. It is easy as well as very cheap.</li> <li>4. For sensitive populations such as premature babies and the elderly, a non-contact means of detecting pulse is very beneficial.</li> </ol> <p><b>Disadvantages -</b></p> <ol style="list-style-type: none"> <li>1. Unable to do heart rate calculations in real-time.</li> <li>2. The use of a segmented ROI increases the number of outliers.</li> <li>3. The calculated heart rate was consistently lower than the reference provided and had a small standard deviation.</li> <li>4. The frame rate is under 8 fps which is just enough to avoid aliasing at 8 fps.</li> </ol>	90%

**Conclusion**-The survey on heartbeat Detection using webcam that can be used for face recognition techniques used to monitor a user's heart rate in real time and a color magnification algorithm which makes it possible to see the color of your face change as blood rushes in and out of your head. This project allows you to visualize your face as it pulsates in real time. Since it is able to detect your pulses, it also calculates your heart rate in beats per minute (BPM). It is effective and easy to use in daily monitoring of home care. It is a low-cost method, and leads a way to show an approach which is easily scalable and cost efficient.