

FINAL YEAR PROJECT DETAILED REPORT

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REMOTE HEART RATE MEASUREMENT USING COMPUTER VISION

ABSTRACT:

Heart beat measurement is one of the trivial approaches to identify human health state in medical industry. The project describes an implementation of Analyzing and measuring of Heart Rate Signal from facial video with health of computer vision.

Traditional way of measurement of heart beat method could take lot of time consuming and in convincing of physical touching.

In this project, video taken from any webcam then, each frame could take part of analysis, form that frame detect face using computer vision and based on color changing the signal data. Finally measure the heart beat taken signal data

INTRODUCTION:

Machine learning is a branch of artificial intelligence (AI) and computer science which focuses on the use of data and algorithms to imitate the way that humans learn, gradually improving its accuracy.

Machine learning is an important component of the growing field of data science. Through the use of statistical methods, algorithms are trained to make classifications or predictions, uncovering key insights within data mining projects. These insights subsequently drive decision making within applications and businesses, ideally impacting key growth metrics. As big data continues to expand and grow, the market demand for data scientists will increase, requiring them to assist in the identification of the most relevant business questions and subsequently the data to answer them.

PROPOSED SYSTEM:

Computer vision-based methods there is no need for a dedicated light source. These methods assume that the periodic circulation of the blood by the heart to the rest of the body, including the head, generates some periodic subtle changes to the skin color of the face and also generates some subtle head motions.

These motions are not usually visible to naked eyes but they can be viewed by techniques. These periodic changes to the skin colors and head motions are then utilized to measure heartbeat rate.

Face image of the subject is first found, by a simple camera. Then, it is separated into its color channels and each channel is tracked independently. Using principal component analysis method to measure the heart beat based on the signals.

PROBLEM STATEMENT:

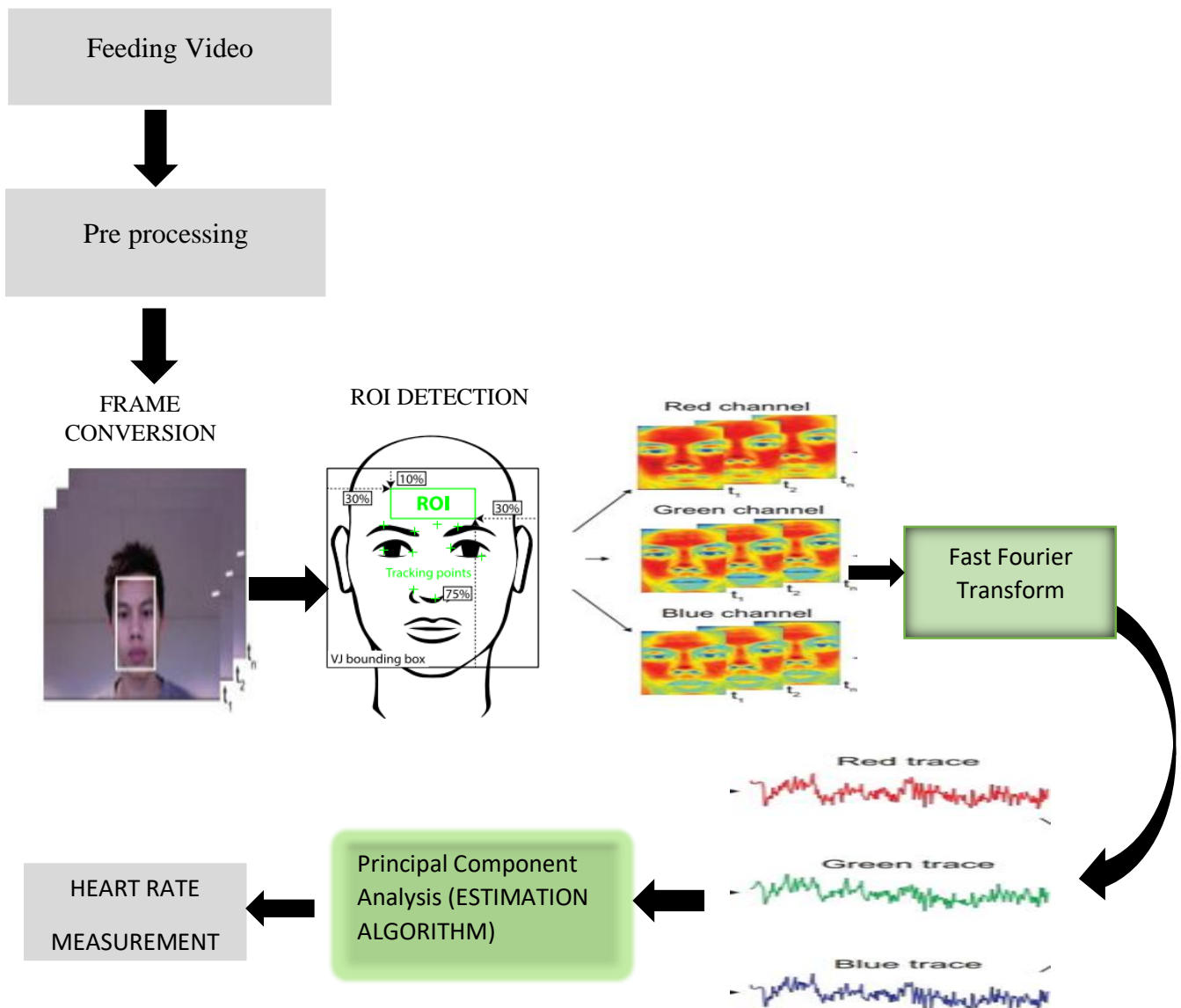
Traditional way of measurement of heart beat method could take lot of time consuming and in convincing of physical touching. In pandemic situations like spread of virus, we might not wish to touch a patient to find the heart rate and doing electrocardiography. So, if this happened remotely, we will be convenient to measure the heart rate i.e., blood volume pulse. This system requires only the facial video from the person who is going to be observed, from that we can able to estimate the final heart rate.

OBJECTIVES:

To detect and track the face and convert facial video to RGB signal.

To measure the heart rate from the obtained signals.

ARCHITECTURE DIAGRAM:



EXPLANATION:

The live video will be captured from the patient and that will be preprocessed like removing the unwanted noisy data. Further the video will be converted into frames. ROI (Region of interest) detection will be carried out for positioning the location to get blood volume. In our case, I will choose the location at forehead. From that the video will be converted into RGB signals.

After extracting the red signal, the signal will be analysed with Fast Fourier Transform(FFT).

Finally to calculate the heart rate , Principal Component Analysis(PCA) algorithm is used. PCA is a technique which fetches out strong patterns from the signals to reduce data dimension. It is used to find out new principal axis where all the data is widely spread. It uses the orthogonal transformation that converts correlated variables into a small number of uncorrelated variables known as principal components. Components are arranged such that initially few components justify for maximum variability.

MODULES LIST:

Module 0 : Libraries

Importing appropriate libraries like openCV

Module 1 : Face Detection

First take video and detect human face, Second, the facial region must be detected in each frame of the video since the face is the only portion of the frame that will contain heart rate information.

Module 2: Frame Conversion

The video will be converted into frames that will loaded into model for further analysis.

Module 3 : ROI detection

The desired region of interest (ROI) within the face bounding box must be chosen. Forehead will be chosen as a location for observing blood volume for our model.

Module 4: RGB signals

The **RGB** signals must be extracted from the change in pixel colors within the ROI over time.

Module 5: Heart rate estimation

Signals are analyzed to determine the prominent frequency within the heart rate range. Principal component analysis will be used to estimate the heart rate.

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