

## Pulse Calculator Using Webcam

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**Abstract:** Heart rate (HR) monitoring in the healthcare aims to equip providers with meaningful data to monitor the health, prognoses symptom and improve the driving safety for the transportation. It is a hot topic for accidents prevention via monitoring the driver's physical condition. However, physiological data collection is a long-term, continuous process that poses various challenges. A camera-based HR detection is as follows. First, facial video is collected over a certain period. Then the facial images are separated into the three RGB channels, and the resulting two-dimensional images are transformed into one-dimensional time-series signals. Each channel signal is normalized, defriended and processed using the independent component analysis (ICA). Afterwards the signals are filtered via band pass filtering and fast Fourier transformation (FFT) to extract the HR.

**Keyword:** - Independent Component Analysis, Heart Rate, Electro cardio graph, Photo plasma graph.

### 1. INTRODUCTION

Heart rate (HR) monitoring in the healthcare aims to equip providers with meaningful data to monitor the health, prognoses symptom and improve the driving safety for the transportation. It is a hot topic for accidents prevention via monitoring the driver's physical condition.

Although some researchers use an electrode integrated into the driving seat to obtain the ECG signal during driving these methods are uncomfortable for the drivers. In some studies, several non-contact techniques have been proposed to estimate HR of drivers. It used the continuous-

wave Doppler radar to detect the HR of the driver. It also used a microwave sensor and template matching algorithm to monitor the HR of the driver. It is well known that a webcam can be used for non-contact measurement of HR and respiration rate via image processing. The involved technique is based on the photo plethysmo graph (PPG), which can detect the blood volume variation by analyzing the transmitted or reacted light. The PPG is a pulsatile physiological waveform attributed to cardiac synchronous variations in the blood volume for each heartbeat which is superimposed on a slowly varying baseline with lower frequency components attributed to respiration, sympathetic nervous system activity and thermoregulation. Toward Driver State Monitoring Thus using a visual sensor such as a camera to measure the HR is a feasible approach. A camera-based HR detection is as follows. First, facial video is collected over a certain period. Then the facial images are separated into the three RGB channels, and the resulting two-dimensional images are transformed into one-dimensional time-series signals.

Each channel signal is normalized, defriended and processed using the independent component analysis (ICA).

#### 1.1 Need:

The need for our project Pulse Calculator Using Webcam System is as:

- This project aims to create a real time, non-contact heart rate monitoring program that utilizes a simple camera to capture facial information.
- Save time for the process.
- Also, the success of this project would provide users access to accurate heart rate.

## 2. LITERATURE SURVEY

YEAR	AUTHORS	METHODOLOGY	SHORTCOMINGS
2012	KUAL-ZHENG LEE, PANG-CHAN HUNG, AND LUO-WEI TSAI.	A contact-free heart rate measurement method using an ambient light camera is proposed.	It takes more time to determine the pulse rate.
2013	ISAYIYAS NIGATU TIBA AND LI	The method implements the haar cascade classifier algorithm presented in opencv to detect human face.	It determines on graphical interface and also image based
2014	QI ZHANG, GUO-QING XU, MING WANG, YIMIN ZHOU	The rgb colour fluctuation during image processing and blind source separation technology in video tracking are used for information extraction.	It use blind source separation technology in video tracking.
2016	H. RAHMAN, M.U. AHMED, S. BEGUM, P. FUNK.	The heart rate is obtained through facial skin colour variation caused by blood circulation.	Skin colour variation are determine mean hr.

2016	AKIHITO SEKI, CHANGQIN QUAN, ZHIWEI LUO	Hr was measured simultaneously using an electro cardiographs (ECG) device during all sessions of the experiment.	The results are not accurate
2018	QI ZHANG, YIMIN ZHOU (MEMBER IEEE), SHUANG SONG, GUOYUAN LIANG AND HAIYANG NI.	Heart rate (HR) detection is proposed via near infrared facial video data	Indoor and outdoor shows different results.
2018	DANILO EMILIO DE ROSSI	These methods are based on subtle colour changes or motions of the face due to cardiovascular activities, which are invisible to human eyes but can be captured by digital cameras	It doesn't have any drawbacks.

## 3. MATERIALS AND COMPONENT

The experiment was taken place in two phases: firstly the real time HR extraction was conducted along with stress system as a reference. All the facial image frames were saved for offline testing. Secondly HR was extracted again in offline using the saved film image sequences.

### 3.1 Data Collection :-

Data acquisition was conducted by 10 participants (all are male) of different ages (25 to 50 years) and skin colors. The experiments were carried out in indoors and with a sufficient amount of ambient sunlight. The participants were informed the aim of the study and they seated at a table in front of a laptop computer at a distance of approximately 0.5 m from the built-in webcam (HP HD webcam). During the experiment, participants were asked to keep still, breathe spontaneously, and

face the webcam while their video was recorded for 5 minutes. HR was extracted in real time and saved in an excel file. All facial image frames (24-bit RGB) during real time HR extraction were recorded sequentially at 30 frames per second (fps) with pixel resolution of 640 × 480 and saved in PNG (Portable Network Graphics) format in the laptop. Simultaneously HR was also recorded using ECG sensors and stress system. After the real time extraction, HR was also extracted again in offline from the saved film image sequences.

### 3.2 Applied Algorithms :-

Three algorithms such as FFT, ICA and PCA have been applied at the same time but separately to extract HR in real time using only facial video. The average of the R, G and B signals were calculated for FFT method. For the ICA method. The data collection was supposed to perform in sitting position without any movement but in reality the test persons moved their hands and heads little bit which is the cause of motion artifacts. Therefore, ICA is used which is able to remove motion-artifact by separating the fluctuations caused by small motions or movement. Interestingly, ICA returns the independent components randomly and the component whose power spectrum contained the highest peak is then selected for further analysis. Similarly the normalized raw traces are also decomposed by PCA to find the principal components. Finally, the Fast Fourier Transform (FFT) is applied on the selected source signal to obtain the power spectrum. The pulse frequency was designated as the frequency that corresponded to the highest power of the spectrum within an operational frequency band.

### 3.3 Hardware Interfaces :-

There are A RBG Camera required to take video of an Object. Object such are human being.

### 3.4 Software Interfaces:-

Software in Run on Windows and is code in PyCharm IDE it bases on Python programming language the Hardware RGB Camera is connected to device and it takes the video of Object and by analyzing it show the Pulse Rate of an Object.

### 3.5 SYSTEM ARCHITECTURE

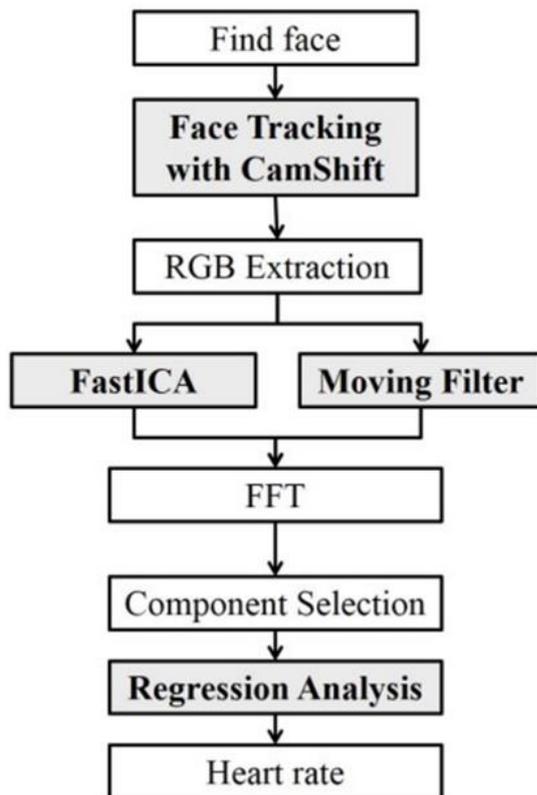


FIG. NO. :- 1

### 4. METHODOLOGY PROPOSED SYSTEM

- When run, a window will open showing a stream from your computer's webcam
- When a forehead location has been isolated, the user should press "S" on their keyboard to lock this location, and remain as still as possible (the camera stream window must have focus for the click to register). This freezes the acquisition location in place. This lock can be released by pressing "S" again.
- To view a stream of the measured data as it is gathered, press "D". To hide this display, press "D" again.
- The data display shows three data traces, from top to bottom:
  - raw optical intensity
  - extracted heartbeat signal
  - Power spectral density, with local maxima indicating the heart rate (in beats per minute).

- With consistent lighting and minimal head motion, a stable heartbeat should be isolated in about 15 to 20 seconds. A count-down is shown in the image frame.
- If a large spike in optical intensity is measured in the data (due to motion noise, sudden change in lighting, etc.) the data collection process is reset and started over. The sensitivity of this feature can be tweaked by changing data\_spike\_limit on line 31 of get\_pulse.py. Other mutable parameters of the analysis can be changed here as well.

### 5. CONCLUSIONS

In this study, we have proposed a method for non-contact, real-time monitoring of heart rate even if the subject's face is always moving. We have evaluated five methods that make use of CamShift, FastICA, moving filter, and second-order regression analysis.

One of the objectives of this study is to design a method for real-time heart rate monitoring. This object was realized with CamShift and the processing speed was 2.7 times faster than other methods. Combining with improvement from the use of moving filter and regression analysis, the mean absolute error was 42.4% reduction from previous methods in the situation of large rapid head movement.

From experiment II, we can measure HR data similar to ECG in the situation of small head movement. Sure and thankfulness to all faculty members of the Department of Computer Engineering of Dilkap Research Institute and management Studies, Neral.

### 6. REFERENCES

- [1] In 2012, The Authors KUAL-ZHENG LEE, PANG-CHAN HUNG, AND LUO-WEI TSAI made a contact-free heart rate measurement method using an ambient light camera. It takes more time to determine the pulse rate.
- [2] In 2013, The Authors ISAYIYAS NIGATU TIBA AND LI proposed the method implements the hair cascade classifier algorithm presented in opens to detect human face. It determines on graphical interface and also image based.

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[6] In 2018, The Authors QI ZHANG, YIMIN ZHOU (MEMBER IEEE), SHUANG SONG, GUOYUAN LIANG AND HAIYANG NI made Heart rate (HR) detection is proposed via near infrared facial video data Indoor and outdoor shows different results.