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Remote Heart Rate Measurement using Facial Expression Videos: A Survey

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Abstract: ***Recent development in Computer science and digital image processing have enabled the extraction of an individual heart rate pulsations from pixel changes in the recorded video formats images of the human skin surfaces. This is commonly known as Remote photoplethysmography(rPPG). It is commonly known as the tool for the measurement of the heart activities. It can be achieved us a consumer level web cameras .We have two methods to follow in the series ,at first we aim to organize future rPPG software development in a non technical manner ,in such a way public gains to access a open source rPPG code by which we can understand its utility purposes. Another way of this series is to determine the accuracy of rPPG by detecting the heart rate activities from the skin surface and all over the body under a ambient light surface entering into the body and its recorded by the camera .Here we can notice that rPPG is comparatively highly accurate when the camera is focused in the facial skin tissue, but the heart rate in the wrist regions are less reliable compared to the skin and the recording in the calves are less reliable .Recently they validated the feasibility of estimating the heart rate activities using the RGB video format. Remote photoplethysmography (rPPG) has proved that the measuring heart activities without any contact sensor has the greater potential in many of the applications ie) in the healthcare. Existing rPPG approach on analyzing fine details of the facial videos which is being affected by the video compression.***

Indexterms: Remotephotoplethysmography (rPPG), Heart rate, Heart Rate Measurement, RGB.

I. INTRODUCTION

Human vital signs like heart rate, blood oxygen saturation and related physiological measures can be measured using photo plethysmography (PPG).This process involves optically monitoring light absorption in the tissues that are associated with the blood volumetric changes. It can be done using the contact sensor through which the light passes into the body(skin)surface. Remote photoplethysmogrphy has the ability to detect blood volume pulse remote by tracking changes in the skin reflectance measured in the camera .The process of rPPG basically involves two basic steps at first it detects and track the skin color changes of the particular person and then it analyzes the signal to compute the various measures by measuring the heart rate of the person and the heart rate variability and by following then respiratory rate. In the recent research they have proved that the basis of the computer video, signal processing ,and the machine learning has been improved the features and the performance of the rPPG techniques significantly. As the heart rate is acting as the basic output from the analysis of the PPG/rPPG signal analysis, fine analysis of the blood volume pressure(BVP) signal is also being obtained .Among all those measures one of the measure is the heart variability ,it is the measure of the variations in the particular time interval between the individual heart beats. This measure has the has utility in providing the insights into the various psychological and physiological signals like if the patient is in the stress level or some sight of anxiety. Heart rate pulse is the measure of number of heart beats per minute. It is one of the critical sign to assess the physiological state of the person. Heart Rate (HR) monitors many potential activities in the body. Like it has the ability to see the inner changes that is happening in the heart beat, and the various video processing research can be done in the various methods but it is mainly use in the case of HR monitoring in addition to the external behavior it also monitors the inner physiological changes provide information for the better understanding of the people. We also have the traditional HR measuring methods in two ways. First method relies on the special electronic or optic sensors in that most of the instrument which requires the skin –contact which is in comfortable and it is also in convenient that is nothing but Electrocardiogram(ECG).Second method is to use the photoplethysmography(PPG) and it has its own principle that is light illuminate the skin with the light emitting diode (LED) and then the we have to measure the amount of light which is being reflected or transmitted to a photodiode. We can also use the PPG based setting for the measurement of the HR without any contact but still this method requires special lighting sources and the sensors.

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II. LITERATURE SURVEY

Many papers has the research work based on this topic and many invented various methodologies in the various manner. Heart rate measurement involves various principles and the mechanisms in the system. It can be able to follow various mechanisms few methods are RGB Laser database, Spatio -Temporal video enhancement netwok, an rPPG network for rPPG signal discovery ,PPGI-where the heart rate is extracted via camera ,Multitask CNN for detecting the presence of a patient and segmenting the skin regions. Another method is done by using the OBF database is the face video for the remote physiological signals measurement and the atrial fibrillation detection.

1) In the olden days existing (rPPG) has the fine details of the facial videos in two stage format end to end method using rPPG information enhancement networks involves two scenarios Spatio Temporal Video Enhancement Network(STVEN),an rPPG network for rPPG signal discovery.

2) Remote sensing it is the thing in which signals are measured over a distance. PPGI where the heart rate is extracted via camera. Compression schemes of Motion JPEG,MPEG-4,Motion JPEG 2000 to extract the PPGI signal. Image filtering is applied after compression to improve the quality in respect to the PPGI signal extraction. Here camera it detects the small changes of skin reflectivity according to the blood in the vessels

3) Patient detection and skin segmentation are important steps in non – contact vital sign monitoring as in the skin. Heart rate and Peripheral Oxygen Saturation(SPO_2).Multi task CNN for detecting the presence of patients and segmenting the patients skin regions.

4) A large face video for Remote physiological signal measurement and Atrial Fibrillation Detection. Oulu Bio Face(OBF) includes large no of facial videos which simultaneously recorded reference physiological signals. Data recorded from both healthy subject and from the patients with the atrial fibrillation. Accuracy of HR,HRV,RF measured using OBF videos.

5) Detection of AF from remote face videos by analyzing the color variations of the face skin. Current rPPG is rather immature which cause difficulty in extracting the pulse signals for describing cardiac rhythm. Feature Fusion Algorithm to select and combine reasonable information from multiple psychological features which aims to preserve discriminability of detecting AF in the presence of noise.

6) Digital cameras is to perform for the health monitoring which includes two scenario :Human computer interaction scenario(HCS), Health monitoring scenario(HMS).HCS includes effects caused by illumination variance in skin tone, motion variance. HMS investigates the feasibility of health monitoring at public places. RGB camera based health monitoring has become one of the interesting avenues for health monitoring due to its inexpensive sensor. MANHOB-HCI Database have presented data which exhibit physical motion regarding moving the head while the body remains the same. Viola Jones Face Detector , Discriminative Response Map Fitting.

7) Blood pressure is a vital physiological parameter that indicates the functional well being of the cardio vascular system.”Plethymos” means to increase. Finding variations in the size body part owing to variations in the amount of blood passing into the body. Measures the volumetric changes of the heart by using light transmission (or) the reflection. LED light should be placed in arties are closer to the skin such as finger tip,ear lobe.

8) We present a method for extracting heart rate and heart rate variability from the face using only by a consumer graded webcam. This model includes few stages they are as follows (i)Skin pixel selection (ii)Signal Extraction (iii)Signal filtering a)Rhythmic motion noise suppression b)Wide & narrow band filtering (iv)Post pre processing (v)Output calculation: Stable Set, Vicar PPG,PURE,MANHOB-HCI

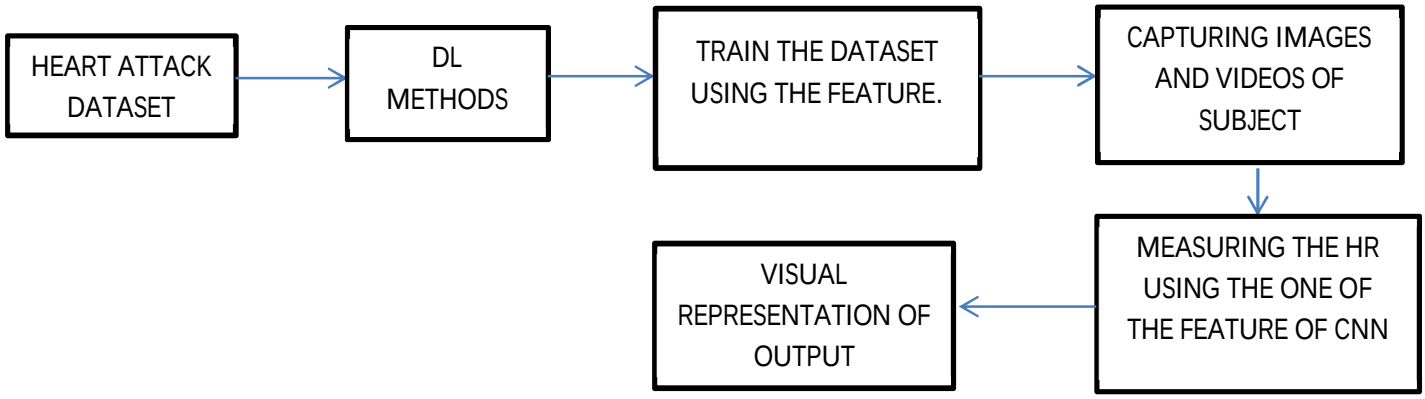
9) The accuracy and precision of the Face reader rPPG by Noldus for measuring the HR was assessed with respect to an ECG criterion measure. Experiment includes Pro Comp InfinitiT7500M(ECG recording)and Logitech HD Pro Webcam and it includes a picture of the face reader rPPG software by Noldus.

10) RGB color model was converted into HSI color model and the mean of hue channel was computed. Fast Fourier Transformation followed by the bandpass filter and z-score theorem was applied to PCA and hue channel for heart rate measurement.(i) Brightness Preserving Bi-Histogram Equalisation (BBHE) (ii) Signal Extraction (iii) Principal component analysis (iv)HIS color model (v) Participants (vi)Experimental Setup (vii) Algorithms.

Existing model had been done with the images in the dataset to determine whether a person is affected by heart attack or an healthy person using the CNN model.

III. METHODOLOGY

The proposition of this methodology is to identify the accurate heart rate measurement from the subject from the following datasets. The existing method are trying to work with the challenges but the accurate solution was not obtained due to the insufficient position of the camera placed from the subject present, as the skin tone variation only will present the correct HR when compared to the other parts in the body image filtering must be done using RGB. Current PPG network is rather immature which cause difficulty in extracting the pulse signals for describing the cardiac rhythm. The architecture proposed here states that, a dataset comprises of the Heart rate are needed to train with the DL methods. Now capturing the images / videos of the subject and train it to get a perfect solution. Train the dataset using the feature and then measure the HR by applying the various techniques. And the resultant output is represented in the visual format in Graphical representation. The RGB also extract the signal from the face into different color format and its being converted for a signal extraction format by the suppression and band filtering and then its being preprocessed for an output signal. Various models are available like Resnet, Alexnet, VGG, Squeezenet, Densenet, Inception v3.I am going to fine tune the model using the technique Alex Net.



IV. CONCLUSION

Remote Photoplethysmography is going to play a vital role in the measurement of the heart activities. Due to the advanced tools it is easy to measure the absolute value as the Deep learning mechanism is involved in the process it provides a solution to build a framework for the signals. Various models is being used for the model to be proportionate and we hope that the future proposed system will provide a solution for the accurate determination of the values and it reduces the time and resultant output but be reliable.

REFERENCES

[1] Zitong Yu, Wei Peng, Xiaobai Li, Xiaopeng Hong, Guoying Zhao(2019) "Remote Heart Rate Measurement from Highly Compressed Facial Videos: an End-to-end Deep Learning Solution with Video Enhancement". IEEE ICCV2019.

[2] Sebastian HANFLAND 1, Michael PAUL "Video Format Dependency of PPGI Signals" Philips Chair for Medical Information Technology, Helmholtz-Institute, RWTH Aachen, Pauwelsstr. 20, D-52074 Aachen, Germany

[3] Sitthichok Chaichulee; Maurico Villarroel; Joao Jorge; Carlous Artete; Gabrille Green; Kenny Mc Cormick "Multi-Task Convolutional Neural Network for Patient Detection and Skin Segmentation in Continuous Non-Contact Vital Sign Monitoring" Published in: 2017 12th IEEE International Conference on Automatic Face & Gesture Recognition (FG 2017)

[4] Xiaobai Li, Iman Alikhani, Jingang Shi, Tapio Sepp¨anen, Juhani Junttila, Kirsi Majamaa-Voltti, Mikko Tulppo and Guoying Zhao Center for Machine Vision and Signal Analysis (CMVS)University of Oulu, Oulu, Finland Research Unit of Internal Medicine, Medical Research Center Oulu." The OBF Database: A Large Face Video Database for Remote Physiological Signal Measurement and Atrial Fibrillation Detection" (IEEE 2018)

[5] Jingang Shi , Iman Alikhani, Xiaobai Li, Zitong Yu, Tapio Seppänen ,and Guoying Zhao , Senior Member, IEEE" Atrial Fibrillation Detection From Face Videos by Fusing Subtle Variations"

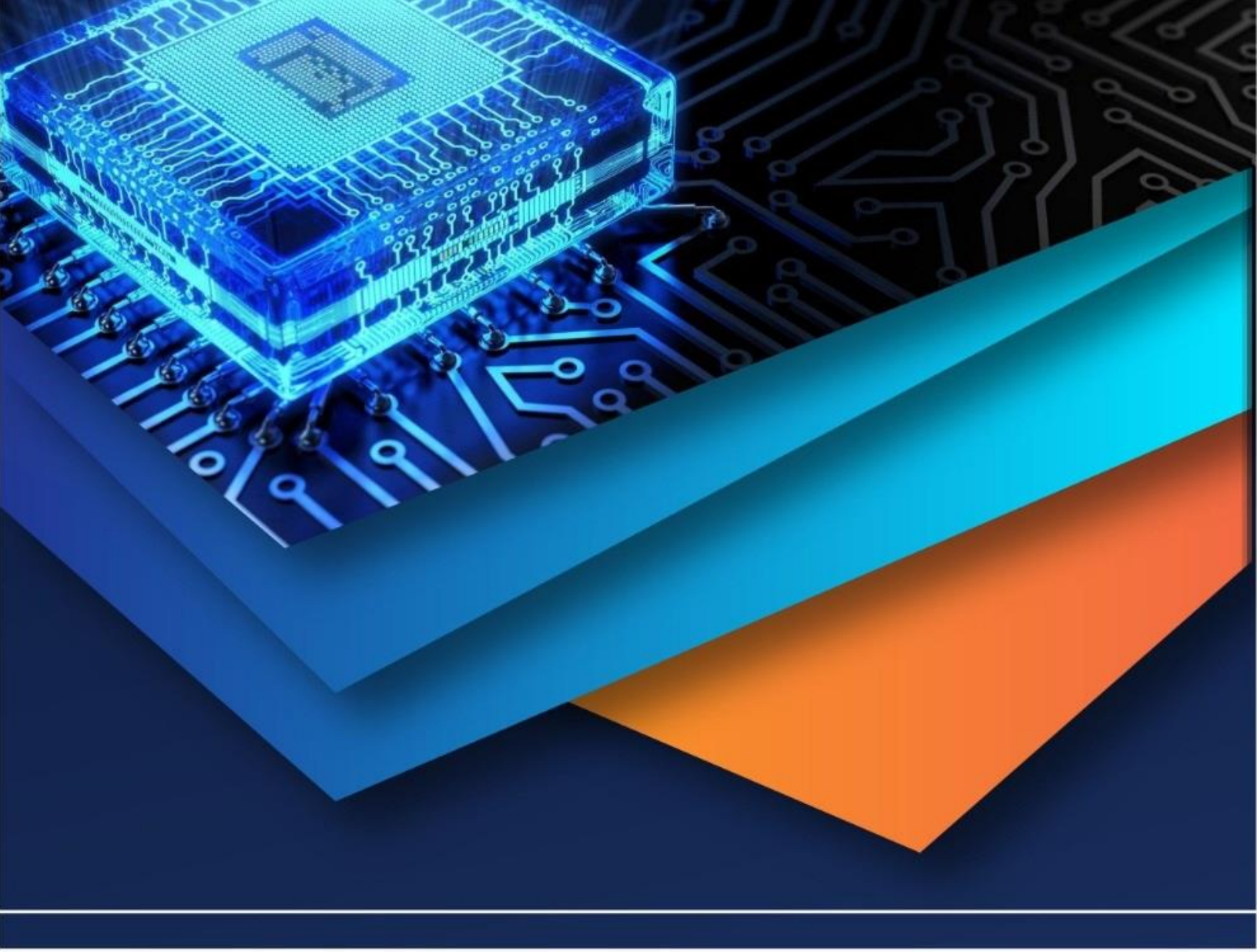
[6] M.A.Hassan[ab]A.S.Malik[b]D.Fofi[c]B.Karasfi[b]F.Meriaudeau[c]" Towards health monitoring using remote heart rate measurement using digital camera: A feasibility study" Volume 149, January 2020, 106804.

[7] C. Bambang Dwi Kuncoro,1,2 Win-Jet Luo,2 and Yean-Der Kuan" Wireless Photoplethysmography Sensor for Continuous Blood Pressure Biosignal Shape Acquisition" Received 8 August 2019; Accepted 8 January 2020; Published 24 February 2020.

[8] AmoghGudiVVTUDamogh@vicarvision.nl Marian Bittner VV TUD marian@vicarvision.nl RoelofLochmansTU/er.h.lochmans@student.tue.nl Jan van Gemert TUD"Efficient Real-Time Camera Based Estimation of Heart Rate and Its Variability"

[9] Simone BenedettoID1 *, Christian Caldato1 , Darren C. GreenwoodID2,3, Nicola Bartoli1 , Virginia Pensabene4,5, Paolo Actis4 "Remote heart rate monitoring - Assessment of the Facereader rPPg by Noldus"

[10] Garima Uppal(1), Neelam Rup Prakash(2), Parveen Kalra(3)"Heart Rate Measurement Using Facial Videos" Advances in Computational Sciences and Technology ISSN 0973-6107 Volume 10, Number 8 (2017) pp. 2343-2357 © Research India Publications http://www.ripublication.com.



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