Heart Rate Evaluation from Face Reflectance using Hilbert-Huang Transform

Neha Deshmukh
M.Tech Student
Department of ISE
Dayanand Sagar College of Engineering,
Bangalore, India

Sunanda Dixit
Associate Professor
Department of ISE
Dayanand Sagar College of Engineering
Bangalore, India

B. I. Khodanpur
Professor
Department of ISE
Dayananda Sagar College of Engineering,
Bangalore, India

***Abstract*—The Monitoring of the heart rate is done using conventional electrocardiogram. In order to measure the electrocardiogram of a patient the patient need to wear adhesive gel patches or chest straps that can cause skin irritation and discomfort.To achieve a robust estimation, empirical mode decomposition of the Hilbert–Huang transform is used to achieve the primary heart rate while reducing the effect of ambient light changes. This paper throws light on different methods to evaluatethe heart rate using different methods such as different view of face,under different illumination conditions.**

Keywords—Heart rate,Hilbert-Huang transform

I. INTRODUCTION

Heart rate is an important indicator of human physiological state. The normal heart rateof a human is between 60 bpm-100bpm.Nowadays we can observe that most of the deaths in the worldwide arearisingdue to heartattack. The main reason for heartattack can be Highblood pressure,sudden cardiac.

In order to measure the heart rate of a patient. The patientneed to wear adhesive gel patches and chest straps that can cause skin irritation and discomfort.

In this paper we have focused on touchless heart rate monitoring which doesnot require physical contact. For touchless heart rate monitoring heart rates can be evaluated from consecutive visual images of subjects face by measuring periodic variation of reflectance resulting from varying hemoglobin absorptivity across visible light spectrum as blood volume in blood vessels increases and decreases with each heartbeat.

II. LITERATURE SURVEY

Mariusz et al.[1] proposed the verification method which is very important aspect in the face verification system and preprocessing method improves the verification rate.

M.z poh et al.[2] has proposed Bland-Altman and correlation analysis.where cardiac pulse and FDA-approved finger blood volume pulse comparative analysis has been done.This method gives high accuracy and correlation.

Shuhang wang et al.[3] have proposed naturalness preserved enhancement algorithm for non-uniform illumination images.The method uses enhancement technique which plays an important role in image processing.Image enhancement technique are of two types:spatial domain method and transform domain method.The images enhances are good,error-free.

Jie Chan et al.[4] proposed a simple yet very useful and robust local descriptor,weber local descriptor.web local descriptor have two components:differential excitation and orientation.

The similar approach has been proposed where Ihsan ullah et al.[5]proposed web local descriptor for gender recognisation.web local descriptor is a texture descriptor and is extended using local spatial information.

Wim verkrysse et al.[6] proposed the cardio-vascular pulse wave travelling through body is detected using plethysmography.PPG uses light reflectance and its principle is it absorbs light more than surrounding tissue.Spatial averaging method is used to improve SNR digital filtering and spatial analysis.

Chihiro and yujiet al.[7] has proposed a non-contact device by applying auto-aggressive spectrual analysis to a time-lapse image from a handy-video.

S.Cook et al.[8] Heart rate is one of the simplest cardiovascular parameters. Heart rate is indicated as risk factor for cardiovascular diseases.which causes death in both adults and infants.Heart rate is a parameter of high significance not only because of monitoring cardiovascular diseases rather heart rate is also caused by physical exercise,mental stress and also require monitoring.

Ralph gross etal. [9] have proposed a large improvement in performance.

V Blanz et al.[10] haveproposed forrecognizing faces from different directions and different illuminations.The main approach is to capture the class specific properties of face.

Athinodoros S Georghiades et al.[11] proposed illumination variability that is the thing appear different when viewed from fixed pose. So, For this illumination cone which models the complete set of images withlambertian reflectance of object

Peter N Belhumeur et ol.[12] have proposed a face recognisation algorithm which is unconcerned to variation in lighting direction and facial expression. Eigenface is used to perform dimensionalityreduction.Fisherface is the next result of the eigenface.Correlation algorithm is used to extract important informationfrom images.Fisherface gives less errors compared to Fisherface.

Survey of different methodologies

Table 1. Survey of methodologies with advantages and disadvantages.

Year	Author	Methods	pros	Cons
2013	Shuhang wang et al	Retinex based algorithm	Preserve naturalness	May produce blurred quality of image/video
2010	Mariusz et al	Preprocessing method,Histogram equalisation		Variations in pose and illumination
2010	M.Z poh et al	Bland-Altman,correlation analysis	Low cost,accurate, Contact free heart rate measurement,Motion tolerant, Can perform measurement on more than one person	This method may not be able to provide details as ECG,variations in sunlight can cause decreasing SNR,uses inbuilt webcam with lappy as videos can undergo changes due to different resolution of camera
2008	Jie chan et al	Webers law	Simple,fast,reliable	
2008	Wim verkrysse et al	Reflectance perception model	Least expensive,simple to use,Efficient	
2007	Chiro et al	Autoregressive spectural analysis	Can measure heart rate and respiratory rates based on brightness on cheeks	
2003	R.Gross et al	Histogram Equalization, Photographic Normalization, Preprocessing method	Improves verification rate	
2002	V.Blanz et al	3D Morphable Model	High performance, Improve face recognition accuracy,reliable,robustness	Not reliable
1998	Athinodoros georghiades et al	Illumination cone	Illumination cone performs good then other techniques, Error rates are improved by cast shadow	
1997	Peter N Belhumeur et al	Eigenfaces,Fisherface,correlation	Fisherface has low error rates,Eigenface improvesperformace in the presence of lightening variation	Sensitive to lightening conditions and position of head.

III CONCLUSION

Detection of heart rate in human beings is very important to see how well the heart is working.This paper provides detailsurvey of different methodologies of heart rate detection using different methods such as different view of face, under different illumination conditions.

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