VI BASED HEMODYNAMIC MONITOR

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INTRODUCTION

Every now and then, we come across terms like 'cardiovascular' and 'cardiac'. Although we do take their face value for the dangerous things that

they represent, very few of us fully understand what cardiovascular diseases are. All of us recognize the terms such as 'Heart attack', 'Heart

Failure', 'Coronary artery disease', and 'stroke', but few would know that these diseases are collectively a part of what is called Cardiovascular

diseases.

Cardiology is actually a branch of medicine that deals with the problems and disorders of heart and some parts of the circulatory system.

For a person, it is important to keep the risk factors;

- High blood pressure
- Physical inactivity
- Excessive consumption of tobacco/alcohol
- Hereditary factors
- Unhealthy diet
- High level of cholesterol
- Age

MOTIVATION

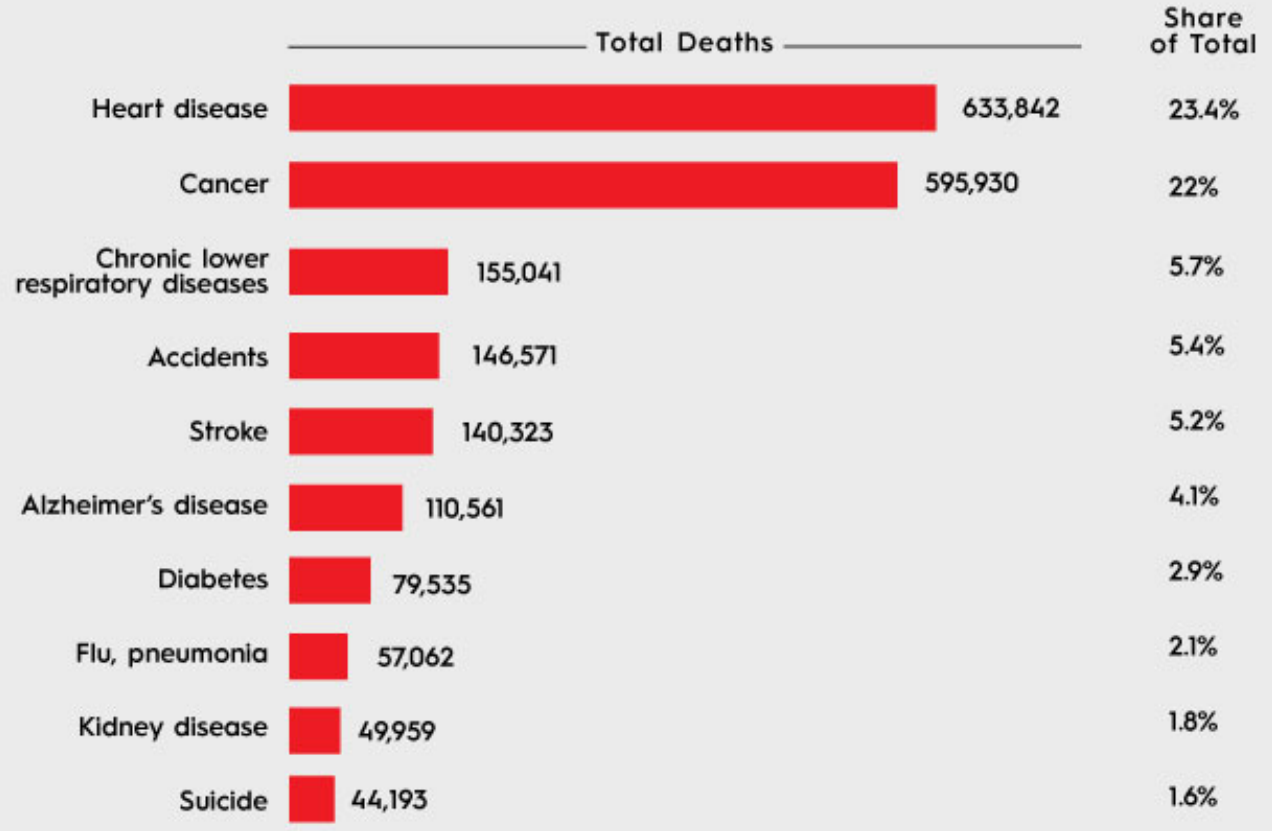
the reality that cardiovascular diseases are the leading cause of death around the world. As estimated by the World Health Organization (WHO), the count is 17.9 million or 31% of death cases around the world

This trend is supporting the scientific activity in the direction of developing new cardiovascular monitoring applications is constantly intensifying.

- employed sensors,
- signal conditioning ,
- data acquisition elements ,
- customized user interfaces,
- intelligent signal algorithms.

LEADING CAUSES OF DEATH

Heart disease continues to kill more Americans than any other cause, followed by stroke at No. 5, according to 2015 federal data.



Source: Centers for Disease Control and Prevention

Published Dec. 8, 2016

PROBLEM STATEMENT

When it comes to a layman, until he has a heart attack, he would not believe that there is something wrong with his heart. It is a basic human tendency to never expect something bad to happen to himself. However, the first step towards getting rid of cardiovascular or any disease is accepting that it can happen to anyone. Therefore, one should always have an eye their physical condition.

So one would monitor his/her hemodynamic parameters

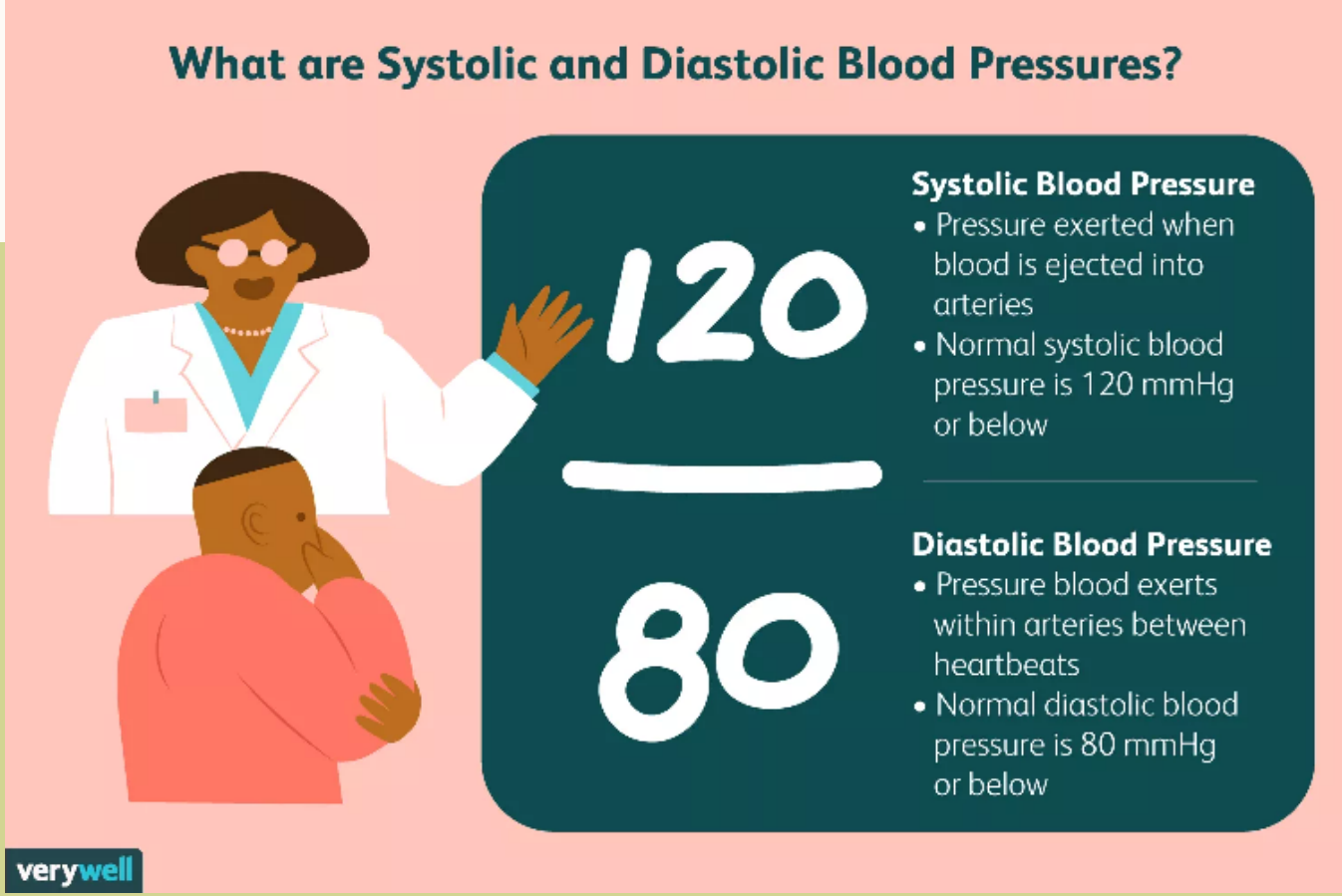
Such as ,

- BP
- HR
- Temp
- CRT

COMMONLY MEASURED HEMODYNAMIC PARAMETERS IN CRITICAL CARE:

Pulmonary Artery Pressure (PAP)

- Systolic (PAS)
- Diastolic (PAD)

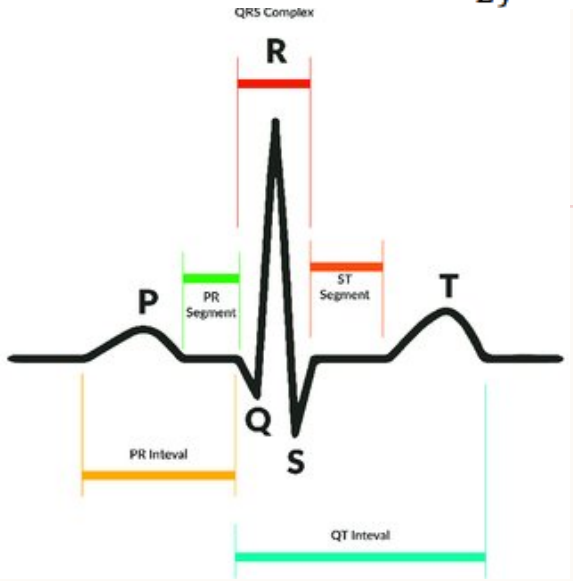


EXPERIMENTAL DATA

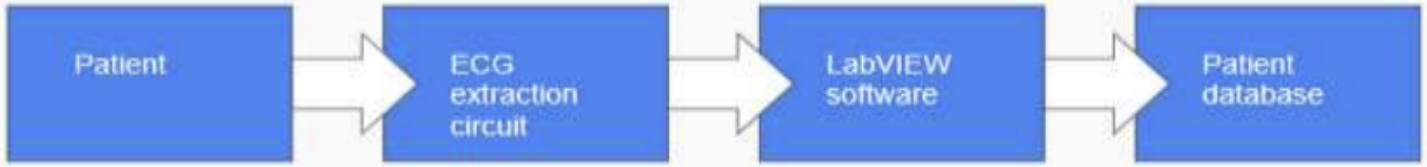
$$BHI = \frac{EJ}{PEJ}$$

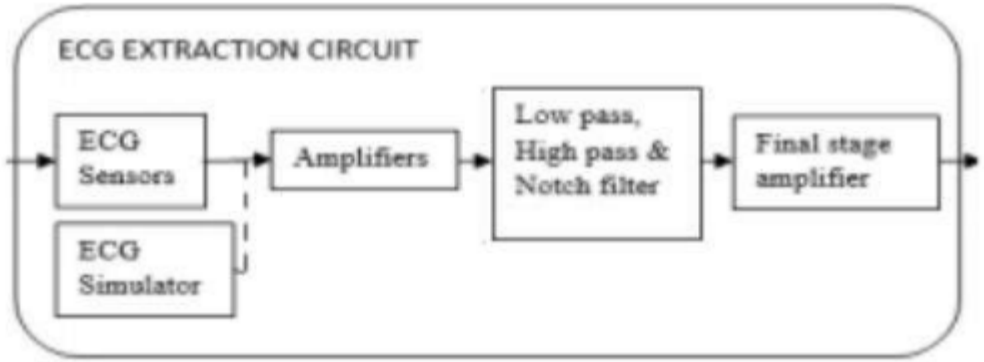
$$FEJ = (1.125 - 1.350 \cdot \frac{PEJ}{EJ}) \cdot 100$$

Subject Info	*BIH*	*FEJ*	*Evaluation*
Male, 63-years old	3.591	74.905 %	Normal
Female, 45-years old	2.963	66.937 %	Normal
Male, 63-years old	2.857	84.706 %	Normal
Female, 27-years old	2.516	58.846 %	Normal
Male, 32-years old	3.864	77.559 %	Normal
Female, 40-years old	3.565	74.634 %	Normal
Male, 39-years old	5.722	88.908 %	Normal
Female, 32-years old	3.280	71.341 %	Normal



BLOCK DIAGRAM





LITERATURE SURVEY

l. A Review Paper on Analysis of electrocardiograph (ECG) Signal for the detection of Arrhythmia Abnormalities

By Anand Kumar, Joshi Arun Tomar, Mangesh Tomar

- The aim of this paper presents analyses of cardiac disease in Electrocardiogram (ECG) Signals for Cardiac Arrhythmia using analysis of resulting ECG normal & abnormal waveforms. This paper presents a method to analyze electrocardiogram (ECG) signals, extract the features, for the classification of heartbeats according to different arrhythmia.

LITERATURE SURVEY

2.Research on a Practical Electrocardiogram Segmentation Model

By Jianjian Wang, Zheying Li

- A practical ECG segmentation model is introduced in this paper, which is built on-time processing. With the model, the ECG signal is divided into several pieces. Each piece has an adjustable sampling time interval and can be processed in a time sequence. Also, the signal amplitude can be adjusted. This is very useful in practical application.

LITERATURE SURVEY

3. Temporal Analysis of ECG using LabVIEW

By Prof Amruta Mhatre, Prof. Sadhana Pai, Prof. Manita Rajput

- "Temporal analysis of ECG using LabVIEW" is meant to acquire ECG signal from patient and analyze it to detect and classify its anomalies and abnormalities. This is achieved by extracting amplitudes and durations of parameters of ECG waveform such as P wave, QRS complex, RR interval, and PR durations. These parameters are compared with the normal values to determine the type of abnormality. The database of the patient is maintained for further use by the doctor.

LITERATURE SURVEY

4. Labview Based ECG Patient Monitoring System for Cardiovascular Patient Using SMTP Technology

By Om Prakash Singh, Dawit Mekonnen, and M. B. Malarvili

- This paper leads to developing a LabVIEW based ECG patient monitoring system for a cardiovascular patient using Simple Mail Transfer Protocol technology. The designed device has been divided into three parts. The first part is the ECG amplifier circuit, built using an instrumentation amplifier (AD620) followed by a signal conditioning circuit with the operation amplifier (lm741). Secondly, the DAQ card is used to convert the analog signal into digital form for the further rocess. Furthermore, the data has been

LITERATURE SURVEY

Contributions

This study aims to contribute to the growing area of research for the detection of heart conditions and different arrhythmias by analyzing the ECG signal in real-time to prevent these conditions and exploring tele-health options and best practices. Our contributions to this area of research can be summarized as follows:

1. Present a detailed overview of the heart and its electrical activity by discussing ECG, its waveform and different arrhythmia types that can be retrieved from ECG
2. Present the stages-based ECG signal analysis process model from data acquisition source selection to the classification process. We present a comprehensive survey of ECG analysis work in the form and context of the introduced stages-based model.

LITERATURE SURVEY

3. Present a detailed literature review of ECG datasets (stage 1) that are used to evaluate machine learning classification algorithms in both research and portable wearable devices for real-time detection
4. Discuss and summarize denoising methods to clean the ECG signal to reduce false alarms and improve classification (stage 2). We present a comparison of different techniques and their usage in various research areas along with their reported performance evaluation metrics.
5. Present an overview of the latest research of traditional and machine learning features engineering-based ECG classification algorithms (stages 3 and 4) and summarize their performance metrics evaluated on different datasets
6. Discuss real-time monitoring systems using body sensors in portable and wearable devices, its feature engineering mechanisms, ECG sensor networks, and ECG classification for portable and wearable devices (relevant to all 4 stages, and mainly stage 3). We further outline the latest hardware of portable systems and wearable smart devices for real-time heart monitoring.

LITERATURE SURVEY

7. Discuss tools that are available to perform research in this area of interest
8. Discuss the challenges and limitations of this area of research and present a comparative summary table of this survey and other related survey papers in the field

REFERENCES

- A Mhatre, S Pai, N Rajput Volume 111, Issue IX, September 2014(Page no. 128-131): Temporal Analysis of ECG usin LabVIEW
- John A Kastor, —Cardiac Arrhythmiasll, University of Maryland,Baltimore, Maryland, USA.
- Elizabeth M. Cherry and Flavio H. Fenton, —Heart Structure,Function and Arrhythmiasll, Department of Biomedical Sciences,College of Veterinary Medicine, Cornell University.http://thevirtualheart.org
- H. Sahool and K. Biswal, "Patient monitoring system for cardiovascular patient with body temperature using lab VIEW," International Journal of Engineering Research and Development, vol. 6, no. 8, pp. 27—30, 2013.

REFERENCES

- C. Saritha, V. Sukanya, and Y. Narasimha Murthy, "ECG signal analysis using wavelet transforms," Bulgarian Journal of Physics, vol. 35, Article ID 13100157, pp. 68-77, 2008.
- S. N. Van, D. T. Quang, and G. N. Hoai, "Development of A Low-Cost Arduino-Based 12-Lead ECG Acquisition System And Accompanied Labview Application," Int. J. of Eng. and Adv. Technology, vol. 9, pp. 1641 - 1648, Oct. 2019.
- Villanueva-Miranda, H. Nazeran, and R. Martinek, "CardiaQloud: A Remote ECG Monitoring System Using Cloud Services for eHealth and mHealth Applications," Proc. of IEEE 20th Int. ConC on E-Health Networking, Applic. and Serv., HEALTHCOM, pp. 1 — 6, Sept. 2018.
- N. Celik, N. Manivannan, and W. Balachandran, "Evaluation of a Behind-the-Ear ECG Device for Smartphone Based Integrated Multiple Smart Sensor System in Health Applications," J. of Adv. Comp. Scie. and App., vol. 7, pp. 409 — 418, Jul. 2016.

REFERENCES

- S. Mahdiani, V. Jeyhani, M. Peltokangas, and A. Vehkaoja, "Is 50 Hz high enough ECG sampling frequency for accurate HRV analysis?," Proc. of IEEE 37th Annual Conf on Eng. in Medicine and Biology Soc., EMBC, pp. 5948 - 5951, Aug. 2015.
- A. Dihn, L. Luu, and T. Cao, "Blood Pressure Measurement Using Finger ECG and Photoplethysmogram for IoT," Proc. of Int. Conf on Dev. Of Biomedical Eng. in Vietnam - IFMBE6, Springer, vol. 63, pp. 83 - 89, Sep. 2017.
- V. Ordodi, L. Mătiu-lovan, G. Bărbulescu, D. Bonciog, D. Nistor, D. Crisnic, and G. Tănasie, "Experimental Elecrophysyological device for the appreciacion of the cardiac systolic function — a pilot study," UMFT J. Physiology (Fiziologia), vol. 29, issue 2, pp. 4 — 7, 2019.
- A. Ciuffoletti, "Design of an Open Remote Electrocardiogram (ECG) Service," MDPI Future Inter. J., vol. 11, issue 4, pp. 1 — 19, Apr. 2019.

REFERENCES

- A. Polo, P. Narvaez, and C.R. Algarin, "Implementation of a Cost-Effective Didactic Prototype for the Acquisition of Biomedical Signals," MDPI Electronics J., vol. 7, issue 5, pp. I — 23, May 2018.
- C. Saritha, V. Sukanya, and Y. Narasimha Murthy, "ECG signal analysis using wavelet transforms," Bulgarian Journal of Physics, vol. 35, Article ID 13100157, pp. 68-77, 2008.