DATA ACQUISITION AND SIGNAL PROCESSING OF AN ECG

Submitted by:

Muhammad Adeel: 14019019147

Abdulrehman Arshad: 14019019008

Syed Arsum Khubaibullah Gillani: 14019019033

Supervised by: Professor Dr. Sajjad H Shami

DEPARTMENT OF ELECTRICAL ENGINEERING

SCHOOL OF ENGINEERING

UNIVESITY OF MANAGEMENT AND TECHNOLOGY LAHORE

July-2018

Data Acquisition and Signal Processing of an ECG

Submitted to the faculty of the Electrical Engineering Department

Of the University of Management and Technology Lahore

In partial fulfillment of the requirements for the Degree of

Bachelor of Science

In

Electrical Engineering

Professor: Dr. Sajjad H Shami Project Advisor	Assistant Prof: Jameel Ahmad Director Projects-BSEE

Department of Electrical Engineering

School of Engineering

University of Management and Technology Lahore

July 2018

Acknowledgments

We would like to thank ALLAH Almighty who gave us the opportunity to serve the humanity by introducing the life changing machine. After this we wish to thank our families who were supportive throughout the final year project. At this stage we must acknowledge the conceptual and theoretical guidance provided by Dr. Sajjad H Shami. He provided us the true idea, direction and motivation for this project.

Declaration

I make this solemn declaration conscientiously believing that the content in this report is my group work. The project was advised by Dr. Sajjad H Shami and has been successfully delivered to School of Engineering in University of Management and Technology Lahore.

Muhammad Adeel: _____

Abdulrehman Arshad: _____

Syed Arsum Khubaibullah Gillani: _____

Date: _____

Table of Contents

Abstract

During engineering we are supposed to do those engineering projects which are in favor and goodwill of the public. The main difficulty faced by the community is diseases and unhealthy life. More exploration reveals some critical facts and figures about the deadly diseases of the heart. According to WHO (World Health Organization) 17.7 million people died due to heart diseases in 2015 all over the world and 82% of them were in low and middle income countries. In most of cases the disease is not diagnosed in right time to be cured because diagnostic procedures are expensive and complex. An engineer's duty is to remove intricacies and serve his fellow human beings. The main purpose of this project is to design a diagnostic (ECG) machine which should be cheap, easy to use and accessible to common people. Most importantly it reveals accurate information about the heart's condition. Moreover, doctors use ECG machine along with electroencephalogram (EEG) to monitor the conscious level of a patient suffering anesthesia or during any surgical procedure. Diagnosis is most important part of any disease to be cured and via this ECG machine we can interpret the condition of heart's four chambers, and via this information we can contribute towards serving the humanity, help the helpless and save the people in distress.

Abbreviations

(ADC) Analogue to Digital Converter

(AF) Atrial Fibrillation

(AFR) Atrial Fibrillation Rates

(AgCl) Silver Chloride

(AHA) American Heart Association

(AM) Amplitude Modulation

(AV) Atrioventricular

(aVF) Augmented Vector Foot

(aVL) Augmented Vector Left

(aVR) Augmented Vector Right

(CSGB) Cardiac society of the Great Britain

(CVD) Cardiovascular

(DC) Direct Current

(DFT) Discrete Fourier Transform

(ECG) Electrocardiography

(EMF) Electromagnetic Forces

(FFT) Fast Fourier Transform

(FM) Frequency Modulation

(HBP) High Blood Pressure

(HRV) Heart Rate Variability

(IC) Integrated Circuit

(ICU) Intensive Care Unit

(ILR) Implantable Loop Recorder

(MATLAB) Matrix Laboratory

(PC) Personal Computer

(PCB) Printed Circuit Board

(REFIN) Reference In

(REFOUT) Reference Out

(RF) Radioactive Forces

(TLOS) Transient Loss of Consciousness

(UOL) University of Leiden

(WCT) Wilson’s Central Terminal

List of Figures

Chapter 1
Introduction

1.1 History

In the developing world, Electrocardiography (ECG) is commonly used by the doctors all around the world. This technical device's origin is in 18th century. By the end of 18th century it was known that in living systems nerves, muscles and organs such that heart produces currents and voltages. This electrical phenomenon in living systems can be recorded in this device called Electrocardiographic machine. As time passed, this technology started the evolutionary significance and the doctors and engineers set the standards for recording ECG's to help this biomedical technology valuable to medical treatments.