A REVIEW OF ECG MONITORING SYSTEM

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ABSTRACT: This paper represents a brief description of system designed for monitoring Electrocardiogram (ECG) of patients using ECG sensor Arduino Uno, LabVIEW. The main objective of this paper is to review the advancements in ECG over the years. ECG is a test which measures the function of the heart by recording electrical pulses of heart and is displayed as waves. The study of the ECG signal includes acquirement of a real-time ECG signal, signal filtering and processing. LabVIEW is used for signal processing and filtering after data is acquired from the patient. It is a tool for programming using Virtual Instruments and GUI (Graphical User Interface).

Keywords:- ECG, Arduino, LabVIEW, Virtual Instruments

INTRODUCTION

Electrocardiograph (ECG or EKG) is an instrument and it used to measure and account the electrical movement of the heart. Interpretation of the data measured by ECG helps to analyse variety of heart disorders. These disorders can change from slight to dangerous [1].

An ECG signal is produced by nerve impulse of voltage drop is in between µV to mV. The signal produced is of very small amplitude and thus it requires large amount of amplification.

ECG machines are built for monitoring a patient's heart condition by studying the waveform output. Diseases like bradycardia and tachycardia can be detected by studying the ECG waveform obtained. In a conventional ECG, there are 12 leads out of which 10 are attached on limbs of patient and on two side of chest. The electrical potential of heart is measured with the help of leads which are placed on different parts of body which is recoded over a period of time which is usually around 10 seconds. The graph between voltage versus time created by this procedure is called electrocardiogram. The goal of performing ECG is to gain information about the structure and function of the heart.

The waveform of ECG includes a recurring wave collection of P-wave, QRS complex and T-wave linked with each beat. P wave is formed due to the depolarization of atria before contraction and depolarization of ventricles before contraction forms the QRS complex andventricles repolarization causes the formation of T wave. Isoelectric line is the baseline voltage of ECG.12 leads (electrodes) are used to measure the distinct capacity. Einthoven's triangle theory is used to place those 3 leads. The value of electric signal could be very small (0.0001 to 0.003 volt). The range of frequencies of these signal is between 0.05 to 100 Hz.

2. LITERATURE REVIEW

LabVIEW is software developed by National Instruments and the aim of designing was to provide easy and powerful data acquisition. LabVIEW programmes can be used for information recording and representation[2]. LabVIEW block diagram is used to build virtual instrument of ECG and the front panel is used for displaying ECG output and other input and output parameters.

The LabVIEW programming is utilized as the coordinating stage for obtaining, preparing and transmitting information as it is an incredible graphical programming environment to create sophisticated approximation, test and control frameworks using intuitive graphical symbols and wires that look somewhat like a flowchart. The software also incorporates number of cutting edge that can be used to enhance programmes and it also allows make your programme more powerful and it also allows to add more features to your programmes.

LABVIEW is used as a platform for signal filtering and amplification of the signals that are obtained from the patient and to plot a voltage versus time graph. With the help of Arduino UNO, analog signals from the patient is converted to digital form and are fed to LABVIEW for filtering and amplification Arduino UNO is a open-source microcontroller board in view of the ATmeg328P microcontroller and created by Arduino.cc[3-4]. The board has sets of advanced and simple input/output pins that can be interfaced to numerous development sheets and different circuits. The board has 14 Digital pins and 6 simple pins. It is programmable with the Arduino IDE (Integrated Development Environment). It can be powered by a USB or by 9 volt battery.

Table 1 shows the research done on the ECG using different methods and tools.

S.No.	Name of the Author	Year	Technique	Result
1.	M. K. Islam, A. N. M. M. Haque, G. Tangim, T. Ahammad, and M. R. H. Khondokar	IJCEE 2012	ECG signal simulation and analysis using LabVIEW and MATLAB[2].	The result produced using matlab are accurate and it provides a faster and better way to measure the heart activity.

2.	Mr.Bhavin Mehta, Ms.DivyaRengarajan, Mr.Ankit Prasad	IJSER 2012	Tele-monitoring system for monitoring vital parameter of patient ad providing them to the doctor at remote location using LabVIEW and android application.[3].	Signals measured using this method can be accessed by doctor even from remote area
3.	BassamH.Abed, RaaedK.Ibrahim, MahmoodHamzaAlmuifraje	IJCSMC 2015	Design and Implementation of ECG (Electrocardiograph) Features Extraction using Biomedical Workbench and LabView[4].	The collection of ECG function extractionalgorithms, and the continuous efforts for enhancement, proves that universally appropriate solution has not been located yet
4.	Mohan Kumar, Umesh , Pandiaraja , Sonu Thomas, Venkatesh	IJCSMC 2014	Research on Identification of Cardiac Disorders using LabVIEW[5].	The raw ECG signal includes greater noise than the simulated signal. Apart from ECG. Other Bio indicators together with EEG, EMG,EOG, and so on., may be extracted via the use of the proposed method.
5.	AfseenNaaz, Mrs Shikha Singh	IJERT 2014	Feature Extraction and Analysis of ECG signalfor Cardiac Abnormalities[6]	It is clear that wavelet transform is one of the essential gear for extracting out QRS complex and other features from theECG signal.
6.	AkshuPurohit, Khalid Khan, GovindKishanBohra	NCIRET-2014	ECG Parameters through LabVIEW[7]	Because of various of algorithm, huge various waveform no longer universally normal answer has been determined which can extract ECG functions.
7.	S.T.Sanamdikar , Dr.S.T.Hamde, Dr.V.G.Asutkar3	IRJET June-2015	Arrhythmia Analysis of ECG Signal[8]	Using wavelet remodel method ECG arrhythmias may be analyzed for one hundred% accuracy, that offers the detection and category effects higher to improve the heart diseases of man or women.
8.	AkshayKenjale,AjaykumarYadav, AmitKhandagale.,PoojaChaudhari	IJSEAS-2016	LabVIEW based ECG Monitoring System[9]	Appropriate ECG signal from patent are achieved no matter the simplicity of the electronic hardware used.
9.	Vijay Srivastava, KratiVarshney, Vibhav Kumar Sachan	CAE-2017	LabVIEWbased Electrocardiograph (ECG) Patient Monitoring System for Cardiovascular Patient using WSNs	Peak detection in electrocardiogram is one of the solved issues using LabVIEW.

10.	Anil Kumar, Jagannath Malik and Vinod Kumar	iJOE - 2011	Virtual Lab: Real-Time Acquisition and Analysis of ECG Signal[10]	The proposed gadget presents a new method of labresearch which is quite fee. By presentingavailability of expensive instruments to college students will help to have satisfactory education.

Graphical System gives the two controls and output comes about on same screen and thus makes the framework straightforward and utilize. LabVIEW being a parallel programming program makes virtual instruments more practical by implementing parallel tasks at the same time. Visual computerization enables the remote end client to watch information data loss amid network transmission as distortion in ECG waveform.[5]

CONCLUSION

In this review paper we have studied various types of systems used for taking ECG using LabVIEW and Arduino together. LabVIEW and Arduino can both be effectively used for monitoring heart condition of the patient without using an ECG machine. The patient can also self diagnose his/her problem with the help of such systems. Use of Labview and Arduino UNO has reduced coast the size of the machine considerably.

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