ECG TELE-MONITORING USING LABVIEW

SMITA SULGANTE¹, RAJENDRA CHINCHOLI ²

¹M.tech, Dept of BME&II PDACE Gulbarga, Karnataka
(ssmita235@gmail.com)
²Professor, Dept of IT PDACE Gulbarga, Karnataka
(rajendrachincholi@yahoo.com)

Abstract: Patient tele-monitoring is remotely monitoring the vital parameters of patient and providing them to the doctor at remote location. The parameters such as ECG, Heart rate etc are obtained and thus ensuring mobility of both patient and the doctor. Patient telemonitoring involves processing, analyzing and extracting necessary features from the biomedical signals easily and conveniently and the signals obtained are displayed on a graphical user interface, which are provided dynamically to a web page in real time to be viewed by an authorized doctor. If anyone of the vital parameters go out of normal range than an alert signal is generated by the system. All the objectives are fulfilled on LabVIEW platform.

Keywords: LabVIEW, Patient monitoring system, Telemonitoring, Electrocardiogram (ECG), Heart rate, Webpage, Web server.

1. INTRODUCTION

There are three directions that influence the development of medical instruments and establish an early position in a very competitive market: producing safe, high quality devices for patient care and reduced development time and low cost system. Therefore for increasing the patient care efficacy there arises a need to improve the patient monitoring devices and make them more mobile.

The medical world faces two basic problems when it comes to patient monitoring, firstly, the need of healthcare provider’s present bedside the patient and secondly the patient is restricted to bed and wired to large machines. In order to achieve better quality patient care, the above cited problems are to be solved.

As the bioinstrumentation, computer and telecommunications technologies are advancing it has become feasible to design a home based vital sign tele-monitoring to acquire record, display and transmit the physiological signal of the human body to any location.

The importance of patient monitoring system (PMS) in medical treatment is very high, hence medical manufacturers are introducing centralized PMS. In centralized PMS all patient monitors are connected with a single server based PMS. The TCP/IP protocol suite based architecture systems are capable to upgrade PMS’s firmware and software through dedicated TCP/IP protocol suite via open communication network.

The computer based signal acquisition, processing and analysis system using LabVIEW is used as a filtering and peak detection tool in ECG. The computer based patient education can help improve patient’s awareness and understanding of his or her disease, thus the efficacy of treatment can be increased.

2. SYSTEM REPRESENTATION:
The figures shows the real time vital parameter transmitting system with both hardware and software components. The electronic component covers two aspects. The first ensures the acquisition and transmission of the signal using acquisition card DAQmx, the second receives the signals on the server side using LabVIEW application.
Laboratory Virtual Instruments Engineering Workbench (LabVIEW) software is used as the integrating platform for acquiring, processing and transmitting the physiological data as it is an excellent graphical programming environment to develop sophisticated measurement, test and control systems. LabVIEW is a program development application much like C or BASIC. However LabVIEW is different from those applications in one more important respect. Other programming systems use text-based languages to create lines of code, while LabVIEW uses a graphical programming language, G, to create programs in block diagram form. LabVIEW like C or BASIC is a general purpose programming system with extensive libraries of functions and subroutines for any programming task. LabVIEW also includes execution to see how data passes through the program and single step through the program to make debugging and program development easier.

3.1 ECG Recording: The low noise ECG signal is acquired by National Instruments Laboratory VI suite using a 3-lead or a 4-lead system. The acquired signal is further processed by LabVIEW which is having signal processing module.

3.2 Heart Rate Determination: Heart rate is determined by the number of heart beats per unit of time expressed as beats per minute (BPM). The measurement of heart rate is mainly based on the QRS complexes.

3.3 ECG Detection Algorithm Available For Telemetry Applications

From this various detection algorithms are available. Some of them are listed below

- Turning point algorithm
- Aztec algorithm
- Fan algorithm
- QRS Detection algorithm

For the storage of the wave, to save the memory space the redundancy is eliminated but with some constraints.

3.4 QRS Detection Algorithm

For this detection algorithm we design aband pass filter from a special class of digital filter which requires only coefficient. It is very difficult to design digital band pass filter directly so we design a cascaded connection of low pass and high pass filter. It attenuates the low frequency characteristics of P and T waves and baseline drifts and high frequency.

Some of the important features of ECG
4. REAL TIME TELE MONITORING USING LABVIEW

LabVIEW has been used to build Computer Graphics Interface (CGI) programs and URL’s to send and receive data using the Telnet protocol, to store and retrieve files from FTP servers and to publish VI’s on the web server. LabVIEW have internet toolkit including the G web server which is an HTTP/1.0- compatible server used to run applications on the web. Servers and CGI applications intercommunicate through environmental variables and standard inputs and outputs. The G web server is used to publish image of front panel on the web. Using this static or animated front panel images can be loaded. The G web server can generate images in JPEG or PNG image format. In some cases while assessing the health condition of a patient, need to go back to previous data occurs. Each session is saved in TDMS file now and then uploaded at the end of session to the server which allows the physician to retrieve the desired session. Using report generation toolkit present in LabVIEW a real time patient record containing basic patient and clinical information like heart rate, and ECG waveform is generated. Also whenever an alert file is generated by the LabVIEW, it will automatically send mail using Email notification application.

5. RESULT AND DISCUSSION

This system can be used to transmit the patient vital parameter information in real time to remote location and can be viewed by the care giver. Also a printable Patient report can be generated any time as per the need. As this is medical application, reliability is needed in the first place. A reliable TCP protocol was used in this application which was implemented in LabVIEW.

6. CONCLUSION

Tele-monitoring application allows doctor to view his patient’s remotely and dynamically in a web page in real time and does not need to have any special requirement on his PC, all he needs is an internet access. For the patient side, it is a home based LabVIEW application embedded in home PC during signal acquisition.

REFERENCES

[1]. Real-time ECG transmission from multi-patient toward multi-physician using wireless communications technologies. Sawsan sadek1, mohamad khali2, sahar merheb2, khaled houssein1, mohamad sayed11Assoc. Prof., Research Group in Computers and Communications GRIT, Lebanese University, UIT Saida, Lebanon 2Prof., Azm Center for Research in biotechnology, Lebanese University, EDST, Tripoli, Lebanon.
[2]. Real Time Patient Tele-monitoring System Using LabVIEW Mr.Bhavin Mehta, Ms.Divya Rengarajan, Mr. Ankit Prasad
[3]. Wireless Intelligent Systems for Biosignals monitoring using low cost devices. Marius branzila, valeriu David


[6]. Telediagnosis system in ambulance using labview.

[7]. Monitoring of Physiological Signs using Telemonitoring System Jan Havlík1, Jan Dvořák1, Jakub Parák1, and Lenka Lhotská2 Department of Circuit Theory, Faculty of Electrical Engineering Czech Technical University in Prague, Technická2,CZ-16627Prague 6xhavlikj@fel.cvut.cz2 Department of Cybernetics, Faculty of Electrical Engineering Czech Technical University in Prague, Karlovonam. 13, CZ-12135 Prague.

[8]. A Comprehensive Analysis of Wireless Mobile Based Tele-Monitoring System for Myocardial Malfunctioning. S.Palanivel Rajan, 2Dr.R.Sukanesh, 3A.Ramprasad, 3M.Jeyakumar, 3G.Shanmuga Raja Assistant Professor, Department of ECE, Kamaraj College of Engineering and Technology, Virudhunagar, Tamilnadu, India. Professor, Department of ECE, Thiagarajar College of Engineering, Madurai, Tamilnadu, India.3 Final Year Research Student, Department of ECE, Kamaraj College of Engineering and Technology.
