University of Science and Technology

College of Postgraduate Studies and Academic Advancement

Designing & Implementing ECG Signal Analysis Using Arduino

A Thesis

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Abstract

ECG device is one of the most important devices used in hospitals to diagnose the symptom of the heart diseases. This thesis aims to design an ECG system to detect, record, and save electrocardiogram (ECG) signal of human beign to diagnose heart diseases using arduino and MATLAB2014a.

The thesis of the system for ECG signal processing was implemented. The system consists from two parts (hardware & software). Hardware includes ardunio328p,USB,PC. The hardware was designed to detect and record ECG signals and transferred the data to computer by connection (USB). The computer receives the data from the arduino. Sotware is the MATLAB2014a programming language on pc, which processes the ECG signal, analyzed and displayed the required ECG signals on PC giving acceptable results.

المستخلص

اجهزه تخطيط القلب من اهم الاجهزه المستخدمه في المستشفيات لتشخيص امراض القلب. هذا المشروع يهدف الي انشاء نظام لتخطيط القلب للكشف عن اشاره (ECG) و حفظها و تسجيلها لتشخيص امراض القلب باستخدام المتحكمات الدقيقه ولغه البرمجه (MATLAB). وظيفه المتحكم الدقيق الذي يعرف بي الاردينو نقل اشاره المرضي الي جهاز الكمبيوتر. اما وظيفه لغه البرمجه التي تعرف بي الماتلاب تقوم بمعالجه اشاره المرضي و تحليلها و من ثم تشخيصها للمعرفه نوع اشاره المريض طبيعيه او غير طبيعيه و من ثم عرضها علي شاشه الكمبيوتر. اذا تم بناء هذا النظام لكشف و تسجيل اشاره المريض و عرضها علي شاشه الكمبيوتر باستخدام لغه البرمجه وقد اعطي نتائج مقبوله.

Chapter one

Introduction

1.1 General view

Heart diseases are one of the leading causes of depth worldwide. To help cardiologists in treating these conditions, medical technology has been researching ways to improve electrocardiogram (ECG). The main tool to find out the health of patient's health. These machines that are once exclusively found at hospitals can now be at a patient's disposal. This project is consist of a simple design that developed an ECG portable system, record, diagnosed and displayed the acquired ECG signal of the patient and stored it in laptop format. Doc using arduino, universal serial bus technology to diagnosed may conditions of heart diseases. The system is used by physicians and medical personnel. Further a patient himself with special training, can used the device, record his own heart activity over a period of time in a day. An automated ECG signal analysis will give a report of an individual.

1.2 Problem statement

It has been reported that heart diseases have been major killer all over the world in modern days. Diagnoses of these pathologies require knowledge and expensive equipments such as electrocardiogram (ECG), echocardiogram (EKG), auditory brainstem response (ABR) diagnosed machines etc. However, both resources are limited. The situation is even worst in poor and developing countries. There are very limited numbers of available cardiologist and equipments.

1.3 Objectives

The objectives of this project are to:

1. Designing and implementing a simplified ECG system using the arduino and MATLAB programming language on personal computer (PC).
2. Reduce unbearable cost of caring in private nursing homes/hospitals.
3. Follow –up the heart beat in an automated way.

1.4 Methodology

The methodology will be based design of electric circuit to send ECG signals to computer via USB. MATLAB2014a programming language will be used as a tool acquiring, processing and to display the ECG signals on pc. The database includes ten ECS signals each sampled at 250 sample per second which obtained from MIT-BIH database distribution home page [1].

1.5 Thesis layout

This thesis consists of six chapters, chapter one is an introduction, previous studies in chapter two, the theoretical background in chapter three, chapter four describe the proposed system (methodology), while chapter five represent result and discussion finally the conclusions and recommendation represent in chapter six.