Design of a Stress Detection Mechanism using ECG

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Abstract— We all know that nowadays stress of all the normal human being. Whatever works and activity we do in our day to day life ether physical and mental both creates a by-product known as stress. In this project we are trying to build a system that could encounter the level of stress produced by a person by using signal which is generated by the heart of a human being. As we know that the heart is one of the sensitive parts of our body. So Electro Cardiogram (ECG) is used in this project. First of all we have acquired the ECG signal from the person, then it is analyze by the system and we have tried to display the level of stress.

Index Terms— DAQ, ECG, Instrumentation Amplifier, LABVIEW, OPAMP, PC, Stress,

1 Introduction

IN this project we are trying to analyze the stress level of human being by Electro Cardiogram, which is a bio potential signal generated by the heart. In this project for good result we have made combination of medical science with technology as bio medical engineering. First of all we have tried to acquire signal from the heart in order to detect the stress of a particular body. Now we need to discuss what is stress and ECG.

2 Stress

Stress is related to our daily life. Stress is a reaction to the stimulus which disturbs our mental stability. The stress causes the increasing level of hormones like Adrenaline and Cortisol which changes our body functions. It creates a challenge towards our well being in stress. But sometimes stress proves to be good for human. For example a little amount of stress during exam helps students for studying seriously. However the stress has a bad effect to the physical and mental health.

3 Ecg

The full form of ECG is Electro Cardiogram. Due to the cardiac activity the electrical potential is generated, which is measured by electro cardiogram. The pumping action of the heart is caused by the signal contraction of the cardiac muscle fibre, which is a current flow in form of ions.

4 Motivation Factor

Actually stress is a normal part of life. Sometimes stress can motivate one to do better and get promoted. But if one cannot able to control the stress can become a seriously interface with one's job, family life and health. It is another common problem of a person to become in a bad mood and prompt into fight with his loved once and friend. This is one of the worst effects of stress.

There are many types of stress. Some of them are bit well and rest will tear you apart. It can effect once well being. The symptoms of stress may be as follows,

PHYSICAL- Frequent cold or flu trouble while sleeping, tension in muscle, skin problem and digestion problem.

MENTAL- Pour concentration, learning problem, forgetfulness, frequent negative thoughts, speech problem.

EMOTIONAL- Anger, anxiety, anger, helplessness, a lack of motivation, relationship problems.

BEHAVORIAL: Eating poorly, driving recklessly, abusing alcohol or drugs, being accident prone, showing aggression.

We can't do anything by which one's stress vanishes in a minute because we are not doctors. So, we decided to do something what can measure one's stress in a daily basis. This measurement shows how much stressed he is than normal time and he can also can consult to the doctor if needed.

5 Project Overview and Objective

The stress has some serious impact to our heart. In a stressful condition our body releases a various number of chemicals like cortisol and epinephrine in the heart depolarize voltage change and currents flow. Changes in potential are transmitted throughout the body and can be measured. By ECG we can calibrate the signal which is generated from the heart. When a person is in normal condition and in stressed condition, two different signals from the heart are taken and then we compare these signals amplitude and other parameters with each other and thus we can find the stress level of a per-

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son. As stress controlling and handing ability defers with person this analyzer will show as per a person takes stress.

We want to compare stress between two different times, when a person is without any worries or in any physical work or in mental stress. This is how we can analyze stress.

6 Components and Tools Used

The components we have used in this project are:

1. AD620: It is a low drift, low power instrumentation amplifier with set gains of 1 to 10000.
2. OP07: Operational Amplifier.
3. DAQ: Data acquisition (DAQ) system is generally used to store any electrical, electronic or non-electrical parameters such as voltage, current, temperature, pressure, or sound with a computer.
4. PC with LABVIEW INSTALLED: A computer is needed where LABVIEW is installed.
5. RESISTORS: Three 220kOhm, one 1MOhm, two 22KOhm, one 10KOhm and one 6.98 K Ohm resistors are needed.
6. CAPACITORS: One 0.1 micro Farad.
7. POWER SUPPLY: +5 to -5v dual power supply.

7 Block Diagram of The Project

Probes collected the signal from the body which goes to the instrumentation amplifier and then the instrumentation amplifier amplifies the small signals and sends through the filter to clear noises. After that, the filtered signal goes through the DAQ to the computer where the LABVIEW implements the signal.

We have already discussed about the needed equipment. ECG signals are collected by the probes go through some resisters to reduce noise. Those two probes from hand are connected to the instrumentation amplifier's pin no 3 and 2 respectively. The probe from the leg goes to OPAMP. One output from OPAMP (output1) is connected to a circuit where one capacitor and one 10kΩ resister is connected in series and these two are accented to one 1MΩ resister by parallel connection. Another output from OPAMP is virtually grounded. The circuit of the output1 is connected to another circuit. Where two 22KΩ resisters are connected in series with parallel connection connected with one 6.98KΩ resister. Those ends of the circuit are connected to the 8th and 1st pin of the instrumentation amplifier respectively. The OPAMP and the 4th and 7th pin of the instrumentation amplifier is connected to power supply (+5 0 -5). The output of the instrumentation amplifier from pin 6 is connected with DAQ and it is connected to the PC. The block diagram is shown in Fig. 1.

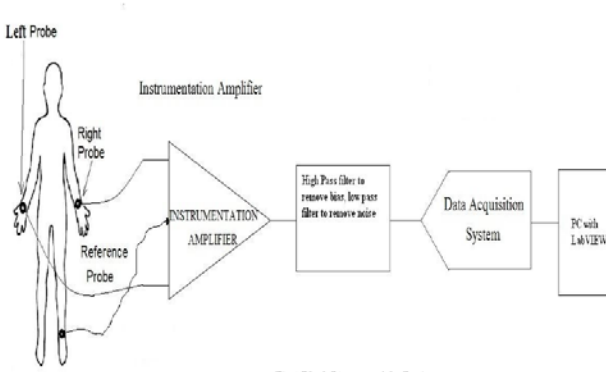

Fig.1 Block Diagram of the Project

8 Signal Anazyzing

First of all this stress analyses device was tested on a normal person in a normal condition and as usually the ECG signal could be acquired from the subject at normal condition. Now, in the second step of this experiment the output was taken from the subject at a stressed condition that is after doing physical exercise that is push up done by the subject. At that time we observed clearly the decreasing of the peak to peak distance as compared to the previous one.

9 Future Scopes

Now we can only show the signals through computer Lab VIEW. Which is very complicated to analysis how much more stressed the person is. Later we are trying to make it more portable which level of stress on a LCD/LED or other display device using a microcontroller, which will be more users friendly.

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