International Journal of Engineering & Technology, 7 (3.27) (2018) 15-17

International Journal of Engineering & Technology

Website: www.sciencepubco.com/index.php/IJET

Research paper

Analyzing The Stress Levels of A Patient Using Heart Beat and Pulse Rate Sensor by Arduino Interface with CRO

K. Arunamanjusha[1*], T. Kalyani[2], B. Naresh[3], N. Nagaraju[4]

[1]*Department of Electronics and Communication Engineering, MLR Institute of Technology, Hyderabad, India.*
[2]*Department of Electronics and Communication Engineering, MLR Institute of Technology, Hyderabad, India.*
[3]*Department of Electronics and Communication Engineering, Institute of Aeronautical Engineering, Hyderabad, India.*
[4]*Department of Electronics and Communication Engineering, Vardhaman College of Engineering, Hyderabad, India.*
**Corresponding author E-mail:manjusha.aruna@gmail.com*

Abstract

With the advancements in medical field, it is easy to treat numerous diseases and study various micro organisms and produce life saving drugs that did not exist few decades back. However, we do not have enough apparatus that is simple and user-friendly to analyze or make assessments to determine the psychological conditions of a patient. The treatment given to the patient is affected by the person's psychological state of mind in terms of stress or emotional levels. A person's stress levels are basically determined by the emotional response and in turn the electrical impulses generated through the exchange of sodium and potassium ions at the cell wall of the human body which is generally maintained at -70mV. The electrical impulses can be captured at the heart or brain or both in order to analyze the state of the patients receiving any particular treatment. In this paper the register pulse rate using heart beat sensor and graph it at certain intervals of time. The slope joining the peaks of consecutive readings indicates the increase /decrease of the patients stress and responsiveness to the treatment

Keywords: *Arduino microcontroller, stress, pulse rate sensor.*

1. Introduction

The prototype can be used basically at the causality or emergency centers at the hospitals. A person's responsiveness to a particular treatment depends on his/her body vitals: I.e., blood pressure, heart beat strength, respiration and also their psychological state which depends on stress and emotions. The developed product aims at analyzing the stress and emotion levels based on pulse sensor and thus provide a parameter for the doctors to judge the responsiveness of the patient to treatment. It can also be used and the process of lie detection treatment for psychological depressions or disorders etc.

On further development of the prototype which adds analyzing of brain signals specifically the alpha signals of the brain makes it more accurate and also reduces the cost and complexity in the existing ECG (Electro Cardio Gram) and EEG(Electro – Encephalogram) . With proper data processing both the signals can be studied combined and separately. Stress is the physical or mental condition; it can affect the body, intellectual conditions, and situation of the person. When a person feels stress his/her heart beat can increases, brain becomes faster and have a sudden change in energy. Stress keeps healthy when we avoid an accident, reaching a target, but it is temporary. All the stress is not bad once you are crossed fight – or- flight moment pulse rate , breathing and muscles should be relaxed in short time without an effects. On another way stress will be frequent, prolonged in nature, it can physically and mentally harmful.

Stress hormones: when you feel it is serious the base of brain can reacts (hypothalamus). It sends information to your adrenal glands, which produces an abundance of hormones. One of these hormones is fight-or-flight. It also works to

- Increases in heart beat
- Inhibit insulin production
- Breathing rate can be increased.

Types of Stress

Stress can be classified into three categories

a) Acute stress: It is most common type of stress that can be happened to everyone. It is the immediate reaction of body when we are taking or facing new challenges. When we are memorizing about the pressures of work that can already done, or forth coming demands in the future is called acute stress. It is a short term stress. Short term effects involves tension, headache and stomach upset, as well as a average amount of distress. This type of stress causes a life threatening situation, can lead to post-traumic stress disorder or other health problems.

b) Episodic acute stress: if acute stress can happens repeatedly, it is called episodic acute stress. The persons who are suffering with episodic acute stress always seems to be a short-tempered, irritable, and anxious. Negative health effects are continuous in people with episodic acute stress, they can accept the stress as a part of life.

c) Chronic stress: the stress that cannot be resolved and starts increasing or remains for longer periods of time is called chronic stress. It can be injurious to health, it helps to generate several types of health risks, diseases such as,

- Depression
- Cardiovascular disease
- Anxiety

Copyright © 2018 Authors. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

- Cancer

It is the response of the body instantaneously to the sudden change or occasion and changes your fight-or-flight response. A person who suffered with victim of crime or life aggressive condition may lead to cause a mental disorder condition; such type of condition is called anxiety stress. Stress plays a important role in reducing the ability of an organism to resist a particular infection or toxin by the action of specific antibodies or sensitized WBC because you are on high alert. Physical stress: the diseases that can be developed by physical stress include pains, headache, also includes the reaction of those indications, such as taking sugar or caffeine at the time of stress.

Some of the important problems identified by physical stress:

- Heart problems, heart diseases
- Pains, stomach upset
- High blood pressure
- Problems with sleep

Dissociative Symptoms

Consists of detachment from emotional reactions, physical distance, such as observing self from another perspective decreased awareness of surroundings. The characteristics of dissociative symptoms shares many of the symptoms with PTSD(post-traumic stress disorder. If a stimulus is perceived as a threat a more intense and prolonged discharge of the locus cerulean activates the sympathetic division of the automatic nervous system.

2. Proposed Model

Mental stress testing can be studied from the cardiovascular changes caused by psychological stress. To examine the effects of cardiac drugs on mental stress induced changes, it is useful to attain a degree of arousal that can be replicated in serial studies which are reliable to some extent but are not simple and user friendly, also involves complex processing of the signals generated. Hence, the heart beat sensor a modern sensor that could determine the pulse rate on the light beams being reflected from the blood vessels and bones. The date from the heart beat sensor is given as input to aurdino Uno which in turn processes it and given the processed date to CRO. The CRO interfaced with aurdino uno receives the data through Arduino and gives a pictorial output from which the stress levels are determined. The main components of the proposed system are shown in the fig 1.

1. Aurdino Uno
2. Pulse rate sensor
3. CRO

Fig. 1: Block diagram for proposed system

3. Working

The working can be explained by three stages

Pulse rate Sensor SEN-11574

Fig. 2: Pulse rate sensors

In the above fig 2 it can shows the different types of pulse rate sensors used by athletes, game & mobile developers those who want to easily incorporate heart rate data in to their projects. The front of the sensor is the pretty side with the Heart logo. This is the side that makes contact with the skin. On the front you see a small round hole, which is where the LED shines through from the back, and there is also a little square just under the LED. The square is an ambient light sensor, exactly like the one used in cellphones, tablets, and laptops, to adjust the screen brightness in different light conditions. The LED shines light into the fingertip or earlobe, or other capillary tissue, and sensor reads the light that bounces back. The back of the sensor is where the rest of the parts are mounted. Even the LED we are using is a reverse mount LED. The cable is a 24" flat color coded ribbon cable with 3 male header connectors. Preparing the Pulse Sensor Before you really start using the sensor you want to insulate the board from your (naturally) sweaty/oily fingers. The Pulse Sensor is an exposed circuit board, and if you touch the solder points, you could short the board, or introduce unwanted signal noise.

Aurdino Uno

The Aurdino Uno is the most important and documented board of aurdino family. It is a microcontroller board based on At mega 328P. Ardunio board is a prototype acts as an interface between the sensor and the CRO. The basic structure of arduino is shown of fig 3

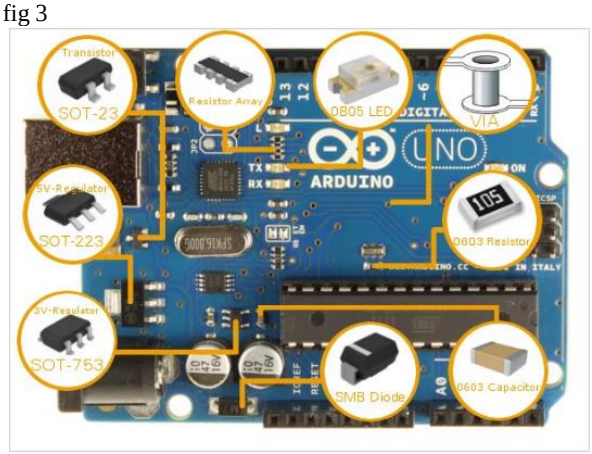

Fig. 3: Aurdino board

CRO

After completion of installing the circuit the aurdino and pulse rate sensor can be interfaced with Cathode ray oscilloscope to observe the graphical output.

4. Results

The fig 4 shows the signals that are generated due to general noise and improper contact between the person and the sensor SEN 11574.The pulses to the CRO are almost regular as there is nominal disturbance at the testing environment. The sensor is insulated by Electron gun on one side which enables no additional electrical signals in the form of noise. [12]

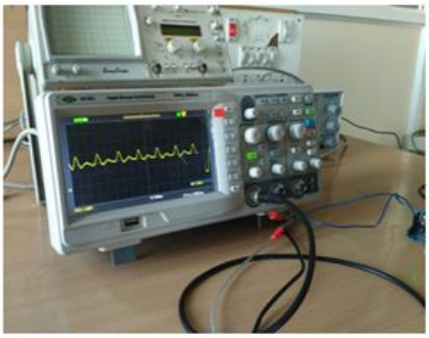

Fig. 4: Contact between person and pulse sensor

The Fig 5 shows both the pulses that are generated due to noise up to one half and the other half is the desired output from the Arduino and the Pulse Rate Sensor with the Timer being effective. The timer in the Arduino controls the ON and OFF time and hence the ON time records positive amplitude pulses with ripples of negligible amplitudes in stable case while negative cycle amplitudes are recorded when the Timer is OFF.[13]

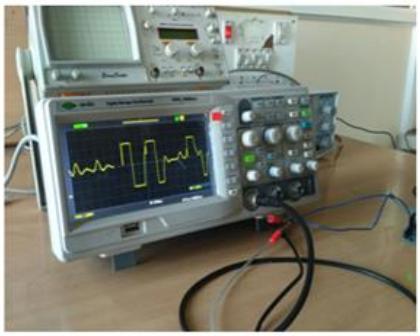

Fig. 5: Pulses are generated due to noise up

The pulse rate sensor provides Analog signal outputs which are converted to Digital signals by the ADC in the Arduino [6-11].

5. Conclusion

The project intends to provide a better analysis of a subject's response to a treatment based on the variations in the Heart beat and the corresponding Pulse variations. The Arduino helps in timing the pulses and better understand the Output graphical plots and analyzing the Stress levels of the subject.
The project can be implemented in the following cases:

1. Medical approach
2. Psychological disorder Treatment
3. Lie detection

The project can be further worked on imbibing other factors such as Brain waves, respiration etc which make the outputs more accurate and can be used for lower cost medical diagnosis.

6. References

[1] Dally JW & Riley WF, *Experimental Stress Analysis McGraw-Hill Publication*, 3rd Edition, (1991).

[2] Lippold O, "Physiological tremor", Scientific American, Vol.224, No.3, (1971), pp.65-73.

[3] Steptoe A & Kivimäki M, "Stress and cardiovascular disease: an update on current knowledge", *Annual Review of Public Health*, Vol.34, No.1, (2013), pp.337–354.

[4] Marmarelis V, "Modeling mythology for nonlinear physiological systems", Annals of Biomedical Engineering, Vol.25, No.2, (1997), pp.239-251.

[5] https://www. Elprocus.com

[6] Arun V, Naresh KD, Ravinder T, Karthik R, Sankit RK & Nagarjuna T, "Implementation of High-Speed Digital Reconfigurable FIR filter using Low Power Carry Look Ahead adder Review", *Journal of Advanced Research in Dynamical and Control Systems*, Vol.3S, (2018), pp.1217-1221

[7] Vijetha T & Karthik R, "Design and Simulation of a new Reconfigurable Antenna with Meandered line structure", *Journal of Advanced Research in Dynamical and Control Systems*, Vol.3S, (2018), pp.1222-1224.

[8] Karthik R, Ranjith S, Shreyas S & Kumar P, "Automatic Border Alert System for Fishermen using GPS and GSM techniques", *Indonesian Journal of Electrical Engineering and Computer Science*, Vol.7, No.1, (2017), pp.84-89.

[9] Karthik R, Nagaraju J & Vucha M, "Distributed Optimal Relay Selection in Wireless Sensor Networks", *Indonesian Journal of Electrical Engineering and Computer Science*, Vol.7, No.1, (2017), pp.71-74.

[10] Manjusha KA, Thotakuri AR, Ravinder T, Nagaraju J & Karthik R, "Design and Implementation of an 8-Bit Double Tail Comparator using Foot Transistor Logic", *International Journal of Applied Engineering Research*, Vol.12, No.12, (2017), pp.3403-3410.

[11] Radha TA, Manjusha KA, Karthik R, Vucha M & Siridhara AL, "Design and Implementation of an Audio Parser and Player", *Journal of Engineering and Applied Sciences*, Vol.12, No.20, (2017), pp.5301-5306.

[12] A Mukanbetkaliyev, S Amandykova, Y Zhambayev, Z Duskaziyeva, A Alimbetova (2018). The aspects of legal regulation on staffing of procuratorial authorities of the Russian Federation and the Republic of Kazakhstan Opción, Año 33. 187-216.

[13] Villalobos Antúnez, JV (2017). Karl R. Popper, Heráclito y la invención del logos. Un contexto para la Filosofía de las Ciencias Sociales. Opción Vol. 33, Núm. 84. 5-11