International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 05 Issue: 03 | Mar-2018 www.irjet.net p-ISSN: 2395-0072

WIRELESS HEALTHCARE MONITORING USING ANDROID PHONES

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Abstract— *To determine the heart rate of the human with the help of an android phone using Bluetooth module and to take reading of electrical resistance between the acupunture points p6 to p3. Thispaper describes a technique for measuring the heart rate throughfingertip and Arduino. It is based on the principle of photophelthysmography (PPG) which is non-invasive method of measuring the variation in blood volume in tissue using a light source and detector. While the heart is beating, it is actually pumping blood throughout the body, and that makes the blood volume inside the finger artery to change too. This fluctuation of blood can be detected through an optical sensing mechanism placed around the fingertip. The signal can be amplified and is sent to arduino with the help of serial port communication. With the help of processing software, heart rate monitoring and counting is performed. The sensor unit consists of an infrared light-emitting-diode (IR LED) and a photo diode. The IR LED transmits an infrared light into the fingertip, a part of which is reflected back from the blood inside the finger arteries. The photo diode senses the portion of the light that is reflected back. The intensity of reflected light depends upon the blood volume inside the fingertip. So, every time the heart beats the amount of reflected infrared light changes, which can be detected by the photo diode. With a high gain amplifier, this little alteration in the amplitude of the reflected light can be converted into a pulse*

Keywords: photophelthysmography, acupuncture, resistance.

Introduction:

Nowadays, people suffering from heart diseases are increasing day by day. So here a need arises to design a compatible system that would give us the accurate and quick heart rate readings. The readings are transmitted to the connected smart phone via Bluetooth i.e. through a wireless media. Conventional heart rate measuring devices were employed with the chest straps to be attached with the patients' body. Such devices require a user to press a key when to check the heart rate. Thus it is desirable to provide a reliable wireless heart rate monitor. In the proposed system, there is no need to press any key nor attach any chest straps, user just has to place his finger on the sensor or wear the sensor on the ear lobe. The sensor simply senses the pulses and displays on the android phone and also on the PC connected simultaneously sending the data to the configured smart phone via Bluetooth and also with some other wireless medium of transmission.

This invention relates to a heart rate measurement device comprising a sensor unit that detects a user's heart rate , a signal processing unit that receives and processes the signal generated from the sensor and a wireless signal transmitting unit that takes the signal from the processing unit and the transmit the signal out to the configured device. The sensor unit detects the frequency of change of blood density to derive the heart rate, with precision and efficiency of detection of heart rate, cooperating the technique of wireless transmission, and thus our purpose of promoting accuracy of detection and improving convenience of using is achieved. The model encompasses of Arduino board, Bluetooth modem , Pulse Sensor etc for signal conditioning of pulse input from patients body and displayed on android phone. The data even sent to the computer via serial communication and we can view the graphical form of the pulses on the monitor.

LITERATURE REVIEW:

[1] Development of reflective ppg signal sensor: Published in: Engineering in Medicine and Biology Society (EMBC), 2017 39th Annual International Conference of the IEEE,Date of Conference: 11-15 July 2017,Date Added to IEEE Xplore: 14 September 2017,Conference Location: Seogwipo, South Korea.

Quantifying mental alertness in today's world is important as it enables the person to adopt lifestyle changes for better work efficiency. Miniaturized sensors in wearable devices have facilitated detection/monitoring of mental alertness. Photoplethysmography (PPG) sensors through Heart Rate Variability (HRV) offer one such opportunity by providing information about one's daily alertness levels without requiring any manual interference from the user. In this paper, a smart watch based alertness estimation system is proposed. Data collected from PPG sensor of smartwatch is processed and fed to machine learning based model to get a continuous alertness score. Utility functions are designed based on statistical analysis to give a quality score on different stages of alertness such as awake, long sleep and short duration power nap. An intelligent data collection approach is proposed in collaboration with the motion sensor in the smart watch to reduce battery drainage. Overall, our proposed wearable based system provides a detailed analysis of alertness over a period in a systematic and optimized manner. We were able to achieve an accuracy of 80.1% for sleep/awake classification along with alertness score. This opens up the possibility for quantifying alertness levels using a single PPG sensor for better management of health related activities including sleep.

[2]Using Heart Rate Monitors to Detect Mental Stress: Published in: Wearable and Implantable Body Sensor Networks, 2009. BSN 2009. Sixth International Workshop on Date of Conference: 3-5 June 2009,Date Added to IEEE Xplore: 28 August 2009,Conference Location: Berkeley, CA,

USA.This article describes an approach to detecting mental stress using unobtrusive wearable sensors. The approach relies on estimating the state of the autonomic nervous system from an analysis of heart rate variability. Namely, we use a non-linear system identification technique known as principal dynamic modes (PDM) to predict the activation level of the two autonomic branches: sympathetic (i.e. stress-inducing) and parasympathetic (i.e. relaxation-related). We validate the method on a discrimination problem with two psychophysiological conditions, one associated with mental tasks and one induced by relaxation exercises. Our results indicate that PDM features are more stable and less subject-dependent than spectral features, though the latter provide higher classification performance within subjects. When PDM and spectral features are combined, our system discriminates stressful events with a success rate of 83% within subjects (69% between subjects).

ACUPUNTURE & ITS MERITS:

Electro-acupunture is a mixture of acupuncture and electrical stimulation, which has been widely used for its effectiveness in pain relief since 1970s,later for treatment of various disease such as depression, addiction, gastrointestinal disorders and non-medical applications such as obesity treatment for stimulation, most EA systems use a pair of needles with long, thick wires attached to an external power supply to form a closed current loop. The thin needle may suffer from the unstable connection to the thick wire and if there are many needles, it is difficult to supply power to all needles. Recently, a wirelessly-powered EA system was proposed to remove the wire connections for treatment, but its wireless power harvesting produce only 8 micro watts which is not enough for various applications .Most EA systems use bi-phase stimulation to reduce tissue damage and electrolytic degradation. Acupunture points used for stimulation. Generally two points are used for stimulation such as p6 and p3.

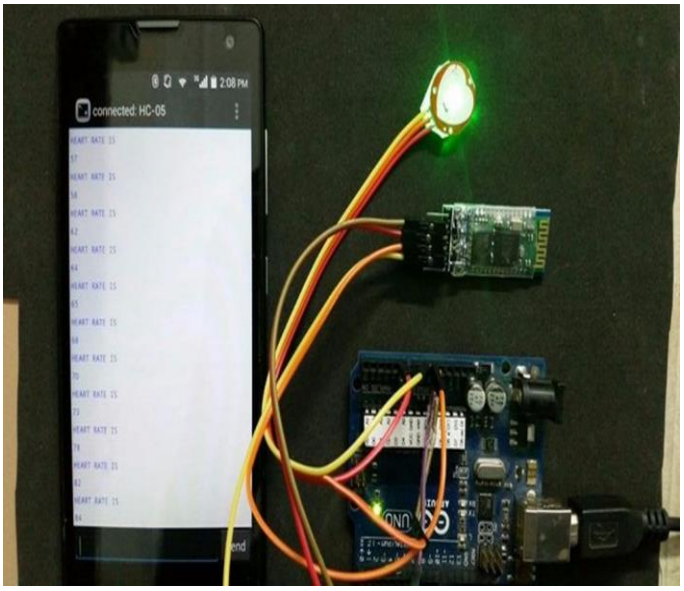

Fig.[1]shows the reading of heart rate.

Serial no	persons	Electrical resistivity between p6 to p3	
		Before pressure applied (ohms)	After pressure applied (ohms)
1	Person 1	420	560
2	Person 2	345	430
3	Person 3	356	473
4	Person 4	405	470
5	Person 5	467	535
6	Person 6	367	410
7	Person 7	345	468
8	Person 8	398	456
9	Person 9	420	498
10	Person 10	387	447

Table 1:Determination of electrical resistivity for 10 persons.

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The above table,shows values of the persons resisitivity of acupuncture points between p6 to p3. This table iwas taken as a proof to varing the resistivity creates some medical problem in ours body.

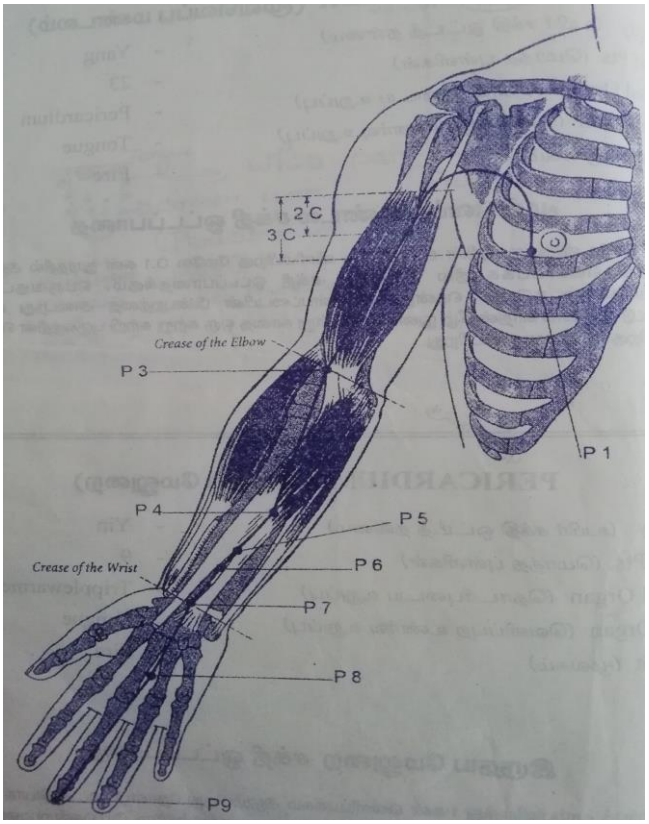

Fig.[2]shows the acupuncture points on the hand

Methodology:

Using the above instrument we have measured the heart rate of persons. Ten normal persons are taken into consideration & they are instructed to sit in a relaxed manner. Here the stimulation is given to stimulate the person. The needle must be inserted on the surface of the skin for 10 minutes. Before the process of stimulation ,corresponding heart rate values are noted. The same values are noted after appling pressure. In the above table, it is noted that the resisitive values are varied after appling the pressure.

Conclusion:

The determination of the heart rate needs to be given highest importance in daily life. Even though we go for various treatments & analysis, acupuncture is considered as one of the vital treatment which has no side effects. Here the above instrument is the mass screening tool. On proof of the proposed method with heart rate study is analysed. Finally it was observed that the persons heart rate have been changed after applying the pressure. In future the same work can be proceeded with more people. This paper will be help to future research purpose.

References:

[1] Development of reflective ppg signal sensor: Published in: Engineering in Medicine and Biology Society (EMBC), 2017 39th Annual International Conference of the IEEE,Date of Conference: 11-15 July 2017,Date Added to IEEE Xplore: 14 September 2017,Conference Location: Seogwipo, South Korea.

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