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Design of a Low Cost Heartbeat Monitoring System

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Abstract--*This project shows the importance of heartbeat sensor to a person. Heartbeat sensor is important to know the pathological condition of a person. It can provide a real-time heartbeat measurement and notifies us if an oddity occurs in heartbeat. We can develop a vital sign detection system using microcontroller and sensors. This project presents a prototype to monitor heartbeat rate. It senses the heartbeat and converts the signal into electrical signals. This signal is amplified by the circuit. Our aim is to provide a simple and robust method to detect heartbeat. The model is accurate and cheaper than other models. Fatal accidents rate has been increased over the past decade so a monitoring system will be a lot helpful to everyone and saves life.*

KEYWORDS-- *Design of a Low Cost Heartbeat Monitoring System*

I INTRODUCTION

The pulse has been a basic & important view into the overall physical condition of a person for a long time[1]. Measuring the heart is very critical to understanding a individual's pathological state. Heart rate can also mean a person is highly vulnerable to heart disease[2]. During each time the number of heartbeats is recorded by bpm, indicating beats / minute. The heart is dependent largely on the physiological body functions which include bodies natural ability to consume oxygen & release carbon dioxide[4], & the effects on heart rate depends on gender , age, activity, health conditions and so on. Sinha et al. in [4] also stated that the quantity of bpm is essentially hooked in to age and physical activities.

In a healthy person, it ranges from 60-100 bpm but may alter unexpectedly in fatal patients that may cause severe medical problems. This disorder is a primary reason why heart rhythm is investigated. The direct benefits to observing the pulse, three index fingers, the middle finger & even the ring finger are put on the wrist outside of the thumb direction. The beats per minute of cardiac beats are then measured by the timer automatically. The calculation of heartbeat can be carried by using a digital computer, thanks to the growth of digital electronics and data technology.

The electrocardiogram unit is the most effective electronic tool to track heartbeat. This is a graphical instrument that registers the battery powered activity of the center muscle. There is a lot of recent work related to electrocardiograph exploration and improvement, see [5-11] for the name of a few. However it is kind of costly to measure cardiac beat using an electrocardiogram. This is why the heartbeat meter is sometimes paid, so that everyone can use it at a decent cost.

This article presents the development of a heartbeat meters model with DFR0052, ATmega 16 and Android-based smartphones. By 2015, the penetration of the smartphone had been estimated to have reached two trillion

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devices [12]. Mobile apps have grown into an excellent superior computer motor. Smartphone's have recently been introduced to their apps by adding sensors to their features Moreover, the Android-based OS, which uses smart phones to maximize the functionality of the smart phone, enables the users to personalize the installed program. This work uses the android-based smart phone to calculate the heartbeat accordingly. It offers a heart beat measurement in real time & provides an alarm if a heartbeat anomaly occurs.

II LITERATURE REVIEW

Figure shows the configuration of the conceptual heartbeat meter. 1. They provide a various sensors, a module for signal conditioning &a minimum device microcontroller. We use a DFR0052 vibration sensor to record the cardiac levels of the power amplifier module for further analysis. The resulting sensor buffers a piezoelectro sensor that reacts to the stress changes by producing a measurable voltage shift relative to vibrational power. In [13-16], several similar works using a piezoelectric sensor are recorded. The sensor is then sensed by the sensor if the sensor is connected to the hand.

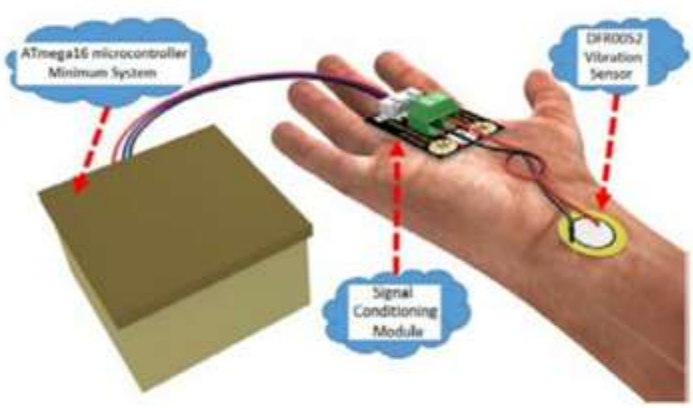

Fig 1. The layout of the proposed heartbeat meter

ATmega 16 is an 8-bit high-level controller of Atmel's low-powered Mega AVR group. It has 16 KB of configurable, 1 kB static flash memory, 512 bytes EEPROM and a number of built-in peripherals, & another function connected with built in peripherals includes its I / O socket. The microcontrol unit ATmega 16 was used for many applications, including jammer control[17], line monitoring & control of solar energy produced by photovoltaics [18], cable power improvement[19], On the basis of these technological abilities, and so on. Pin configuration of ATmega 16 microcontroller is depicted in Fig. 2. In our work, this microcontroller is used to process the heartbeat taken by vibration sensor and send it to android based smartphone via a bluetooth module. We use HC-05 bluetooth module to send the info and display within the smartphone. That module is employed to speak between microcontroller and smartphone with bluetooth functionality. The module communicates with the assistance of USART at 9600 baud rate hence it's easy to interface with ATmega 16 microcontroller that supports USART. Additionally, that module operates using the port Protocol and consumes low power. That module is shown in Fig. 3.

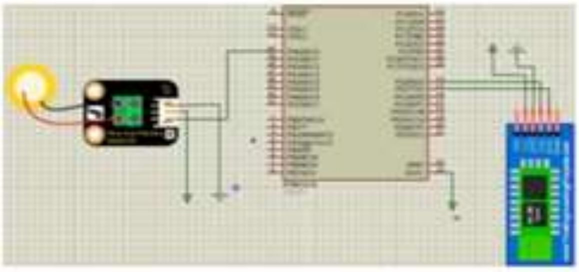

Fig. 4. Schematic diagram of a proposed heartbeat meter.

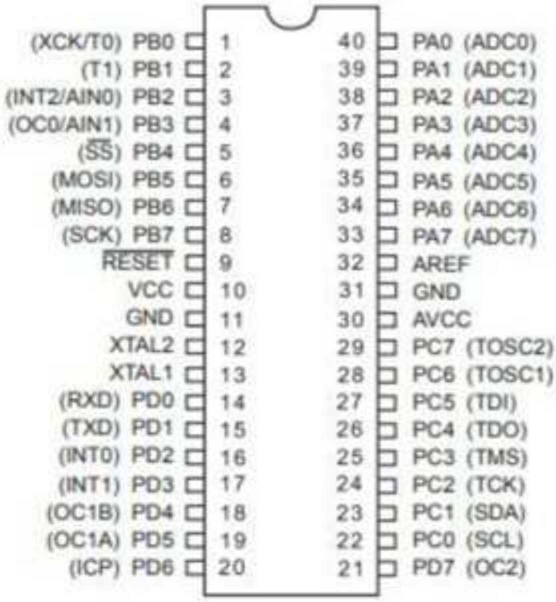

Fig. 2. Pin configuration of ATmega 16 microcontroller.

Fig. 3. HC-05 bluetooth module.

The suggested heart meter is presented as a schematic in the Fig. 4. Vibration sensor is placed on the right hand side of the figure. The controller is in the middle of the figure. Within a sensor module the signaling modulation module transforms the vibration into a piezo effect powered by electrical impulses. This impact was related to the presence of electrical charge on solid due to stress and strain.

The device is connected via pin A0 or PIN 40 to the signal conditioner module. The A / D Converter is used for analog inputs. The device movement is converted with a certain quantification into digital sequence to render

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beat the amount of heartbeats per min. The bluetooth module is activated by the synchronous serial port on pin D1 & pin D0 & is associated with the microcontroller. The pulse data that the detector collects will then be sent through the bluetooth to the phone. These data are transmitted to the phone in near real - time. An open-source program named Bluetooth's S2 terminal is mounted on the ATmega 16 controller & phone through the Bluetoosh device on an Android-based smartphone. Diagram to show the way trigger data are sent and processed to be viewed on a phone given in Fig. 5.

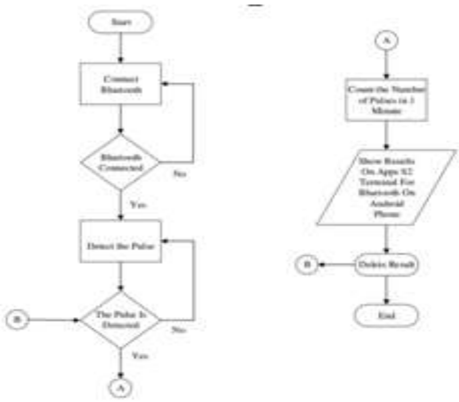

Fig.5. Flowchart that describe a data processing from sensor until displaying at smartphone.

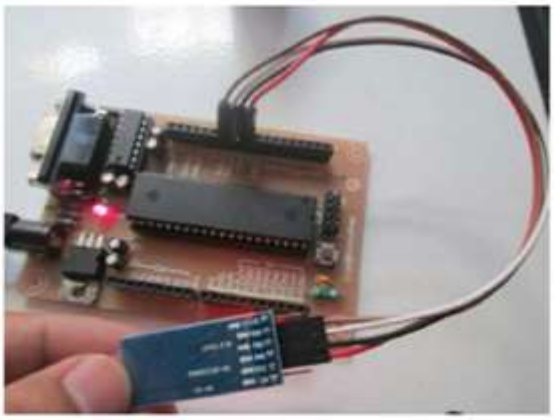

Fig. 6. Hardware realization of the proposed heartbeat meter.

The pulse rate is to be recorded as low as 60 seconds & the overall health is defined as the amount of bpm, as per the beats-per-minute unit. Heart beat levels will be categorized into three groups during this test, namely bradycardia, normal & tachycardia. The adolescent beats 60 to 100 times a day at regular levels. Bradycardia means that the speed of the heartbeat may be weaker than usual. Tachycardia can be a severe form of cardiac rhythm disorder wherein the core beat at rest faster than usual. There are, literally 15 classes of beat that can be clustered into 5 basic & wide forms which include standard (N), superventrical ectopic beat (S), ventricular ectopic beat (V), fusion beat (F, normal and ectopic ventricular beat), & Q, which are unclassifiable or uncommon, according to the Association for the Advancement of Medical Instrumentations (AAMI) as cited in [10]. There's many Nevertheless, the detection and analysis of electrocardiogram signals may lead to a grouping

III RESULT

Figure shows the effect of the proposed cardiovascular meter. 6. In addition, the proposed modular heartbeat meter box is shown in Fig. 7. The test was done with the sensor module mounted on the handle, as seen in the figure. 8. The findings were then shown on the mobile.

Fig. 8. The experimental test of the proposed heartbeat meter.

The findings are checked by reviewing the outcomes with the popular cardiac heartbeat meter known as the pulse oximeter. The results of the comparative analysis are summarized in table 1 to indicate that the frequent errors level is nearly 0.69%. The imbalance between the beats-per-minute amount seen in pulse oximeter and the suggested heartbeat meter adds up is maximum one beat.

Table 1. The comparison between the proposed heartbeat meter and pulse oximeter.

Pulse oximeter	heartbeat meter	error	error percentage
87	87	0	0
87	86	1	1.15 %
91	90	1	1.15 %
83	84	1	1.15 %
87	87	0	0
The average of error percentage			0.69 %

IV CONCLUSION

ATmega 16 controller & Android-smartphone has already been introduced to design & implement an occasional cost core beat meter that uses DFR0052 various sensors. A DFR0052 vibration sensor can obtain the amount of heartbeat displayed in the phone from the pulse calculation on the wrist. In addition to the number of pulse rates in the bpm unit, the data provided by the smartphone include information on pulse classification, physiological causes, medications & related diseases may also be used. Test results show that , compared to the commercial pulse oximeter, the new heartbeat meter can be of good precision..

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