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Performance Improvement of Health Monitoring System Using Wireless Technologies

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Abstract- The heart rate can be measured by monitoring one's pulse using specialized medical devices such as an electrocardiograph (ECG), portable device e.g. wrist strap watch, or any other commercial heart rate monitors which normally consisting of a chest strap with electrodes. Despite of its accuracy, somehow it is costly, involve many clinical settings and patient must be attended by medical experts for continuous monitoring. For a patient whom already diagnosed with fatal heart disease, their heart rate condition has to be monitored continuously. For this a system is proposed "Design & implementation of biosensor detecting heart beat rate with integrated GSM modem" is an alert system which is able to monitor the heart beat rate condition of person. The heart beat rate is detected using a band consisting of LDR & LED and finger is placed inside the band. When the heart beat detector is working, the LED flashes with each heart beat this output signal is processed using AT89S52 microcontroller to determine the heart beat rate per minute (BPM). Then, it is displayed on a LCD screen & sends SMS alert to the mobile phone of medical experts or patient's family members, or their relatives via SMS. Thus, doctors can monitor and diagnose the patient's condition continuously and could suggest earlier precaution for the patients themselves. This will also alert the family members to quickly attend the patient.

I. INTRODUCTION

Heart rate measurement indicates the soundness of the human cardiovascular system. This project demonstrates a technique to measure the heart rate by sensing the change in blood volume in a finger artery while the heart is pumping the blood. It consists of a IR LED that transmits an IR signal through the fingertip of the subject, a part of which is reflected by the blood cells [1]. The reflected signal is detected by a photo diode sensor which is LDR (light detecting resistor). The changing blood volume with heartbeat results in a train of pulses at the output of the photo diode, the magnitude of which is too small to be detected directly by a microcontroller [2]. Therefore, a two-stage high gain, active Operational Amplifiers (Op Amp) IC is used to amplify the signal to appropriate voltage level so that the pulses can be counted by a microcontroller. The heart rate is displayed on a LCD display [3].

The microcontroller used in this project is Atmel AT89S52. This BPM (beats per minute) is then sent via SMS on a desired number [4].

This is designed to give digital output of heart beat when a finger is placed inside a band. When the heart beat detector is working, the LED flashes with each heart beat. This is a plug and- play gadget that can be set up quickly by a nonprofessional, making possible pervasive monitoring of a patient without interrupting that patient's daily routines [5].

Design & Implementation of Biosensor detecting heart beat rate with integrated GSM modem is equipment which can be used daily to indicate heart condition, to detect heart attack and message is sent when heart beat rate exceeded a preset threshold, to any relative or emergency number for quick recovery of the person [6].

BENEFITS OF DEVICE

- A benefit of the device includes:
- Providing immediate notification of abnormalities in cardiac activity on a monitored patient
- Its low cost and low power consumption provides a cheap and reliable method for monitoring patients in developing countries
- Easily accessible
- User friendly
- Adjustable threshold level for different heart issues
- Portability

II. OBJECTIVE

My objective is to investigate and develop an application whereby a heart patient is monitored using a sensor which doesn't require a complex circuitry as well as design should be portable. The sensor information is collected and transferred wirelessly to a smart phone

III. LITERATURE SURVEY

Before creating the biosensor detecting heart beat rate with integrated GSM modem. Literature survey has been done using research papers and Google to find out whether such device exists in the market or not. During the search some of the systems were examined from different aspects (size, price, GSM connectivity, internet connectivity, multiple recording units, connects to remote server, uses distributed data storage) with the following results some of the systems connects to the physician through the internet, and some display the measurements via World Wide Web but the major issue among these are cost factor which very high.

A biosensor based heart beat monitoring system integrated with GSM modem is a system which is small, portable, low cost, can send alert message without delay & that can be used by any nonprofessional.

There are few major areas of research investigated for the purposes of this project are

- Method to be opt for detecting heart beat rate,
- Microcontroller selection for its calculation
- Signal amplification IC since the acquired signal from body is very low magnitude.

This research played a significant role in determining which parts were eventually chosen for the design, "Design & Implementation of Biosensor detecting heart beat rate with integrated GSM modem" since there are a wide range of microcontrollers and GSM modules available. The following subsections outline the relevant literature that played a determining role in the final design.

Traditional heart monitoring solutions exist for many years such as the Holter device which records the patient's ECG for 24 to 48 hours and is then analyses afterwards by the cardiologist. The patient can 'wear' the device and go home and resume his/her normal activities. The main drawback of these solutions is when a major incident occurs during the monitoring phase which is recorded but no immediate action is taken to help the user. Other solutions have been introduced that address this problem and J. Rodriguez et al have classified these solutions in two groups [4]

- The first group uses smart phones (or PDAs) equipped with biosensors that record the heart signals and transmit them to a health care center or hospital for analysis. Some solutions can store the signals locally as well. Examples include A live technology [3], Vita phone [5], Ventracor pocket view [6] or Welch Allyn Micropaq [7]. Most are capable of recording, viewing and storing ECGs directly on the smart phone. Some solutions transmit the stored ECG to the health care center using wireless technologies (e.g. GPRS).
- The second group aims at building platforms for real-time remote health monitoring. Examples are Mobil health [8], Telemedicine [9], Osiris-SE [10] and PhMon. These solutions use (wearable) wireless sensors to monitor patient's vital signs (e.g. ECG, oximeter, blood pressure). The European project My heart develops such a platform and focuses on heart patients. My heart aims at designing intelligent biomedical clothes for monitoring, diagnosing and treatment. The platform developed by this second group collects the bio data and send it to a care-center or a hospital for processing and analysis. None of these solutions process the ECG data locally on the smart phone and the ECG signals need to be continuously transferred to a health center if the patient needs to be monitored 24/7.

This can be costly when GPRS is used for transmitting the data.

To deal with this issue several research projects consider processing the ECG data on a local device [11]. A wrist-worn medical monitoring and alert system targeting high-risk cardiac and respiratory patients. The system includes continuous collection and evaluation of several vital signs, smart medical emergency detection, and is connected to a medical center. For heart monitoring, they are technically limited by the fact the device is worn on the wrist and therefore the ECG signal is very noisy and not suitable to diagnose cardiac abnormalities.

Epi-medics project [1,4] defines an intelligent ECG monitor which can record, analyses the ECG signals and other sensor information and can generate alarms. It can also be personalized but it is not a device meant to monitor the patient 24/7. The patient connects to the 12 lead monitor periodically as directed by the heart specialist or when he/she doesn't feel well.

MOLEC [7] provides a solution that analyses the ECG locally on a PDA. It generates alarms to the hospital in case of high risk arrhythmias. this is to design a circuit which is simple & could be used by non professional. Using simple microcontroller & LCD to display the result & transmit this via GSM modem.

IV. METHODOLOGY

Heart rate is the number of heartbeats per unit of time and is usually expressed in beats per minute (bpm). In adults, a normal heart beats about 60 to 100 times a minute during resting condition. The resting heart rate is directly related to the health and fitness of a person and hence is important to know. The measurement of heart rate is used by medical professionals to assist in the diagnosis and tracking of medical conditions. It is also used by individuals, such as athletes, who are interested in monitoring their heart rate to gain maximum efficiency from their training [8].

Heart rate is measured by finding the pulse of the body. This pulse rate can be measured at any point on the body where the artery's pulsation is transmitted to the surface by pressuring it with the index and middle fingers; often it is compressed against an underlying structure like bone. The thumb should not be used for measuring another person's heart rate, as its strong pulse may interfere with discriminating the site of pulsation [2]

Possible points for measuring the heart rate are:

1. The ventral aspect of the wrist on the side of the thumb (radial artery).
2. The ulnar artery.
3. The neck (carotid artery).
4. The inside of the elbow, or under the biceps muscle (branchial artery).
5. The groin (femoral artery).
6. Behind the medial malleolus on the feet (posterior tibial artery).
7. Middle of dorsum of the foot (dorsalis pedis).
8. Behind the knee (popliteal artery).
9. Over the abdomen (abdominal aorta).
10. The chest (apex of heart), which can be felt with one's hand or fingers. However, it is possible to auscultate the heart using a stethoscope.
11. The temple (superficial temporal artery).
12. The lateral edge of the mandible (facial artery).

We can count the number of pulses within a certain interval and easily determine the heart rate in bpm. In this project heart beat is measured for 30 sec and then it is multiplied by 2 to get BPM. The system consists of a super bright red LED and LDR (light detecting resister). The LED needs to be super bright as the maximum light must pass spread in finger and detected by detector. Both LED & LDR are placed inside the band in opposite direction & a finger is placed inside the band [9]. This system measures the amount of light absorbed by the blood in capillaries under the skin.

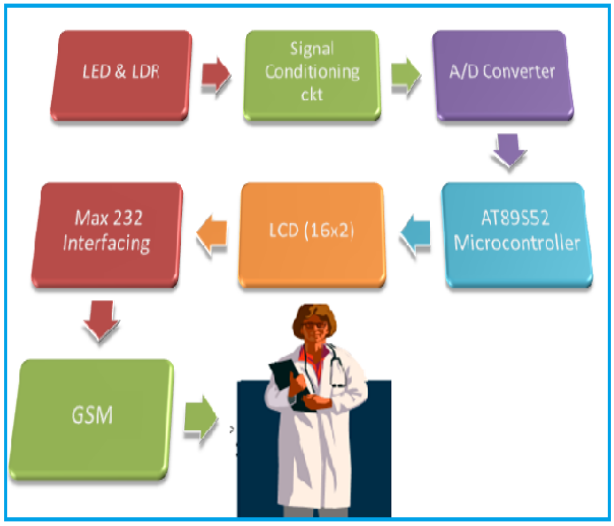

Fig1. Block Diagram

Now as the heart pumps a pulse of blood moves through the blood vessels & the finger becomes slightly more opaque and so less light reached the detector.

It works on the principle of light modulation by blood flow through finger at each pulse. The output signal is also indicated by a LED which blinks on each heart beat. LED and LDR is placed inside the tube which forms a finger band for better result. As we insert the finger in the tube, then light is crossed through the finger and focus on the LDR [6]. Its resistance is to change as per the light on the photodiode is to be change.

(A)AMPLIFICATION STAGE

An instrumentation amplifier is usually the very first stage in an instrumentation system. This is because of the very small voltages usually received from the probes need to be amplified significantly to be proceeding stages. An instrumentation amplifier (IA) is a difference amplifier where the difference between the two input terminals is amplified and the common signals between the inputs are rejected (Common Mode Rejection (CMR) [1]. The latter function is the device characteristic, termed the Common Rejection Ratio (CMRR)

LDR is connected to the op-amp amplifier. Since the output of the LDR is low amplitude current, some signal conditioning must be applied before it can be used. Operational amplifier is an ideal choice for which we used LM324 IC. With each heart pulse the detector signal varies. This variation is converted to electrical pulse. This signal is amplified and triggered through an amplifier which outputs +5V logic level signal [5].

For a bio-signals amplifier once of the important characteristics of the Op-amps to be used are its CMRR and Gain.

CMRR is generally affected by the matching of the resistance values throughout the circuit. Therefore the use of resistors with accuracies of 0.1% is highly desirable [7].

The overall gain of the IA circuit is given by equation 1 below.

$$\frac{V_0}{V_s} = \left(1 + 2\frac{R_1}{R_2}\right)\frac{R_s}{R_1} \quad \ldots\ldots\ldots\ldots\ldots\ldots(1)$$

(B) PROCESSING & DISPLAY

An AT89S52 microcontroller is chosen to process the output signal produced by the amplification stage. This amplified signal is fed to microcontroller for calculating the BPM (beats per minute) & display the resulting BPM (beats per minute) on a LCD screen. Due to the use of a microcontroller to calculate the beats per minute (BPM), it was decided that a liquid crystal display (LCD) module would be the most flexible way of displaying this numerical output[3]. It was originally planned that several seven segment displays could be used, but again it was deemed worthwhile to integrate the display unit together and limit the number of components required. In addition, the information which the LCD could convey was greater. With the use of the microcontroller however more precise measurements were able to be made resulting in an output of greater accuracy and speed.

(C) INFORMATION TRANSMISSION

GSM model is selected to transmit the information wirelessly sending a message on a desired mobile number whenever BPM reaches above the preset threshold value. This threshold value can be adjusted according to the patient. Two switches have been placed in the system for setting up the threshold value up & down. This makes a system more flexible to use for human in general [4]. Hence it is not designed for a particular age person, it can be used by any person with varying BPM (beats per minute).

(D) POWER SUPPLY

To power the circuit, the system is divided into two sections. The system will be powered via a 220V ac power supply for its long time use, which is further converted to 9 V dc voltages then to 5 V dc by 7805 voltage regulator IC [6]. The sections are designed such that both sections can be powered via a single supply where first section is voltage amplifier circuit LM324 IC & the second section is microcontroller & LCD.

V.RESULTS

The Design & Implementation of Biosensor detecting heart beat rate with integrated GSM modem is equipment in which detects heart condition & displays on LCD. The measured signal from finger is amplified and A/D conversion of the signal performed as expected. The most significant part was the emergency messaging which has been done without any delay.

Design & Implementation of biosensor detecting heart beat rate with integrated GSM modem hardware design worked properly. Total time taken in detecting BPM & transmitting takes less than 1 minute.

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VI.CONCLUSION AND DISCUSSION

The main objective behind this research work is fulfilled which is cost and time. I developed a mobile phone search engine server. It crawl the data and also send live image to the sender. Here Mobile phone is acts as a server The system made in this research requires only android mobile phone and wi-fi network connection. Mobile phone crawler presents most effective and talented searching, that type of crawler based on android java environment. By using that type of mobile crawler procedure, it has less important searches compare to other search engines. By this crawler system presentation improved, reason behind of this is those pages which are not customized and not repossess, along with this near photocopy recognition feature adds more privilege to reduce unwanted downloads

VII. FUTURE WORK

1. In Future such implementation can be d Possible future improvements are better packaging of the circuitry, instead of adjusting finger inside the band it will be worn on wrist.
2. Emergency calling & messaging via cell phone instead of a GSM modem for more compact size of a design, and more accurate and faster algorithm.

VIII.APPLICATIONS OF ANDROID TECHNOLOGY

1. Clinics, Hospitals, Intensive care units
2. Providing remote treatment in rural areas.
3. Organization where work environment involves high risk of heart attack (STOCK EXCHANGE, markets).
4. Trauma centers.
5. Insurance agencies
6. Ca
7. n be used for generating family heart activity patterns will be very useful in preventive diagnosis of hereditary disorders.

REFERENCES

[1]WelchAllyn®Micropaq.[http://www.monitoring.welchallyn.com/products/wireless/micropaq.asp[last accessed 2nd April 2006].

[2]Jones, V. and van Halteren, A. and Widya, I. A. and Dokovsky, N. and Koprinkov, G. and Bults, R. and Konstantas, D. and Herzog, R. (2006) MobiHealth: Mobile Health Services based on Body Area Networks. In: M-Health Emerging Mobile Health Systems. Springer-Verlag, Berlin, pp. 219-236. ISBN 0-387-26558-9.

[3]Telemedicarehttp://www.sintef.no/units/informatics/projects/TelemediCare/ [last accessed 2nd April 2006].

[4]OSIRIS-SE Runtime Environment for Data Stream Management in Healthcare [Last accessed 2nd April 2006]

[5]PhMon Personal Health Monitoring System with Microsystem Sensor Technology [last accessed 2nd April 2006].

[6]Myhearthttp://www.hitechprojects.com/euprojects/myheart/ [last accessed 2nd April 2006].

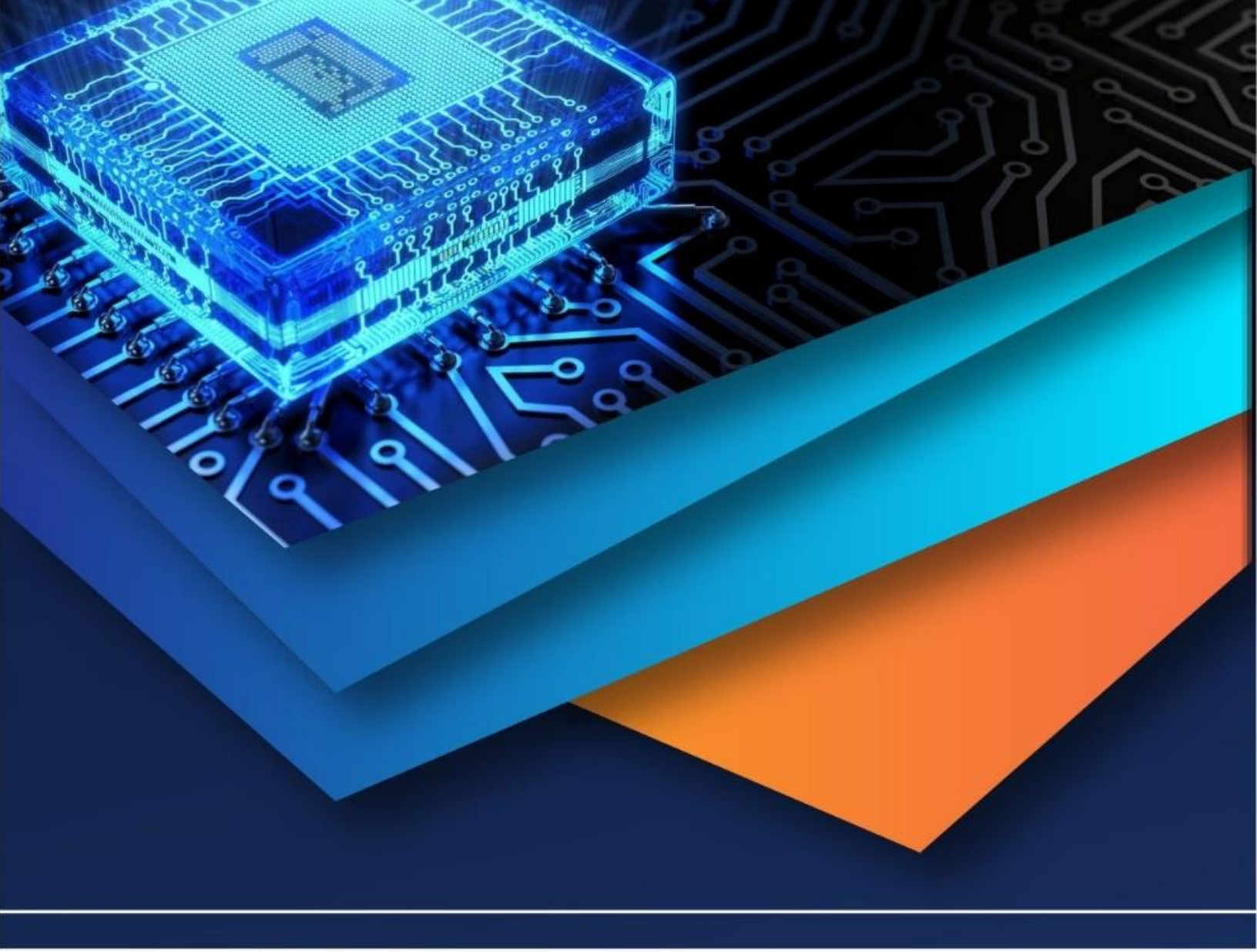
[7]Anliker, U., Ward, J.A., Lukowicz, P., Troster, G., Dolveck, F., Baer, M., Keita, F.; Schenker, E.B., Catarsi, F., Coluccini, L., Belardinelli, A., Shklarski, D., Alon, M., Hirt, E., Schmid, R.and Vuskovic, M., AMON: a wearable multiparameter medical monitoring and alert system, IEEE Transactions on Information Technology in Biomedicine, Volume 8, Issue 4, Dec. 2004 Page(s): 415 – 427.

[8]Epi- medics, http://epi-medics.insa-lyon.fr/flash/epimedics.html [last accessed 1st February 2006].

[9]Heartbeat monitoring alert via SMS Jubadi, W.M. Mohd Sahak, S.F.A. Dept. of Electron. Eng., Univ. Tun Hussein Onn Malaysia, Batu Pahat, Malaysia. 4 Oct 2009.

[10]Design and development of a heart rate measuring device using fingertip Hashem, M.M.A.; Shams, R.; Kader, M.A.; Sayed, M.A. Dept. of Computer. Sci. & Eng., Khulna Univ. of Eng. & Technol. (KUET), Khulna, Bangladesh 11-12 May 2010

[11]Rodriguez, J., Goni, A and Illarramendi, A., Real-time classification of ECGs on a PDA, Information Technology in Biomedicine, IEEE Transactions on, Volume 9, Issue 1, March 2005 Page(s): 23 – 34.



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