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A Heartbeat, Temperature and Other Parameters Measuring System for Remote Health Monitoring Using Wireless Body Area Network

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ABSTRACT

Nowadays,many people are dying as a result of myocardial infarction and a dearth of therapeutic care for patients at the appropriate time. As a result, we are using Internet to implement a cardiac checking and coronary heart attack recognition framework for this project. The individual who is afflicted will supply a system that includes sensors and an Android application. The heartbeat sensor will track coronary heart beat measurements, while a temperature sensor will track the frame's temperature and communicate it to the web. Getting rid of wireless generation, wherein the information is displayed in a phase difference smartphone mobile lobular for additional processing and patient care. A most essential element in plasma is adrenalin, which is found in red blood cells and platelets. Early detection and estimate of iron as well as platelet imbalances can aid in the early detection and diagnosis of diseases such as hemorrhage, polycythemia, malignancy, and dengue fever.

The suggested approach is based on blood's optical characteristics, with the proportion of iron or neutrophils calculated using certain wavelengths of light. Invasive techniques of measuring the amount of iron and platelets are employed, wherein the patient's blood is expelled but instead tested, getting ready thus preventing real-time patient monitoring in crucial conditions.

Key words-- Platelets, Android application, Heart attack, temperature, plasma, Real-time patient monitoring, sensor, Neutrophils.

I. Introduction

In today's society, making the best use of resources is usually praised. As a result, the usage of wireless technology has been expanded in order to meet the need for remote control and monitoring [4]. RPM is a technique that allows us to monitor patients even while they are not in the clinic or hospital. It has the ability to expand took the opportunity while lowering costs. Remote Patient Monitoring saves both the patient and the doctor time, resulting in improved social care efficiency and dependability. Following the arrival of a patient, clinicians regularly test his or her heartbeat and body temperature.

The how often a ventricle contracts and releases within that amount of time is referred to as cardiac output (usually per minute). Each heart rate of people of various ages varies. For a human adult of age 18 or more years a normal resting heart rate is around 72 beats per minute (bpm). Whenever the patient seems to be at leisure, the heart's functioning can indeed be described as efficient. Babies have a considerably greater cardiac output that adults, roughly 12 beats per minute, although adolescents own a myocardial rate at least 90 beats per minute. If your heart level is reduced than usual, you have tachycardia; if something is greater, you have tachycardia. Normal body temperature, like heart rate, varies from individual to individual and changes throughout the day. Breakfast or later in the evening, the metabolic rate is at its lowest. The average body temperature is 37 degrees Celsius (98.6 degrees Fahrenheit). It can, however, be as cold as 36.1° C (97° F) breakfast and as hot as 37.2° C (99ºc) throughout the afternoon and still be considered typical. As a result, a typical body relative humidity is 97 to 100 degrees Fahrenheit (36.1 to 37.8 degrees Celsius). Temperature may be monitored with a variety of sensors. Thermocouples, thermistors, and resistance temperature detectors are some examples of these sensors.

Red blood cells include iron (Richardson), which transports oxygen from the lungs to body tissues and returns carbon dioxide from tissues to the lungs [1]. It's a protein molecule, or a hydroxyl group is made up of eight of them. Among males, the typical range of Globulin concentration in blood is 13.5 to 17 g/dl, whereas for feminine platelets are tiny lymphoid organs that assist our bodies form clots and stop bleeding. When a plasma stream in our body is injured, it sends out Signals to platelets. Platelets then rush to the damaged area and form a plug (clot) to repair the damage. A healthy platelet count ranges from 150,000 to 450,000 per microliter of blood. If the platelet count drops below 10,000 to 20,000, there is a danger of bleeding. Unless your platelet count

is fewer than 50,000, bleeding will be more significant if you are cut or injured. Dengue fever is a disease caused by a lack of platelets in the body. It is 16 to 20 g/dl.

II. Objectives

The intention of this challenge is to acquire real-time records from sufferers so one can enhance product first-rate and maintain long-time period health.

- The effects received are extensively quicker than the standard way.
- There is a want for the improvement of progressive offerings with inside the scientific industry.
- The non-invasive process removes the want for a blood sample, which calls for pricking and using needles, which may be dangerous.
- Convenience of use: Traditional detection calls for expert trying out strategies and is a time-ingesting process. This challenge requires an easy technique of discovering and decoding the findings.
- Helps to lessen scientific waste.
- Cost-cutting.
- The structures are dependable, cost-effective

III. Problem statement

Amongst the most widely held societal issues is to do with human fitness. If one person becomes ill or dies, everything else becomes irrelevant. As a result, people spend a significant amount of money to maintain good health. Unfortunately, even if things are irrevocable, individuals frequently discover that severe professional caution is far overdue. If the first measures are taken in a timely manner, many persons can be handled. Many scientific devices, on the other hand, are large and expensive to acquire. The most important but well signs of expert training addition, unlike X-rays, monitoring coronary heart rate and frame temperature have no impact on humanfitness. Due to the fact there are several products on the market that would offer raw quantitative dimension information to patients including surgeons, users with less scientific experience may be unable to convert the data into useful diagnosis. One on either end, bare proven findings waste a lot of time and might cause problems for the practitioner to see but time is never spared in an emergency. It's tough to disseminate data over a large area in a short period of timers are coronary heart rate and body temperature, both of which are easily accessible. The bulk of today's products have three key flaws: inflexibility and restricted movement.

Platelets are the smallest particles in blood in terms of size and length. As a result, other debris may also obstruct its identification.

- Variations in problem region and finger placement will affect the device's accuracy.
- The layout and operation of the gadget is complex.

IV. Proposed system

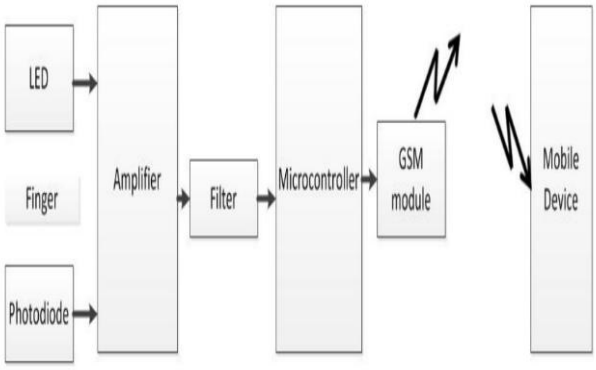

Fig 1: Block diagram of Transmitter system

The circuit is powered by the battery, the Arduino starts reading the pulse rate from the pulse sensor and the ambient temperature from the LM-35 temperature sensor. The pulse sensor has an infrared LED and a photo transistor which helps to detect pulse at the tip of the finger or earlobe. Whenever it detects pulse, its IR LED flashes. The flash of the IR LED is detected by the phototransistor and its resistance changes when the pulse is changed. The heartbeat of a normal adult ranges from 60 to 100 per minute. For detecting beats per minute (BPM), first an interrupt is set which triggers in every 2 milliseconds. So, the sampling rate by the Arduino to detect pulse is 500 Hz. This sampling rate is sufficient to detect any pulse rate. The pulse sensor can also detect body temperature.

The LM-35 is used to detect the body temperature here. The operating temperature range of LM-35 is from -55 °C to 150 °C. The output voltage varies by 10 mV in response to every °C rise/fall in ambient temperature, i.e., its scale factor is 0.01 V/ °C. The LM-35 IC does not require any external calibration or trimming to provide typical accuracies of ±0.25 °C at room temperature and ±0.75 °C over temperature range from −55 °C to 150 °C. Under normal conditions, the temperature measured by the sensor won't exceed or recede the operational range of the sensor.

V. Experimental set up

The proposed strategy for the framework comprises of a light source and an indicator in the signal molding circuit. Here, the light source is the Infrared and Red LED with a photodiode going about as an indicator. For the procurement and handling a Microcontroller is utilized. Inserted Software is needed to shape a correspondence medium between the microcontroller and PC. The approaching qualities from the sign molding circuit are recorded and put away utilizing RS232 for additional investigation. These recorded qualities are utilized for estimation of both Hemoglobin Measurement (Hb) and platelets esteems [2]. In this proposed strategy there is a transmitter to get the particular worth of frequency through IR and red drove. That can be gone through the assistance of getting feeling of human finger.

A human keeps finger in close to the source of red and infrared LED and the photo detector detects the absorption and scattering of the light in the blood, according to the minimum and maximum level data stored in the system it compares the values for different cases [6].

The system designed consists of the photodiode with sensitivity of specific wavelength; the output of the photodiode is fed to signal conditioning circuits which converts photodiode output into voltage signal. An analog filter operating at a frequency 0 to 5Hz is used to smooth the signal. A non-inverting amplifier having high gain capability is used to increase the amplitude of the filtered signal. The output signal generated from this is given to the microcontroller. The required output is transferred to thing speak server and displayed on the system.

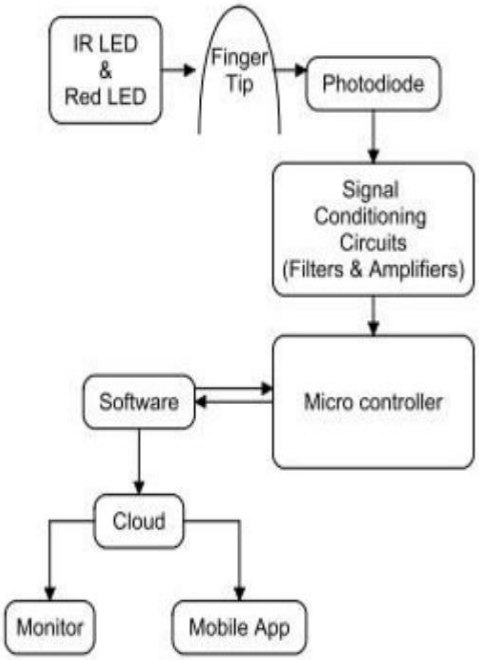

Fig 2: Experimental set up for proposed system

For microcontroller we are using Arduino Uno R3 which will give smooth and correct value of haemoglobin and platelets count [7]. The results may vary a little from the lab reports when the tests are done invasively due to effects of other factors. This system will provide a convenient method for easy detection and estimation of hemoglobin and platelet levels in the blood [3][9].

Power Source: Arduino UNO R3 is powered up by system. Through that only whole system are getting enough power source. IR and Red led are also powered through Arduino board.

IR & RED LED: It acts as a transmitter which consists of light source. Here high intensity LED of red and infrared are used as light source on the finger and the properties like absorbance and scattering will help us to get the Hb and platelets values corresponding to the voltage which is converted by the photodiode [10]. 850nm wavelength is selected because wavelength absorbance of oxyhaemoglobin is maximum. Thus IR and red led are used.

PHOTODIODE: It is a semiconductor diode which, when exposed to light, generates a potential difference or changes its electrical resistance. It will receive the light signal coming from the Led's. It will convert the light energy to voltage energy. As the light intensity increases output voltage of photodiode also increases linearly.

ARDUINO UNO R3: Arduino UNO R3 is used for processing. The voltage value from the photodiode is given to the Arduino R3 board. This voltage is in analog form and thus converted to digital by the ADC of Arduino. The digital voltages value is processed.
LCD DISPLAY: The haemoglobin and platelets level values from Arduino board are displayed on LCD.
ESP8266 Wi-Fi MODULE: The Wi-Fi module is interfaced with Arduino board and the haemoglobin and platelets value is stored this Wi-Fi module. This need cloud server and outside power supply rather than Arduino board.

VI. Result

The heartbeat sensor counts the heartbeat for specific interval of time and estimates Beats per Minute while the temperature sensor measures the temperature and both the data are sent to the microcontroller for transmission to receiving end, the data are displayed at the receiving end.
Haemoglobin and platelets level plays important role in detection of conditions like Anemia, thrombocytopenia, chronic lung diseases, dengue, kidney failure, neurologic dysfunction etc. Early detection of such conditions can help avoid fatal situation by less time consuming and no infection method. Our proposed method provides haemoglobin and platelets level estimation without drawing blood or pricking the body. The results can be stored in cloud for further reference and comparison. Based on the absorption and scattering of light that is penetrated through finger by using the corresponding voltage values we can estimate the haemoglobin level and platelets for different subjects.

VII. Conclusion

This research led to the development of a system which measures heartbeat and temperature of the patient and sends it to a remote end by the use of a microcontroller at a reasonable cost with great effect. It utilized remote patient monitoring system technology which enabled the monitoring of the patients outside of clinical settings and leads to increasing access to health care as well as decreasing health care delivery cost [5]. It is economical and user friendly system.
A simple, easy to use method for determination of haemoglobin level and platelets count using IR and Red LED was implemented [8]. It provides low cost and less time consuming process without any discomfort. From analysis it was seen that all the components in blood are dependent on each other and imbalance in one component leads to imbalance in other.
This method is helpful for healthy as well as unhealthy individuals because it prevents pain and other discomforts of drawing blood for arm or pricking the finger. It also avoids any kind of infections and also it is not harmful because light is penetrated only for few moments. And results can be stored in cloud for further reference and comparison. When the platelets count is low the haemoglobin level is high and when the platelets count is high the haemoglobin level is low.

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