

CUEDETA: A Real Time Heart Monitoring System Using Android Smartphone

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Abstract – In the world nearby 17 million people die due to cardio vascular diseases, especially heart attack this estimation is given by the WHO that is World Health Organization. In which by Untimely Intervention the maximum deaths are occurred. We can able to save their life by giving proper medical treatment and for this we required system which monitors continuously the ones ECG signal. So, here we are giving the information about CUEDETA system. These names generate from the world cuerpo that means human body and detalles tell by the world Detalles. This system send alerts to her/his medical professional, ambulance services and contacts by continuously monitoring the ECG signals of the patient. With the help of Google map we can find the exact position of patient by using URL which is present in alerts. By connecting wireless heart rate monitoring device to the body and interfacing it with the smart phone we can detect the false alerts so that patient and his/her contacts can detect that false errors before contacting the medical professionals. To support the diverse class of mobile devices we developed a software framework in android.

Keywords-cuedeta; heart attack; alert; Smart phone.

I. INTRODUCTION

The biological sensor and off-the-shelf wireless devices gives the methods for collecting and processing the ECG signals. The updates about the one's health is given by the this system because it have a full-fledge personal monitoring system by incorporating biosensor data like heartbeat. The CUEDETA word comes from cuerpo that means human body and detalles for details. The propose of this system is to used for monitoring continuously to the patient at different environment like hospital, work place, home or anywhere. With the help of wireless network the mobile cardiac monitor which is home based developed a solution which integrate a design of an integrated electrocardiogram that is ECG beat sector which is supported by Facilitated Accurate Referral Management system that is FARMS and PHIMS that is Personal Health Information management System which is version of PDA.

II. LITRATURE SURVEY

In this section we learn about the ECG, it includes the heart activity, three lead and interpretation of electrograph.

- ECG

A. Electrocardiography

Here electrodes are placed on the surface of the body and capture the electrical activity of the heart over time.

B. The Heart Activity

We know that heart is a muscle whose function is pumps the blood to the body. Heart has four chambers that is right atrium, right ventricle, left atrium and left ventricle. Both sides work together, the right side supply deoxygenated blood from body to lungs and left side supply oxygenated blood from lungs to body. For this electrical impulse is necessary. This is generated by SA node (Sino atrial node) and transmits to the conduction system of heart. Electrodes which is present on the skin surface measured the potential changes occurs during depolarization and repolarization and this electrical activity represent in two dimensional called electrocardiogram.

C. Three Lead Electrocardiography

We know that at the time of depolarization, the electrical changes are detected on the skin on which ECG works. This is done by placing electrodes on the either side of heart. The voltage difference between two electrodes is measure by this leads that's why it also called as a bipolar lead. The types of ECG are differentiating on the basis of number of leads record like 3-lead ECG, 5-lead ECG and 12-lead ECG. And on the basis of precision and accuracy of their records the types of ECG differentiated. In this project we learn about the 3-lead ECG. In 3-lead ECG the electrodes placement based on Einthoven's triangle. It contains LA-RA (Lead 1) which measure potential difference between right and left arm electrodes. The potential difference between right arm and left leg electrode is measured by LA-LL (Lead 2) and left arm and left leg potential difference is measure by RA-LL (Lead 3).

D. Electrocardiograph Interpretation

During each beat of heart the ECG signal shows a series of waves related to the electrical impulse.

III. ANALYSIS REQUIREMENTS

A. Hardware Specification

For sensing the ECG signal the ECG electrodes are employed. ECG signal collected by the ECG sensor from human body and transmit to the smart phone with the help of Bluetooth. Due to the ion, the current flows in human body. The cation is a positive charge and anion is a negative charge. Bio potential electrodes analyze ion distribution which is occurred on the surface of tissue and convert into electron current. At the time of interface between electrolyte and electrode, a chemical reaction occurs. For removing the noise present in the signal and processing the ECG signal from electrodes, a signal processing module is used. We receive the signal with the help of Bluetooth module and process it and transmit it with the help of Bluetooth link. For generating the result required a Smartphone. For development and debugging purpose we used Samsung Galaxy S Plus here.

B. Software Specification

We use Android 2.3 which was developed by Google led by Open Handset Alliance. We included Google map API for geocoding and map views in order to provide the location of the patient for developing environment.

IV. PROPOSED APPROACH

A. ECG Signal

To measure the electrical potential difference between various points of the body, the electrocardiograph is constructed. There are five electrodes connected in a standard ECG recording. They are RA (Right arm), LA (Left arm), LL (Left Leg), RL (Right Leg), Chest (C). The different waveforms and amplitude can be obtained on the basis of connectivity between electrodes pairs and ECG sensor. The information about heart activity can not obtain from another pair of lead because each pair has unique information of the heart activity. On the basis of connectivity between lead and ECG amplifier, the leads are divided into Unipolar Chest leads, unipolar limb leads, augmented limb leads and bipolar limb leads, Einthoven triangle.

By measuring the electrical potential difference between left arm and right arm, we measure a main signal Lead I in this project. The upward deflection of the electrograph is cause due to the electrical wave moving towards the left arm which is positive pole.

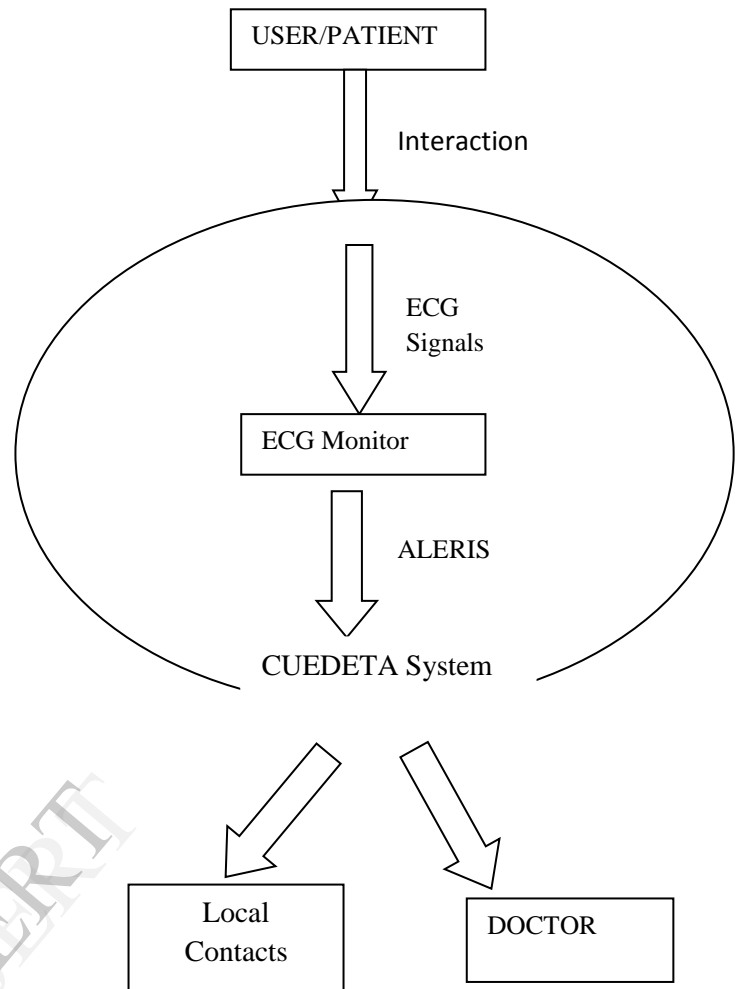


Fig. System Architecture

B. Electrical Components

1. Amplifier Operational

On the basis of electrical characteristics, the operational amplifier is used in the applications. The requirements for fulfilling operational amplifier were;

- 3.3V single supply
- Quad operational amplifier for ECG sensor system size
- low power consumption
- low input offset
- low noise
- Rail to Rail input and output
- High output Current

2. TS924 Quad operational amplifier

The characteristics of TS924 Quad operational Amplifiers are low noise, low input offset to avoid DC- Level disturbances, Rail to Rail input and output, High output

current, and Quad operational amplifier package SO14 and low power consumption.

3. Microcontroller

For more or less standard device in low voltage applications, the microcontroller Pic18LF452 was choosing. It also compatible with PICSTART Plus, software and Hardware. Performance of the application is not affected by using sample rate 4 MHz crystal instead of 10MHz. due to the slow sample rate 400 Hz, Italso reduce power consumption without affecting the ADC performance.

4. Bluetooth Module

A wireless capability product adds the RN42 small factor, highly economic and low power Bluetooth radio for OEM's. It supports a simple design and fully certified multiple interface protocol for making a complete embedded Bluetooth solution. Its functionality is compatible with RN41, on chip antenna give high performance and support enhance data rate of the Bluetooth (EDR). It also useful at the time of applications required external antenna.

5. ECG Module

ECG platforms and ECG modules are two parts where implementation of ECG modules is divided.

A. Platform of ECG Sensor

It include,

- Bluetooth Module
- Microcontroller
- Amplifier
- ECG electrodes

The output signal of amplifier handled by ECG amplifier, it include serial port configuration, controlled sample rate, sending data through serial UART to Bluetooth Module.

B. Platform for ECG Mobile

The android enabled Smartphone present in the mobile platform. For handling the output signal from ECG sensor system the Cuedeta App on the PDA is required. The functions of this applications are connect to the ECG signal, send start signal, Read output from ECG sensor system, display of graphical signals, Analyze the ECG, send alert, send stop signal before existing program.

C. Variation Detection in ECG

We can plot the ECG with the help of java layout by sending data through Bluetooth Module. The ECG signal counted number of spikes by analyzing one cycle. During the data connectivity, the spikes value is computed by collecting highest value. If the number of spikes is lower or higher than threshold value then core part of algorithm spikes and detects the failure.

D. Alerts

For sensing the false alert and cancel the alert, a countdown timer is initiated. The automatic alert propagation starts at the time of no response from the patient.

- Call Alert: - the application initiated call when the alert is detected.
- SMS Alert: - after the call end, the SMS alert is initiated and send the address of the patient.

V. MATHEMATICAL APPROACH

A. Failure detection algorithm

```

While (ecg_connected)
For each cycle Count spikes
If (for_one cycle spike<3 OR spike>8fail->fail+1)
If (fail>=3)
EXIT and
SEND_ALERT ()
end For
End While
Function SEND_ALERT ()
If (ALERT_ENABLED)
Initiate CALL to Primary number
ON_CALL_END
SEND_SMS (primary number)
If (SECONDARY_ALERT_ENABLED)
SEND_SMS (secondary number)
End IF
End IF
End function SEND_ALERT()

```

B. Microcontroller Algorithm

```

int temp_res1, temp_res2;
int i, start=0;
int EKG_1,EKG_2;
main()
{
Usart_Init(19200); //Serial port configuration with 19200
baud rate
do {
if (Usart_Data_Ready())
{
start = Usart_Read(); //get start
signal from PDA
do{
for (i=0;i<100;i++) // send 200
bytes at the time
{
temp_res1 = ADC_Read(1); //
Get results of AD conversion input
EKG_1=temp_res1/4; //Shift the 2 LSB
temp_res2 = ADC_Read(0); // Getresults of AD conversion
input
EKG_2=temp_res2/4; // shift the 2

```

```
LSB
Delay_us(500); //wait 0.5 ms
USART_Write(EKG_1); //sendchannel 1 8 bit result via
serial UART
USART_Write (EKG_2); //send channel 2 8 bit result via
serial UART
Delay_us (2500); //wait 2.5 ms
}
start = Usart_Read(); //check startsignal
}while (start == '1');
}
} while(1);
} //~! //end of program
```

VI. CONCLUSION

This project concludes that with the help of ECG sensor and Smartphones we design and implement a real time ECG monitoring System. This system successfully implemented in android platform. Here validated alert system present and testing can done in real time and verified the outputs. Noise and slight interface signal tested by ECG sensor. In this project the replacement of Bluetooth is more complicated. For analyzing the patent current location, we add option for sending ECG signal to a doctor at a remote location.

VII. REFERENCES

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