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RECEPTION AND DISPLAY OF THE ECG SIGNAL

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Abstract

The prime aim of this paper is to design an advanced Electrocardiogram (ECG) signal monitoring and analysis design. Heart is an important part of the human body. Heart diseases are the important factor which cause death in the world. An electrocardiogram is a device which graphically records the electrical activity of the heart. This project takes care about the receiver part in the ECG kit. The signals are transferred from transmitter to receiver using the ZigBee module which uses low power. The device is also used to identify normal and abnormal heartbeats. Feature extraction will be done in raspberry pi. Here MATLAB is used for processing and after the total process the signal will be send to transmission part which will be interface with the PC.

Keywords: ECG, raspberry, Xbee Module, ADC and DAC.

I. Introduction

Characteristics, Biometrics authentication is used in computer science as a form of identification and access control. There are many biometric signals that can be taken from the human body like fingerprint, palm veins, face recognition, DNA, palm print, hand geometry, iris recognition retina, ECG etc., Out of these signals we are dealing with ECG signal which is taken from heart. This signal is helpful to know the function of heart. In this busy world people don't take care of their health condition. It is difficult to take care of the heart patients regularly. It will be easy when the patient is under surveillance. ECG is a test that measures electrical activity of the heart with the help of electrodes located on the surface of the body. Hence an equipment is designed for the measurement of ECG. So there will be no problem to determine the function of heart at every period of time easily. We will use the wavelet transforms to know the difference in heart functionality. It provide to the patient a safe and easy way to achieve his exercises and helps the specialized to supervise

the patient. the heart can function too fast, too slow, or with an irregular rhythm. A heartbeat that is too fast is called tachycardia (TAK-ih-KAR-de-ah). A heartbeat that is too slow is called bradycardia(bray-de-KAR-de-ah). Most arrhythmias are harmless, but some can be serious or even life threatening. ECG is basically responsible for patient monitoring and diagnosis. The extracted feature from the ECG signals plays a important role in diagnosing the cardiac diseases. In present days the development of accurate and quick methods for automatic ECG feature extraction is of major importance . therefore it is necessary that the feature extraction should perform correctly and accurately. The purpose of feature extraction is to find the abnormalities in heart. this will helpful to the people who are suffering from the cardiac diseases.

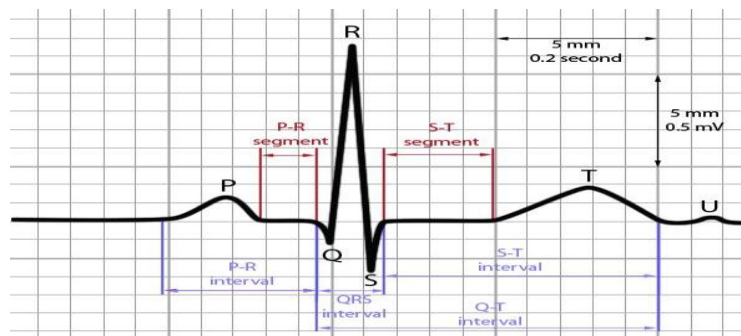


Figure1: ECG waveform.

An sample ECG signal shows P-QRS-T [2] waves. The electrocardiogram translates the heart's electrical activity into line tracings on paper. The spikes and dips in the line tracings are called waves.

The P wave[3] will record through upper heart chambers which is atria. The QRS wave will get through the movement of electrical impulses by lower heart chambers which is ventricles

The ST segment shows when the ventricle is contracting but there will be no electricity flows through it and it usually appears as straight line in between QRS complex and the T wave.

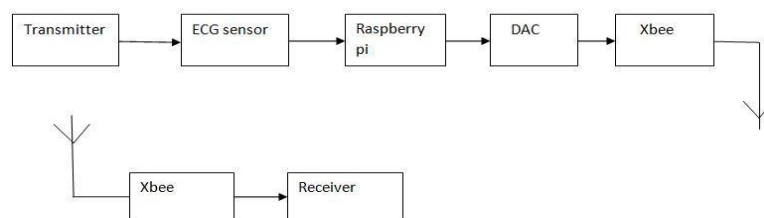
The T wave shows when the lower heart chambers are resetting electrically and preparing for the next muscle contraction.

II. Literature Survey

ECG feature extraction has been developing from the early time and lots of techniques and transformation have done to get the perfect ECG .this section gives how the ECG feature extraction has developed from the past years. The heart monitoring subject has developing gradually like in the first stage recognition of individuals using electrocardiogram,

after acquirement of data from electrocardiogram, modules of algorithm, biometric identification of individuals and identification using electrocardiogram modules. Zhao and liqing zhan[4] built up the component extraction utilizing wavelet changes and bolster vector machines. The paper displayed another path to the element extraction for solid heart cadence acknowledgment. The created arrangement of order is contained three measurements including information preprocessing, highlight extraction and grouping of ECG signs. Two unique strategies are connected together to get the ECG information. The wavelet change is utilized to separate the coefficients of the change as the components of every ECG fragment. Simultaneously, autoregressive demonstrating (AR) is additionally connected to get hold of the transient structures of ECG waveforms. At that point finally the bolster vector machine (SVM) with Gaussian portion is utilized to arrange diverse ECG heart musicality. Alan and Nikola [5]proposed tumult hypothesis that can be effectively connected to ECG highlight extraction. They likewise examined various disorder strategies, including stage space and attractors, relationship measurement, spatial filling record, focal inclination measure and surmised entropy. They made another element extraction environment called ECG confusion extractor to apply the aforementioned bedlam strategies. Another self-loader project for ECG highlight extraction has been executed and is exhibited in this article. Graphical interface is utilized to determine ECG records utilized in the extraction strategy and additionally for technique choice and results sparing. The system separates highlights from ECG documents. Relationship examination for unusual ECG signal element extraction was clarified by Ramli and Ahmad[8] . Their proposed work researched the strategy to extricate the imperative elements from the 12 lead framework (electrocardiogram) ECG signals. They picked II for their whole investigation because of its delegate attributes for distinguishing the normal heart illnesses. The examination procedure picked is the cross-relationship investigation. Cross-relationship examination measures the closeness between the two flags and concentrates the data present in the signs. Their test outcomes recommended that the proposed method could successfully separate elements, which separate between the sorts of heart illnesses broke down further more for ordinary heart signal

III. Project Overview:



Xiaomin Xu, and Ying Liu,[6] depicted a calculation utilizing Slope Vector Waveform (SVW) for ECG QRS complex discovery and RR interim assessment. In their proposed strategy variable stage separation is utilized to accomplish the wanted slant vectors for highlight extraction, and the non-direct enhancement is utilized to show signs of improvement of the sign to-clamor proportion. The strategy takes into consideration a quick and precise inquiry of the R area, QRS complex span, and RR interim and yields great ECG highlight extraction results. Keeping in mind the end goal to get QRS terms, the component extraction principles are required.

A strategy for programmed extraction of both time interim and morphological elements, from the Electrocardiogram (ECG) to group ECGs into typical and arrhythmic was depicted by Alexakis et al. in[7]. The strategy used the blend of manufactured neural systems (ANN) and Linear Discriminant Analysis (LDA) strategies for highlight extraction. Five ECG includes to be specific RR, RTc, T wave sufficiency, T wave skew ness, and T wave kurtosis were utilized as a part of their technique. These components are acquired with the help of programmed calculations. The onset and end of the T wave were distinguished utilizing the digression strategy. The three element blends utilized had extremely undifferentiated from execution while considering the normal execution measurements.

The basic process will be in the transmitter section the ECG signal can be taken from the body using electrodes by ECG sensor and it will send to the raspberry kit which will do the feature extraction and send it to the receiver via xbee module and the output will be displayed at the PC.

IV. ECG Sensor:

The ECG sensor is attached to the patient the use of disposable electrodes on the left and proper aspect of the chest. The sign obtained from the frame is filtered and amplified. The sensor outputs an analog sign that's then converted through the analog-to-digital converter (ADC). The serial-to-Bluetooth module transmits the digital output of the ADC to the cellular phone. at the cellphone the sampled ECG is displayed. Its frequency range will be 0.05 to 16Hz, sampling rate will be 470 samples/sec and the transmission will be 10 meters.

V. Raspberry PI

It is a series of credit card size of single board computers. Raspberry pi is like a single a single board terminal which has input output pots, ram, USB port and Ethernet ports. The basic block diagram will be common length of QRS complexes are detected. To keep away from the problem of baseline shifting of the ECG sign, the sign is de-trended. The baseline

transferring is due to a completely low frequency sign. This very low frequency factor is filtered out with the aid of discrete wavelet transform approach.

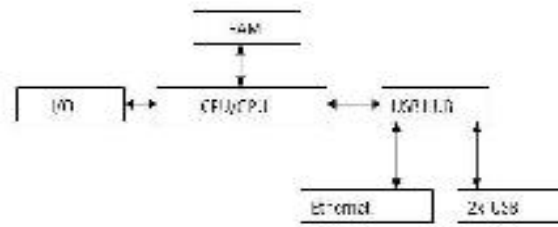


Figure-2.

Basically raspberry pi is a small sized computer which can perform all the operations and it have RAM, processor , USB ports and Ethernet pots ,it is of good portability and used to perform the feature extraction using wavelet transforms.

VI. Wavelet Transforms

The Wavelet transform is a time-scale illustration that has been used successfully in a extensive range of packages, in specific signal compression. Currently, Wavelets have been implemented to several troubles in Electro cardiology, including records compression, evaluation of ventricular late potentials, and the detection of ECG characteristic points.

The Wavelet transformation is a linear operation that decomposes the sign into a number of scales associated with frequency components and analyses each scale with a sure resolution. The WT uses a quick time interval for comparing better frequencies and a long term interval for decrease frequencies. due to this belongings, high frequency additives of brief duration can be observed efficaciously by means of Wavelet rework. one of the blessings of the Wavelet transform is that it could decompose signals at diverse resolutions, which allows accurate function extraction from non-desk bound alerts like ECG. A circle of relatives of reading wavelets in the time frequency area is received via making use of a scaling thing and a translation factor to the primary mom wavelet. Wavelet transform of a signal $f(t)$ is described as the sum of over all time of the sign improved by means of scaled, shifted variations of the wavelet characteristic ψ and is given by using,

$$W(a,b)=\int_{-\infty}^{\infty} f(t)\varphi_{a,b}(t)dt$$

Heart rate is calculated the use of the height detection method. Rwave is decided through reading the slopes of the ECG samples. The iso-electric powered baseline of a coronary heart signal may be shifted for numerous abnormalities. for this

reason the ECG components can also be shifted. this can be a hassle in detecting the Rwaves. So a threshold stage is taken into account. Peaks exceeded the edge level are counted as R-waves by means of determining the slopes of the growing and falling edges. before everything, we symbolize the ECG signal, this is, we detect and discover the distinctive waves and segments of the ECG signal. The onsets of P-wave, QRS complicated, T-wave and the P-R section, S-T segment, the common length of QRS complexes are detected. To keep away from the problem of baseline shifting of the ECG sign, the sign is de-trended. The baseline transferring is due to a completely low frequency sign. This very low frequency factor is filtered out with the aid of discrete wavelet transform approach.

VII. ADC and DAC Converters.

A. ADC: It converts the analog signal to the digital signal

B. DAC: It converts the digital signal to analog signal

In modern life, electronic device is frequently used in special fields consisting of communication, transportation, enjoyment, and so on. Analog to virtual Converter (ADC) and digital to Analog Converter (DAC) are very crucial components in digital equipment. considering that maximum actual world signals are analog, those converting interfaces are important to allow virtual electronic equipment's to method the analog alerts. [9]

VIII. XBEE Module:

XBEE modules are a circle of relatives of truly best little radio devices that use the ZigBee or 802.15.4 protocol. They ship and get hold of statistics via the 2.4GHz or 900 MHz band at a relatively low energy and may be used to installation easy point-to-factor hyperlinks or complicated self-recovery networks spread over good massive areas. The better strength devices can be used as telemetry solutions over lengthy levels, however actually the applications are extremely varied.[10] Interfacing with an Xbee module is easy. They have the same pin outs, and you talk to them with simple serial communication, using AT based commands, or an API command set. They can be configured to be very low power, and to wake up very quickly. Crucially, for many applications, Xbee modules do not need to be driven by an external microprocessor. Many have on-board ADCs and digital inputs outside of the normal serial communication in/out meaning that you can interface them directly to sensors, switches and so on.

contain new, useable, and fully described information. For example, a specimen's chemical composition need not be reported if the main purpose of a paper is to introduce a new measurement technique. Authors should expect to be

challenged by reviewers if the results are not supported by adequate data and critical details.

IX. Conclusion

Thus the transmission of the ECG data is succeeded by using the xbee module .Feature extraction is done using wavelet transform. With the help of the feature extraction abnormalities in the heart can be diagnosed easily and it is possible to save the patient at the correct time.

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