A Design Of Simple And Low Cost Heart Rate Monitor

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***Abstract*— ECGs are important biomedical signals, which are reflective of an electric activity of the heart. Cardiac Arrhythmia is the condition of abnormal electrical activity which is observed by the ECG graph. The aim of this paper is to determine the ECG graph of human body and heart rate also in a low cost that everyone can afford it. The early detection of different arrhythmia is very important for the cardiac patients. So this device helps us to detect that. It is portable too.**

***Index Terms*— Electrocardiograph, Electrodes, Heart rate, Ardiuno**

I. INTRODUCTION

Science and technology play a vital role in our daily life now days in the field of medical science we can easily determine our diseases. The electrocardiogram is one of the useful diagnostic tests in the emergency medicine; we know our heart has four chambers-right atrium, left atrium, right ventricle, left ventricle. The function of the heart is to pump blood, gases, water to the whole body this is known as the cardiovascular system. Blood enters the heart on the right side through two main veins superior vena-cava and inferior vena-cava, the incoming blood fills the both atrium. Now both ventricles are in diastole situation of by atrium pressure heart pumps the blood to the both ventricles which is known as systole situation of atrium. Finally its time to the ventricle systole so it pumps the blood to the whole body and lungs.

ECG are the bio potential generated by the muscles of the heart. The action potential in the heart originates near the top of the right atrium at a point called the pacemaker or SA node the heart beat is the result of the action potential generated by the pacemaker which propagates in all direction along the surface of both atria. By electrocardiogram we can see the graph of the action potential. If there is any problem related to the blood flow system in the chambers or node in the heart we can determine it from ECG graph. By ECG we can measure the heart rate of the human beings. As shown in the table 1[1] -

Age (Years)	Average Maximum Heart Rate (bpm)	Target HR Zone 60-90% (bpm)
20	200	120-180
25	195	117-176
30	190	114-171
35	185	111-166
40	180	108-162
45	175	105-157
50	170	102-153
55	165	99-148
60	160	96-144
65	155	93-139
70	150	90-135

Table1[1] Heart rate of human anatomy

Low heart rate is known is bradycardia and high heart rate is known as tachycardia.

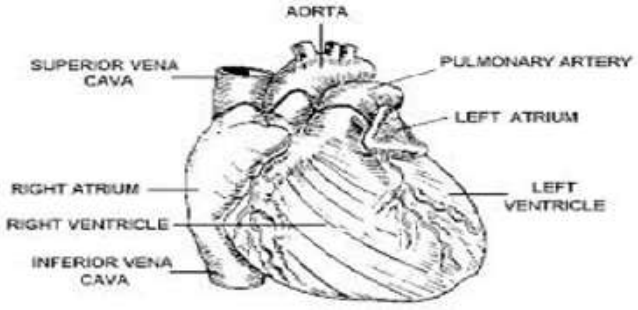

Fig 1[2] Cardiovascular system of human anatomy

II. SYSTEM DESCRIPTION

Electrical potential generated by the heart's electrical activity is measured by the ECG signal through the electrodes on the body surface.The ECG signal is divided into five waves reflecting the different functions of the heart during a cardiac cycle-these waves are P.Q,R,S and T segments as shown in figure 2[2]-

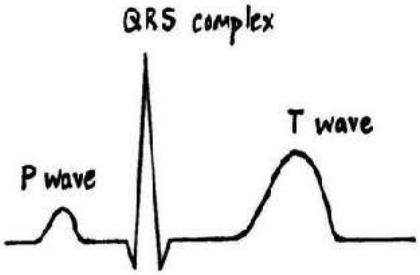

Fig 2[2] ECG wave segments

Here we use electrodes, instrumentation amplifier, band pass filter, notch filter and CRO with 9v power supply, two potentiometer to control the gain and finally output to be displayed. Block diagram is shown in the figure 3—

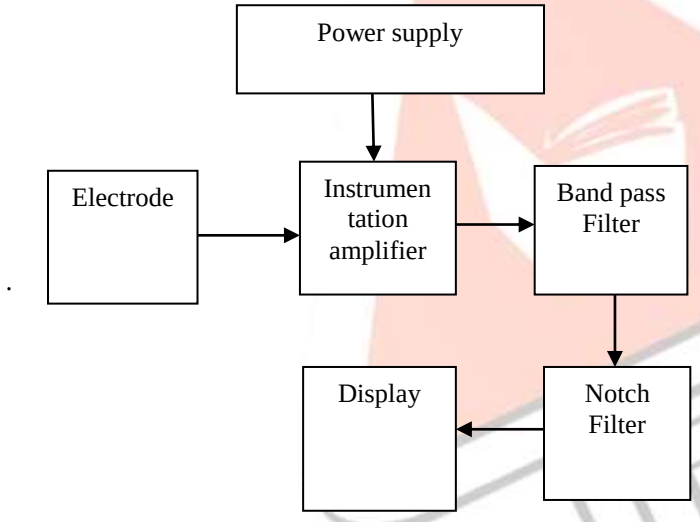

Fig 3 Block diagram of System

III. ELECTRODE

Here we use body surface electrode these are used to get bioelectric potentials from surface of the body and are available in different sizes and forms larger electrodes are generally used in ECG as localization of the measurement is not important the electrolyte paste or jelly serves as conductive path between the metal and the skin.

IV. INSTRUMENTATION AMPLIFIER

An instrumentation amplifier is a type of different amplifier which is outfitted with input buffer amplifiers that eliminates the need for input impedance matching and thus it make the amplifier particularly suitable for use in measurement.Instrumentation amplifier are used where great accuracy and stability of the circuit are needed our instrumentation amplifier connect with the two electrodes. Here we use LM324N as an instrumentation amplifier. It is a 14 pin IC as shown in the figure 4[3]-

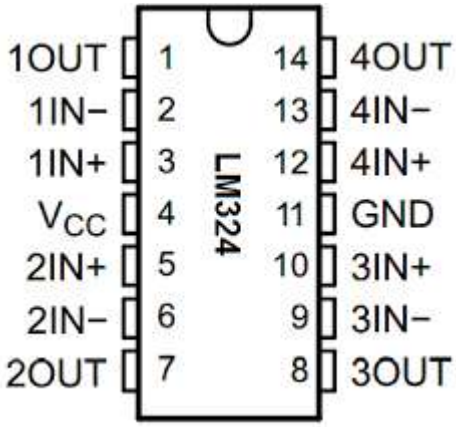

Fig 4[3] Instrumentation amplifier LM324

V. BANDPASS FILTER

Here we use a bandpass filter to avoid the noise .we set it in 50Hz frequency .Now a bandpass filter is an electronic device or circuit that passes signals between two specific frequencies but that discriminates against signals at other frequencies.Some bandpass filters require an external source of power and employ active components such as transistors and intergrators and intergated circuits;these are known as active bandpass filters.Other bandpass filters has no external source of power and consist only of passive components such as capacitors and inductors; these are called passive bandpass filters.

VI. NOTCH FILTER

Notch filter is commonly known as band-stop or band-rejection filters. It can transmit most wavelengths with little intensity loss while attenuating light within a specific wavelength range (the stop band) to a very low level. It is mainly the inverse of band pass filters which offer high in-band transmission and high out-of –band rejection. So it can only transmit light within a small wavelength range. So here we use a notch filter after band pass filter in the circuit to get the result more accurate.

VII. POWER SUPPLY

This project is designed to run on a 9v battery sources.

VIII. CIRCUIT DIAGRAM

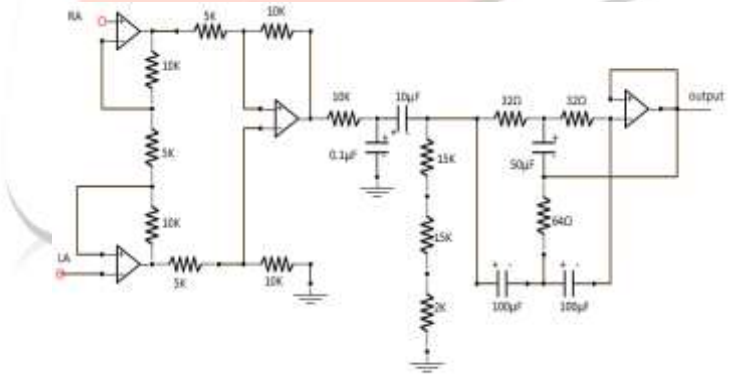

Fig 5 Circuit diagram of heart rate monitor

IX. RESULT DISPLAY

Now ECG form is displayed by the CRO before soldering-

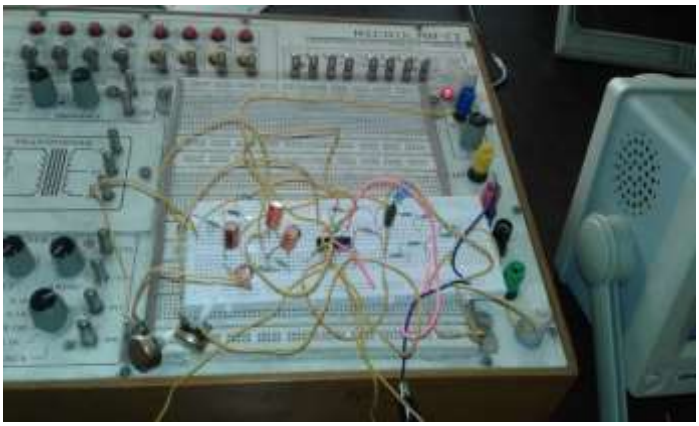

Fig 6 Circuit in breadboard

Fig 7 ECG waveform

After soldering we got the final output.

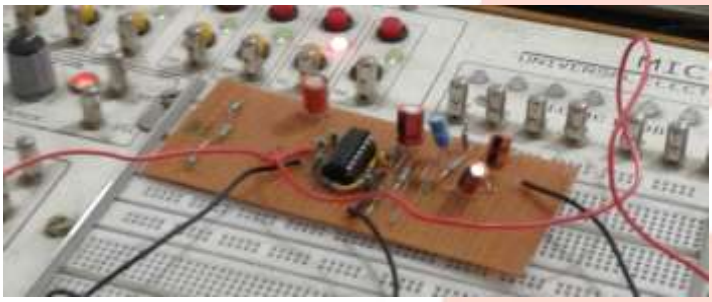

Fig 8 Circuit after soldering

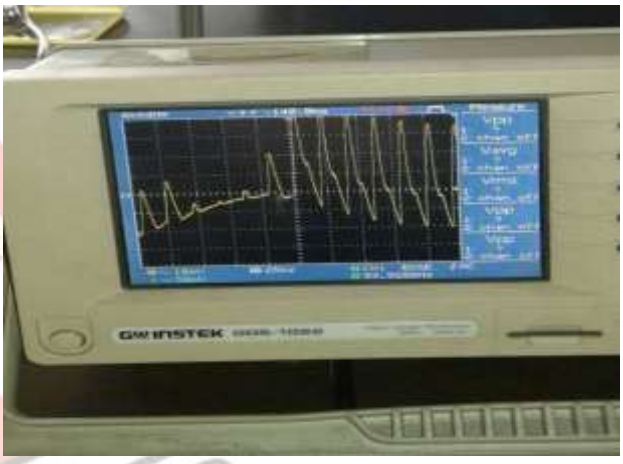

Fig 9 ECG waveform

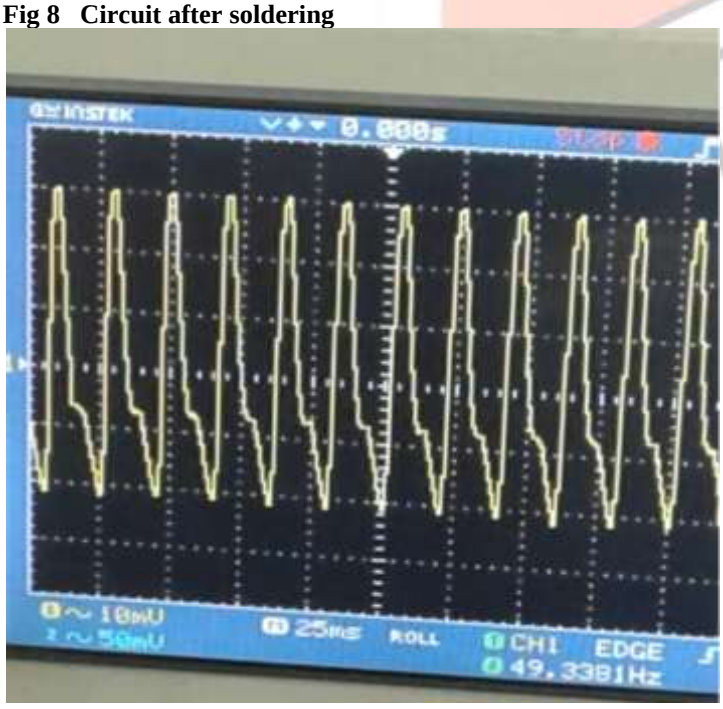

Fig 10 ECG waveform

X. CONCLUSION

So it can easily be concluded that a noise free and undistorted ECG is achieved. The system can be improved by using more specific components such as instrumentation amplifier with better performance. So in this paper the design of the simple and low cost device for ECG monitoring is portable durable and cost effective hence could be used by any person even if not a cardiologist.

XI. FUTURE SCOPE

In future by using ardiuno we can measure the heart beat after getting the graph in CRO.

XII. REFERENCES

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