



Analysis of Emotional Health using ECG Data Acquisition System

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ANALYSIS OF EMOTIONAL HEALTH USING ECG DATA ACQUISITION SYSTEM

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Abstract

Our aim is to provide an intelligent system that detects the variation in heart beat to give the precise output, which is its corresponding emotional health, Using Simplified circuitry component's like Arduino, Raspberry pi-3, AD-8232, ECG Electrode. ECG electrode senses the bio potential signals which are given to AD-8232, which will amplify and filter small bio potential signal in the presence of noise. The processed signal is potted on screen using Arduino-UNO, the signals are extracted from Arduino to Raspberry pi-3 to interpret the variations in emotional health.

Keywords: ECG, Heart, Arduino, Raspberry Pi-3, Mental-states, Emotions.

I. INTRODUCTION

The Human Body is a complex system. In this complex system the heart is the central and most important part involved in pumping blood throughout the body through systematic atrial constriction and dilation. Humans exhibit certain emotions like happiness, Sadness, Anger etc. and the interesting part is that each emotion has a corresponding heartbeat associated with it. It can be detected through several ways of the oldest method is the Aura therapy. In

this therapy a person's emotional status is identified by energies exhibited by the body according to the Seven Chakras. The other Technique of detection is through ECG. ECG also known as Electro-Cardiogram is defined as the measure of electrical activity of the heart. In today's world ECG is system widely used in medical field to get accurate & precise reading

II. LITERATURE REVIEW

As we know the ECG gives the precise electrical output of our heartbeat. Normal heart rate of human beings about 72 BPM.

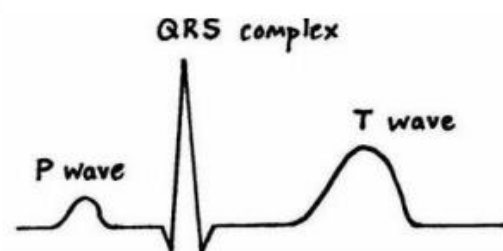


Fig.1 Electrocardiogram (ECG) Signal

Figure.1 shows ECG signal having different waves. The P wave of the ECG waveform is caused due to the contraction (depolarization) of the atrium and QRS complex is caused due to contraction (depolarization) of the ventricles. But T wave is formed due to the ventricular relaxation. A detection of QRS complex is

important to find out R-R interval. Further it will calculate heart rate in Beas Per Minute (BPM). The time duration for one PQRST wave is about 0.8s (Ms.Gauravi.A.Yadav, 2014). The existing ECG system displays only the heartbeat to check the status of the patients' survival. Also it's little costly which leads to the lack of affordability for layman. To counter these issues and to widen the horizon of ECG applications as done by various professionals like Classification of Emotional states from ECG Signals (Classification of Emotional states from electrocardiogram signals: a non-linear approach based on hurst, 2013). This particular model developed by us census the heartbeat, processes it and gives corresponding output signifying the emotional health of the subject.

III.PROPOSED SYSTEM

The main Idea behind this proposed project is to get the emotions of human being with minimal technological and sophisticated components involved is called minimal human work involved this can be achieved by creating a database or we can see your data sheet which has a record of lots of people with their details of emotions and frequency and energy so that for every human being that we can compare it with the database and retrieve its corresponding output closest to the matching value.

Proposed system design by us is unique in its own way has with the components which we are trying to use our modestly cheap for any college student to use and also so they provide output in the least time frame required and with maximum efficiency since we are using the machine learning algorithm it is also we can say one of the cheapest method of getting the ECG of a patient since the traditional message method might cost hefty amount for people in the bottom of the pyramid for them to this might act as a boon do when we say we can

get the emotions out of those ECG ads and added value for them to further we can expand this to get the aura frequency and energy by which we can treat the human body by stabilizing its frequency since human frequencies of healthy body and of disease body is different we can analyse it and treat accordingly

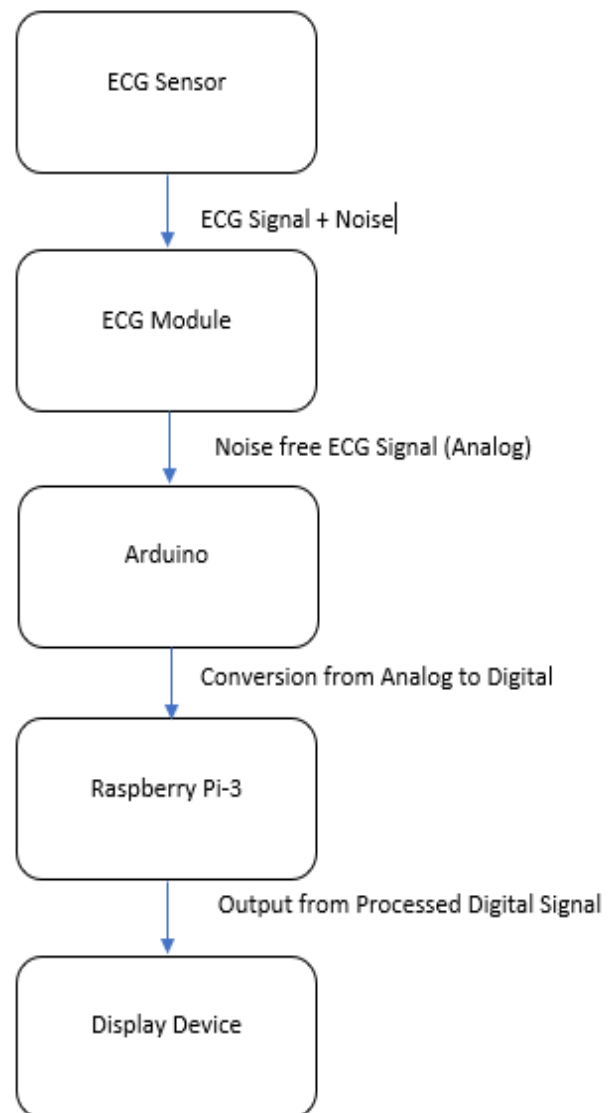


Figure2: the basic block diagram of the detection system

IV. THEROTICAL ASPECT

While preparing the Model for the Detection of ECG important Hardware and Software components had to be mentioned some of which are.

1. AD8232 ECG Sensor:

The AD8232 is basically a simplified circuit chip used for detection of heartbeat. This particular activity is termed as ECG or Electrocardiography. This particular sensor is more cost-effective board used to measure the electrical activity of the heart in simplified form. This electrical activity can be charted as an ECG or Electrocardiogram and output as an analog reading. (Alam, 2020) ECGs can be extremely noisy, the AD8232 Single Lead Heart Rate Monitor acts as an op amp to help obtain a clear signal from the PR and QT Intervals easily.

2. Arduino:

The Arduino is a better platform for students newly developing projects. The Arduino offers more sophisticated learning environment for project makers as it is not completely programmed as traditional circuit we can program as per our desire we can simply use a USB cable. The programming language used in Arduino is simplified version of C++ which is easier to learn for beginners apart from that Arduino provides a standard form factor that makes it more accessible to the user and sophisticated in nature.

Arduino is a microcontroller which helps to plot the analog signal through serial plotter.

3. Raspberry pi 3:

Raspberry Pi is the CPU which helps in processing and can be used to implement Machine learning [11]. The raspberry pi allows processing of only digital signals. Therefore, the analog signals need to be converted into digital signals.

4. Arduino IDE:

The Arduino Integrated Development Environment is a special software application used and testing of Arduino by writing its program. It is used to write and upload programs to Arduino compatible boards. The Arduino IDE uses the program named `avrdude` which first identifies the executable code converts it in machine

language and encodes it in hexadecimal encoder and loads it in loader, the loader loads the encoded program in the Board's firmware.

5. Thonny:

Thonny is an integrated development environment for Python designed for beginners. It supports different ways of stepping through the code, step-by-step expression evaluation, detailed visualization of the call stack and a mode for explaining the concepts of references and heap [10].

6. Implementation of Machine learning:

We have used machine learning algorithms to suppress noise so that the processing becomes more accurate and simpler. Furthermore, ML algorithms are applied to compare the input data with the data collected. A regression method which learns to produce a ratio mask for every audio frequency. Following is the approach to build an intelligence system:

1. Data Collection: Generate big dataset of synthetic noisy speech by mixing clean speech with noise
2. Training: Feed this dataset to the DNN on input and the clean speech on the output
3. Inference: Produce a mask (binary, ratio or complex) which will leave the human voice and filter out noise

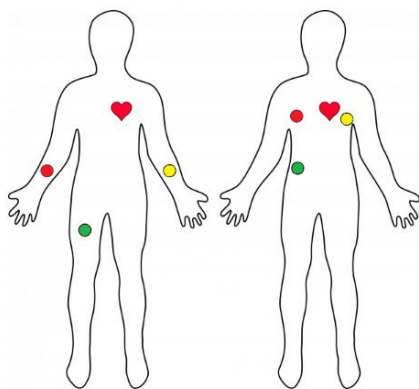
The angry or happy conditions were a series of standardized steps (step fifteen of the happy condition: "Stooge replaces the hula hoop and sits down with his feet on the table. Shortly thereafter the experimenter returns to the room.") that were intended to influence the emotional state of the participant. The participant then had to complete a questionnaire about how they were feeling [6]. They found that not only was the emotional state of the participant influenced by the apparent emotion of the confederate (and more so in the epinephrine condition), but that the participants also

attributed that emotion to events entirely unrelated [6] to the situation they were currently in. The angry or happy conditions were a series of standardized steps (step fifteen of the happy condition: “Stooge replaces the hula hoop and sits down with his feet on the table. Shortly thereafter the experimenter returns to the room.”) that were intended to influence the emotional state of the participant. The participant then had to complete a questionnaire about how they were feeling [6]. They found that not only was the emotional state of the participant influenced by the apparent emotion of the confederate (and more so in the epinephrine condition), but that the participants also attributed that emotion to events entirely unrelated [6] to the situation they were currently in.

V.WORKING MODEL

By understanding Theoretical Aspect, the practical implementation can be easily done. As we mentioned the aim of our model is to Detect the Emotion Health of the Body by sensing the heartbeat and making correct decision

1. ECG electrodes are placed at specific locations on the body according to the color coding as Mentioned in figure.



2. ECG electrodes records the electrical currents. The electrical currents interpreted by the Heart Rate Monitor (AD8232).

3. AD8232 module eliminates the noise added in the electrical signals and amplify the small bio-potential signals. It helps to obtain a clear signal from the PR and QT Intervals easily. The heart rate monitor is connected to Arduino as following:
4. Using Arduino UNO, the extracted signal in plotted on the screen and can be visualized in Serial Plotter (in the Arduino software).
5. The data from Arduino is fed to Raspberry Pi 3 for further processing. Since Raspberry Pi works with digital signal, here Arduino is acting as analog to digital converter.
6. In Raspberry Pi, the processing of the signal in done via Machine Learning.
7. Machine learning is implemented using Python language. Relevant data is searched through the data-sheet and the output is predicted and displayed on the monitor.

Board Label	Pin Function	Arduino Connection
GND	Ground	GND
3.3v	3.3v Power Supply	3.3v
OUTPUT	Output Signal	A0
LO-	Leads-off Detect -	11
LO+	Leads-off Detect +	10
SDN	Shutdown	Not used

This sophisticated component will help in getting the desired results which is in this case emotions of human body and the also from it we can calculate the energy and the frequency all of these are correlated with each other. The main approach here is also to get a database that is giving app to build one database which will have thousands of data at least of different human along with their different emotions so that if we detect human then it will match in output with those in the database to give final output which is in this place its corresponding

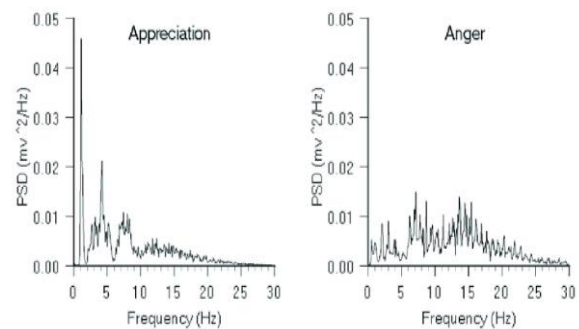
emotions. This process of detection of ECG and getting the emotional status of human being is pretty underrated in the manner with which approaches because we use the components which are pretty basic and yet they can give sophisticated output by getting the desired output we can link it in future to get the ore of the patient horror itself is a huge bird as it deals with the energy of the human body and it does involve the chakras so by

Generating desire frequency, we can calculate the aura through which we can treat the patient by the process of frequency healing which was pretty underrated to it was discovered by some scientist name unknown in world war 2 got over it was crushed by hospitals and doctors and it cost dangerous their business since if this particular method came into action the use of doctors and other hospital facilities wouldn't be needed anymore. although there are significant progress and development made in this field like there as research papers published by various universities and scientist to detect the emotions from ECG by using various complex devices and many of them even succeeded in their approach the thing that makes our approach unique from there as is that we are using simplified and sophisticated components like we mentioned earlier which will help us to reach at the desired output with minimal human efforts the project of ours will gets kicked off as soon as will get grant from college.

VI. PROPOSED OUTPUT

After Implementing the Circuit, the result will be obtained in a Graphical Manner. We will collect samples of heartbeat in particular emotions from various people, after getting sufficient data we'll be able to develop a Datasheet with standardised value of Emotions, Frequency and

Heartbeat. The Datasheet will be uploaded in Raspberry Pi since it will process and make decisions. While testing the measured data will be compared with the Datasheet using Machine Learning Algorithm to get live result of the Heartbeat along with its The Datasheet will be uploaded in Raspberry Pi since it will process and make decisions. While testing the measured data will be compared with the Datasheet using Machine Learning Algorithm to get live result of the Heartbeat along with its Corresponding Emotional Health as output. A sample form of the graph is given below Generating desire frequency, we can



calculate the aura through which we can treat the patient by the process of frequency healing which was pretty underrated to it was discovered by some scientist name unknown in world war 2 got over it was crushed by hospitals and doctors and it cost dangerous their business since if this particular method came into action the use of doctors and other hospital facilities wouldn't be needed anymore. although there are significant progress and development made in this field like there as research papers published by various universities and scientist to detect the

The emotion heart sound data were further processed as follows:

1. Each sample of heart sounds were 300 seconds, and was divided into 2 segments; thus, 48 samples in the relaxed emotion were divided into 96 segments, 16 samples in the

happy emotion were divided into 48 segments, 16 samples in the sad emotion were divided into 48 segments, 16 samples in the angry emotion were divided into 48 segments.

2. Pre-processing of emotional heart sounds filtered out the data interfered by noise, such as laughter, crying and talking. Then, we accurately segmented the heart sound that passed preselecting, and only the heart sound signals with a segmentation accuracy of 100% remained in the database. In addition, to ensure the independence between each emotion heart sound, only one segment of a heart sound from the same sample eventually remained. Therefore, the emotion heart sound database eventually provided 43 segments heart sound in the relaxed emotion, 21 segments heart sound in the happy emotion, 18 segments heart sound in the sad emotion, 14 segments heart sound in the angry emotion for [7] a total of 96 segments.
3. We retained the corresponding 96 segments of the synchronized acquisition ECG signals for comparison. This is a domain where they have been researching experiments done but not what in sophisticated manner and also this is a domain which has wide scope in medical and scientific field with benefit for the human in all respects. And also one of the important tractor is from this ECG is we can detect the frequency of the human body and thereby determines its power and energy which will help us to understand the disease is much better and help in treating the diseases by changing the frequency of human body

VII. CONCLUSION

The System Displayed calculates the ECG and the Emotional state associated with it. By obtaining accurate data we will have a clear vision about the Emotional Health of the person and also by looking at the variations in frequency we can predict any upcoming diseases. This is a domain where they have been researching experiments done but not what in sophisticated manner and also this is a domain which has wide scope in medical and scientific field with benefit for the human in all respects. And also one of the important tractor is from this ECG is we can detect the frequency of the human body and thereby determines its power and energy which will help us to understand the disease is much better and help in treating the diseases by changing the frequency of human body

VI. ACKNOWLEDGEMENT

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