Section A-Research paper
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UNIQUE CARDIAC CHAMBER

Dr. Gajanan P. Dhok
Sipna College of Engineering and Technology
gajanandhok432@gmail.com

Abstract:

This article demonstrates a practical and innovative cardiac chamber that is helpful for patients who suffer from high heart rate, slow heart rate, and low diastolic blood pressure.
The facility of a computerized electrocardiogram (ECG) machine for measuring heart rate as well as automated blood pressure measurement gear is designed inside a closed chamber with tied-off air vents.

In order to construct and validate the classifier, real-time ECG data are utilized throughout the process. An artificial neural network is utilized in order to carry out the automatic analysis. Automatic detection requires the completion of the three processes listed below in sequential order: 1) The identification of R-R intervals 2) The Calculation of the Heart Rate, and 3) The Classification.

Following the completion of an ECG analysis on the patient while they are positioned within the cardiac chamber, the appropriate treatment is administered to the patient based on their heart rate and blood pressure. This treatment serves as an emergency first-line preventative measure for patients suffering from arrhythmia. In the one-of-a-kind cardiac chamber, it is feasible for the patient's heart rate and blood pressure to change as a direct result of the therapeutic intervention being carried out on the individual. This study effort is brought to a successful conclusion with the invention of a unique and effective cardiac chamber that is capable of automated identification of cardiac arrhythmia and the execution of an effective therapy for individuals suffering from arrhythmia.

Keywords: *Electrocardiogram, Neural Network, Training, Learning Parameter, Oxygen Therapy, and Colour Therapy*

I. INTRODUCTION

The majority of these fatalities are caused either by an abrupt cardiac arrest or by a severe arrhythmia of the heart. As a direct consequence of this, the diagnosis of cardiac arrhythmias may now be performed mechanically, either at the patient's bedside or in ambulatories. The ECG develops into an increasingly important component of the whole risk assessment procedure. In order to overcome the challenges that are posed by the clinical environment, one strategy that has

the potential to be helpful is the utilisation of computer-based diagnostic technologies. It has been demonstrated that incorporating artificial neural networks into clinical care can be helpful in providing physicians with assistance with decision-making. An artificial neural network is capable of capturing the basic information that enables a clinician to function as an expert even when presented with a problem that is exceedingly complicated [1]. This information is essential for the clinician to have in order to provide optimal care to patients. The color therapy has become a breakthrough treatment because; colour therapy is noninvasive, cost-effective, and risk-free alternative for improvement in health. Therapy has quickly become one of the most effective and natural treatments for disorder. This therapy is a great idea because it is natural and does not require you to put any medication into your body.

To be able to pull oxygen out of the air and deliver it to their cells, where it can be used for vital metabolic activities, people need to have the ability to do so in order to continue their species. Although it is an inefficient process, certain cells are able to generate energy in the absence of oxygen (a process known as anaerobic metabolism). Other organs are composed of cells that are only capable of producing the amount of energy required for living through the process known as aerobic metabolism when there is a constant supply of oxygen present. There is a wide range of resistance among tissues to the effects of anoxia (loss of oxygen). The most sensitive parts of the body are the brain and the heart. At first, a lack of oxygen will have an effect on organ function, but after some time, the damage will be irreparable, and it will be difficult to revive the patient.

II. MATERIALS AND METHODOLOGY

This research work proposes Conjugate gradient algorithm for automatic detection, which required fewer time for convergence than simple Backpropagation algorithm and suggesting most effective color light therapy and effect of oxygen in air on heart rate variability, which is emergency first line healing from instant arrhythmia attack and patient will get sufficient time to reach to expert cardiologist.

Real time ECG signal is imported in MATLAB its RR intervals is extracted and convert into appropriate heart rate in bit per minute (BPM). The extracted heart rate is sent into the neural network as an input so that it may be analysed further.

The analysis and classification of the input data is carried out by a neural network. Heart rate is considered normal when it is between 60 and 100 beats per minute (BPM), high when it is more than 100BPM (also known as tachycardia), and slow when it is less than 60 BPM (also known as bradycardia).

A red light with a high intensity, a blue light, and an oxygen supply are all designed to be included in an air-tight cardiac chamber. The individual who is positioned within the chamber is illuminated with red and blue light, and their with the assistance of an automated blood pressure equipment as well as an electrocardiogram (ECG) machine, On the patient, there is ongoing monitoring of both their heart rate and blood pressure to ensure that they are in good health. The length of time that a colour shines directly on a person may vary depending on their ability as well as the characteristics of their physical bodies. Percentage of oxygen in air is measured with the help of oxygen sensor, normal percentage of oxygen in air is around 18 to 20%. Percentage

of oxygen inside the cardiac chamber is increase by providing extra oxygen and its percentage is measured Both the subject's heart rate and blood pressure are being measured concurrently while they are contained within the chamber.

The systolic and diastolic blood pressures, as well as the variability in heart rate, are going to be measured during the course of this investigation in order to facilitate the evaluation of the impact that oxygen and colour therapy have on these parameters.

III TRAINING AND TESTING OF NEURAL NETWORK

In light of the fact that we intend to arrive at a diagnosis of arrhythmia illness, we collect several ECG data samples for the purpose of teaching and validating the artificial neural network. The newly constructed database has been divided in half, with one section devoted to the training of an artificial neural network, while the other will be dedicated to evaluating the network. In order to make a correct diagnosis of an arrhythmia disease using an artificial neural network, the following values of training parameters were used during the training of the network:

Progress displays occur 100 times each period. The maximum number of training epochs is 10,000. Goal for the mean squared error is 0.001 and the learning rate is 0.000001. When training a neural network, the Tan-Sigmoid and Purelin activation functions are chosen as the non-linear activation functions to use.

For Input layer

$$\delta (X_i^k) = X_i^k \qquad i=1\text{----}n$$

$$\delta (X_o^k) = X_o^k = 1$$

Where is the " X_i^k " represents the i-th component within the input vector. "X_k" that was supplied to the network, and $\delta (X_o^k)$ represents the bias neuron input layer iteration index signal. For hidden layer

$$Z_o^k = \sum_{i=0}^{n} W_{ih}^k \, \delta (X_i^k) = \sum_{i=0}^{n} W_{ih}^k \, X_i^k$$

$$\delta (Z_h^k) = \frac{1}{1+ e^{-Z_h^k}} \qquad h=1\text{-----}q$$

$$\delta(Z_o^k)=1$$

"W_{0h}^k" biases in the hidden neurons δ is bias neuron signal is from the hidden layer that is used for the output layer. "q"

$$Y_j^k = \sum W_{hj}^k \, \delta (Z_h^k)$$

h=0

j=1-------p

$$\delta(Y_j^k) = \frac{1}{1+e^{-Y_j^k}}$$

Where" W_{0j}^k" are the output neurons' biases.

IV CONCLUSION

Various algorithm and methods are developed for ECG analysis most of them are not real time so it is not possible to implement them for clinical practices but we are proposed the real time ECG signal analysis using ANN which can be easily implemented for clinical practices and help the clinician in diagnosis and overcome the difficulty of intensive computational time. An strategy that dynamically changes the gradient search direction is presented as a fast learning algorithm for neural networks. This method increases the effectiveness of back propagation neural network methods for training. Novel of this research work is not only the effective analysis of heart rate variability using color therapy implementation but suggesting the effect of colored light therapy before a person is subjected to it, by measuring its physical body parameters like blood pressure, Body mass index, trunk fat, visceral fat and body fat%.

The findings of the current research indicate that inhaling oxygen concentrations that are greater than 21 percent results in a significant slowing of the pace at which the heart is beating in the majority of individuals.

We are proposing red light-colored therapy for the person with low heart rate blue light therapy for patient suffering from low diastolic blood pressure and oxygen therapy for the person with high heart rate. At the same time, we are proposing unique chamber having all these facility for cardiac disorder patient which may be helpful for settling heart rate and blood pressure.

One way of looking at this body of effort in the field of research is as a baby step towards the creation of a technology that will be of great benefit to society.

There is a possibility that the effectiveness of each and every module that is now being deployed can be enhanced. The following is a list of some of the areas in which further work may be done in the future to make the existing plan more successful.

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