An exploratory study on the viability of ECG Based application on Deducting Arrhythmia Deduction

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Abstract: Automatic ECG classification is becoming a more common method in medical diagnosis and treatment. MATLAB was used to carry out the analysis proposed in this article. It is to classify that the ECG signals’ normality and abnormality are focused and the heartbeat is causing Arrythmia have been highlighter in this paper. The device called Electrocardiogram (ECG) has been a test which is to be done on the heart to see where there is Symptoms in the heart functioning. This paper contains the following details. To summarize, after collecting and filtering the ECG signal, morphological and dynamic features were extracted from the signal, which were then used in a two-step classification process.

Keywords: MATLAB, Signals, QRS Complex system, Cardiac arrhythmia

1. INTRODUCTION:

The ECG, a valuable technique invented by Willem Einthoven, has been used in clinical practice for over a century and is the primary instrument used to record the electrical activities of the heart. The electrocardiograph (ECG) calculation is now a part of the internal investigation carried out by physicians, and the 12-lead ECG configuration is one of the most widely used, and we will focus on the Lead-II ECG Configuration in this article. Since it is similar to the cardiac axis (the overall direction of electrical movement), it is the best lead for detecting cardiac arrhythmias.

Design of the Study:

This study is of Exploratory in nature. Since it gets used to find out the deduction of heart functioning and the disease due to its volatile beat rates. It is the first of its kind in nature. This paper is pretty much focused on the coming out with the device which can deduct this disease.

Objectives of the Study

- To Study ECG Signals for deducting Arrhythmia Disease

PROPOSED SYSTEM'S METHODOLOGY
Step 1: An ECG signal must be read and plotted before it can be processed. The MATLAB Environment, which is a powerful tool, was used to complete our project. We must use the formula below to initialize the signal and delete the base and gain if it is raw, as it normally is unless it comes from a filtered database.

Step 2: To obtain diagnostic information from the ECG signal, the feature extraction and evaluation stages are used. The aim of feature extraction and evaluation is to figure out what:

- Features of Morphology
- Characteristics of a Dynamic System

The scale, shape, and structure of the ECG signal, as well as fiducially points like peak points, segments, and interval durations, are all determined by morphological features. RR (Reserve Reserve)

i. Since R is the largest amplitude and sharpest component in a Normal Lead-II ECG Signal, R peaks were detected by obtaining local minima greater than a deceptively defined threshold, which was used to estimate amplitudes, temporal positions, and length.

ii. To detect the QRS Complex, the Pan Tompkins Algorithm was used, which involved
First applying a band pass filter to the ECG, then differentiating the signal to obtain slope information. The signal was squared before moving window integration was used to obtain waveform feature information, making all of the signal values positive. The obtained signal was threshold after moving window integration. A QRS peak is described as a peak that exceeds the threshold during the first phase of analysis (Complex). The Q and S peaks were defined by the magnitude, location, and length of the first local minimum to the left of the positive R wave and the first local minimum to the right of the positive R wave, respectively.

It was able to classify the P and T peak points in the ECG signal, as well as their Amplitude and locations, using the Moving Window Integration technique and the Threshold Detection process.

RR Rate = 60 Interval (Avg)
Heart rate variability is the physiological phenomenon of a difference in the time period between heartbeats

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(HRV) = \frac{(HRV_{\text{max}} - HRV_{\text{min}})}{100} \text{ I d HRV} = \frac{(HRV_{\text{max}} - HRV_{\text{min}})}{100} \text{ I d}
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Since the waveform boundaries are sensed, the onset and offset of any wave can be measured. This function can be used to find the segments and intervals in an ECG. The
segments that were tested were PR or PQ segment and ST segment. Intervals tested included PR or PQ, QRS, and TP.

**ANALYSIS AND RESULTS**

- The ECG Analysis determines that the signal has a Regular Rhythm and that all Waves, Segments, and Intervals values are within the normal range, but the rate observed in such signals is less than 60 BPM. The rate is less than 60 beats per minute (47 at rest), which is below the normal range. This atrial fibrillation represents BRADYCARDIA. After processing, the statistics in the table above are the averages of over 80 samples. A value or function that does not meet the requirements and has a haphazard form with no fixed regularity or rhythm is defined as an irregular ECG. As a result, waveforms that do not meet the following criteria may be classified as abnormal.

- The ECG Analysis concludes that the signal has a Regular Rhythm and that all Waves, Segments, and Intervals values are within the normal range, but that the rate is greater than 60 BPM. The heart rate is greater than 60 beats per minute (133 at rest), which is outside of the normal range. TACHYCARDIA has this level of severity.

- The ECG Study concludes that it lacks a natural rhythm and that many of the Vibrations, Segments, and Intervals are either absent or immeasurable after examining ten related signals. The signal's transmission rate. According to the literature review, the QRS Complex time is 0.0842s, and few features of a Chaotic Rhythm are indistinguishable. Following the ECG Analysis.

- The ECG Study concludes that it has a Regular Rhythm and that the Waves, Segments, and Intervals can be seen after analysing ten related signals. Figure 1 depicts the resting pace. The number 21 has a BPM of 84. Since it has a bifurcated P Wave, this is most definitely P MITRALE, an ECG signal that is OUT OF BOUNDS.

**CARDIAC ARRHYTHMIA IN THE ECG SIGNAL**

It is all known that heart disease is one of the leading causes of death worldwide, and that an ECG is the most reliable way to detect any defects in cardiac function or tissue damage. Due to heart anatomy, location, age, height, relative body weight, chest configuration, and a variety of other variables, ECGs differ from person to person. The morphology of a normal sinus rhythm refers to the morphology of a normal sinus
rhythm. Cardiac arrhythmia is a disorder, disturbance, or abnormality that disrupts the myocardium's usual activation sequence, resulting in an irregular pulse or erratic heart rhythm that may cause permanent heart harm. Arrhythmia can occur in a healthy heart with no consequences, but it can also indicate a severe issue that can result in a stroke or premature cardiac death, as well as scarring.

ADVANTAGES OF OUR PRODUCT OVER OTHERS

1. COST EFFECTIVE
   - Slightly higher initial cost but cheap future modification cost.

2. SOFTWARE UPDATING
   - Automatic Software upgradation

3. POWER SOURCE
   - Low Power, High Durability

4. REAL TIME MONITORING
   - Compact size and High Accuracy Readings

5. RECTIFY HUMAN ERRORS

VISION AND MISSION

- Vital care aims to provide better healthcare solutions to mankind and to be a company that is fully trusted by the customers.
- To offer a dedicated range of reliable medical device of high quality, using our knowledge and technologies to meet specific needs.

MARKETING FEASIBLE ANALYSIS

ABOUT THE PRODUCT

- Our product is designed to measure vital parameters
- It is a watch with small finger cuff
- Non invasive
• Continuous monitoring
• Portable device

PROMINENT FEATURES

• Wireless communication and Remote monitoring
• Configurable voice prompt or audible alarm
• Integrated PDF reports through app
• Graphical history of vitals
• Long battery life
• Accurate parameters
• Low cost
• 24/7 customer care

MARKETING PLAN

• Reach out to all healthcare organizations
• Social media campaign
• Internship opportunities to biomedical students
• Conduct science fairs
• Due to covid-19, many people are not willing to go to hospitals for check-ups. Since our device is very user friendly they can use it in their homes itself and can sent the results to doctors in pdf forms.
• As a preliminary process this product is to be explained and introduced between MBBS students of final year grade and then subsequently introduced to Deans and Doctors.

APPLICATION (APP)

• Can be downloaded through the link provided on the kit
• Unique product key for every user

➢ Major Customer Groups
1. Army

2. Senior citizens/ General users

3. Hospitals

4. Schools/ Fitness centers/ IT Company/ Mall

FINANCIAL Plan for Investing on the Device

COST OF PROJECT

| Land                          | 40.88 |
|-------------------------------|-------|
| Technical Civil Work          | 30.20 |
| Plant and Machinery           | 50.38 |
| Supporting Equipments         | 35.65 |
| Contingency                   | 7.68  |
| Preliminary and Pre-operative expenses | 4.33 |
| Operating Capital             | 2.15  |
| **Total Cost**                | **171.27** |

CONCLUSION

The MIT-BIH database (also known as the MIT-BIH ARR DB) is an unbalanced database for presenting literature results. On the other hand, authors who use the intra-patient system have overlooked this. Writers who used a more practical approach and didn't mix heartbeats for planning and research (inter-patient scheme) struggled to produce successful results for the SVEB. As a result, some proposed approaches in the literature do not adhere to a more objective evaluation methodology. The size and diversity of databases used to construct methods, according to machine learning experts, has a greater impact than the learning algorithm and/or techniques used.

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