Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 4, 2021, Pages. 9461 - 9466
Received 05 March 2021; Accepted 01 April 2021.

Robust Heart Disease Diagnosis and Analysis System Using Data Mining

[1]Dr.M.Parameswari, [2]Dr.S.Balaji , [3]Dr.D.C.Jullie Josephine, [4]Mrs.D.SterlinRani, [5]Mrs.J.M.SheelaLavanya, [6]Dr.D.C.Joy Winnie Wise

[1]Kings Engineering College
[2]Panimalar Engineering College
[3]Kings Engineering College
[4]Kings Engineering College
[5]Kings Engineering College
[6]Rajalakshmi Institute of Technology

Abstract:

Coronary illness is the main source of death everywhere on the world in the previous ten years. A few specialists are utilizing measurable and information mining devices to help medical services experts in the determination of coronary illness. Utilizing single information mining strategy in the finding of coronary illness has been extensively explored demonstrating satisfactory degrees of precision. As of late, analysts have been examining the impact of hybridizing more than one procedure demonstrating upgraded brings about the finding of coronary illness. Nonetheless, utilizing information mining strategies to recognize a reasonable treatment for coronary illness patients has gotten less consideration. In this paperwork, developing fast and accurate heart disease detection through pulse rate using various comparison of clinical pulse rate which is recommended by experts is focused. Blood flow(BF) is recorded by the wrist pulse detector(WPD) then the recorded signals can be taken as input to analyze the current condition of the heart and the inner posterior diameter of the arteries and veins on the (heart surface). The data is analyzed and clustered using k-means algorithm to produce exact situation of heart. This data will be compared with the clinical data which we collected from experts and stored in a separate database. This process can be done by data mining methodology. The levels of synchronization are taken in different parts of the generated pulse rate; various constraints are set in between the pulse rate. Using the analyzed data, remedy engine (RE) will provide result to the victim to ensure that the victim has kind of heart disease or not.

Index terms:

Heart diseases detection, Data Mining, Wrist Pulse Detector (WPD), Remedy Engine (RE)

I. Introduction

According to our survey, it is very rare to find heart disease in an earlier stage. Due to this we are losing number of lives every year. Approximately in India, 2 million peoples were dying every year. In 2019, 2.1 million people were dead at the age of 30-69 years, 1.3 million cardiovascular deaths, 0.9 million (68.4%) were caused by coronary heart diseases, 0.4 million (28.0%) by stroke. The types of heart diseases are coronary heart disease, heart valve disease, heart failure, Arrhythmic, ischemic, Stoke etc. These diseases cannot be able to find in the starting stage only through symptom identification these diseases can be found in the critical stage of attack that leads to death. To overcome this major loss, we are introducing a user-friendly application with a wearable device to diagnose heart rate in day to day living process, by taking the pulse reading, the algorithm can analyze the complete rhythm of the person heart, if there is any sort of abnormal rhythm found then the application shows the alert message about the current condition of heart and it will suggest remedies according to issue shown in the analysis process of an individual user data which was collected by wrist pulse sensor device.

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 4, 2021, Pages. 9461 - 9466
Received 05 March 2021; Accepted 01 April 2021.

II. Related Work

System is designed to analyze the pulse rate of the individual person using a wearable device; wrist pulse sensor (WPS). In [1], a wearable device is used to detect disease in easy form. The data taken from the WPS will immediately store in the database, then from there it is analysed by heart rate estimation algorithm [1], estimate the frequency and bandwidth of the analogue sequence of heart rate. PC based clinical choice emotionally supportive networks (CDSSs) have been proposed to address such inadequacies and have essentially improved clinical practice over the previous decade. Notwithstanding, they stay restricted to center and clinics, and don't exploit tolerant information that are acquired consistently utilizing wearable clinical sensors (WMSs) that can connect this data hole. WMSs can gather physiological signs from anybody anyplace whenever. In this way, they can possibly introduce a time of inescapable medical services [2]. In [3], Various strategies have been proposed for assessing normal pulse utilizing photoplethysmography (PPG) during active work, defeating the huge impedance that movement causes in PPG follows. We propose another calculation structure for extricating momentary pulse from wearable PPG and Electrocardiogram (ECG) signs to give a gauge of pulse fluctuation during exercise.

An electronic stethoscope with an advanced sign handling unit could be a minimal effort and effectively applied strategy for finding of CAD. The ebb and flow study is a quest for heart sound highlights which may recognize CAD. Strategies: Nine distinct sorts of highlights from five covering recurrence groups were acquired and examined utilizing 435 accounts from 133 subjects. The highlights of the various kinds were moderately emphatically related. Utilizing a quadratic discriminant work, different highlights were consolidated into a CAD-score is discussed in [4].

Finally, [5] proposed AI strategy gives the clinicians a quick and exact analysis device to decipher MCG information, boosting its acknowledgment into facilities. Besides, the attractive shaft attributes uncovered by the technique shows to be identified with ischemia area, introducing the chance to noninvasively find ischemia.

III. Heart Diagnosis System Architecture

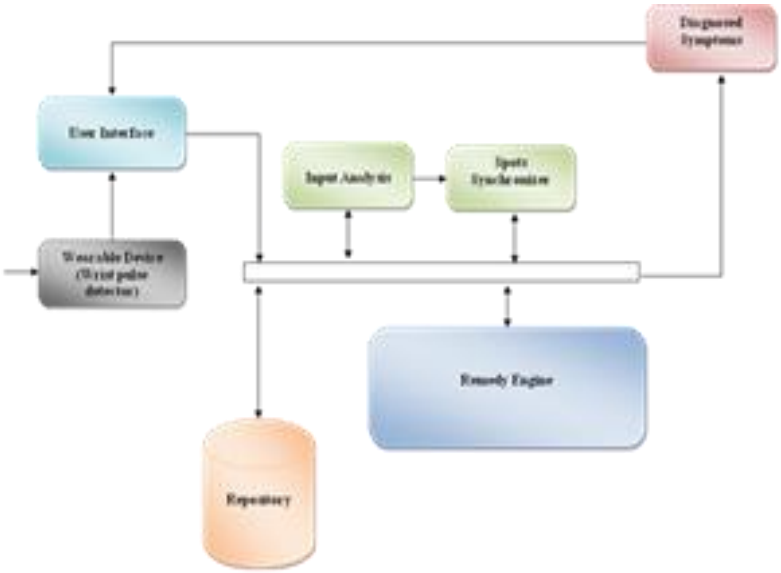


Figure 1. Heart Disease Diagnosis System

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 4, 2021, Pages. 9461 - 9466
Received 05 March 2021; Accepted 01 April 2021.

Figure 1 describes signal will contain some noise to reduce the noise common wiener filtering tool is used, where it separates the accurate data from noisy process to get clear diagnosing report. In that diagnosed report algorithm will create various spots, then the spots will be made into clusters using k-means algorithm. The cluster will define the source of different symptoms of various heart diseases if it exists in the pulse rate. Then the application will produce the detailed report from the analysis, after that process the report and the stored clinical data will be compared and then accurate or exact remedy will be produced to the user about the condition of heart and basic resolution for respective disease if exist. Finally, we are making it possible by giving remedies without consulting doctors in an earlier stage of heart diseases which will reduce chance of losing lives as shown in figure 2 & 3.

A. User Interface:

In figure 4 user interface module there will be login and registration phase to store user information as shown in (Figure 1) and for simple authentication process. User information like name, age, gender, blood group, height, weight. etc.

B. Wearable device (WPS):

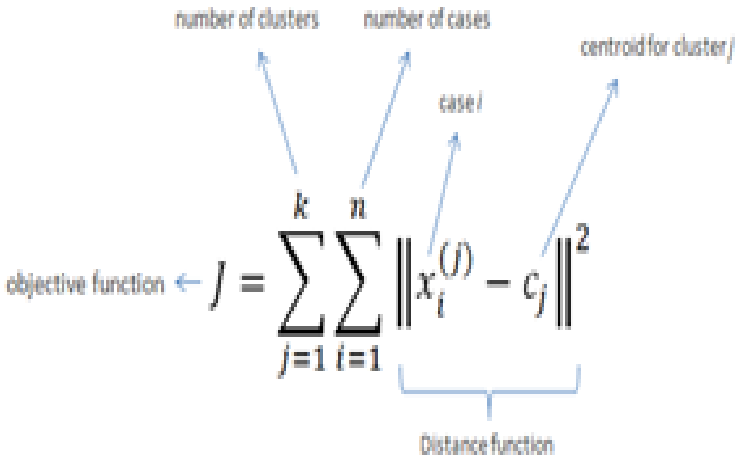
Wrist pulse sensor (WPS) is the device which gives us pulse reading in analogue and digital form, input data will be taken and it will be stored in the database down the table of current user information for further process in figure 5.

C. Input analysis:

Stored pulse reading from wrist pulse sensor (WPS) will be analysed using various algorithms like heart rate estimation and k-means which is able to find the possibility of disease occurrence for the person.

K-means: Use of k-means algorithm is to cluster the spots which generated by the system throughout the pulse rate. Clustering is done by grouping the nearest points into a single form of cluster and giving a unique identification for that cluster. Many clusters can be formed in a single pulse reading. Increased number of clustering will increase the source of acknowledging symptoms in the heart rate. Before clustering the spotted points will be plotted into a graph of X-axis and Y-axis, different symbols can be used to cluster the spots. After clustering the clustered data will also be stored in the current user database table in figure 6.

Objective function is:



Where,

J- is the objective function of clustering k and n are the number of clusters and number of cases respectively.

cj- is the centroid for cluster j.

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 4, 2021, Pages. 9461 - 9466
Received 05 March 2021; Accepted 01 April 2021.

xj- is case j, by calculating the distance between the xj and ci cluster is formed.

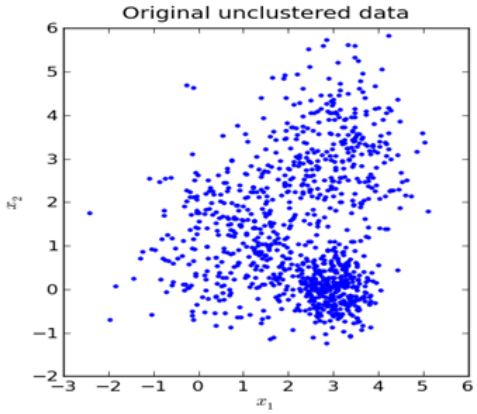


Figure 2. Unclustered Data

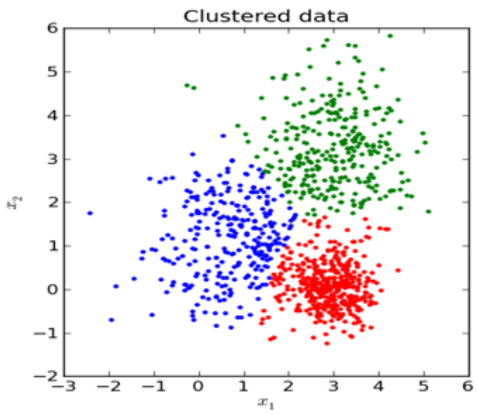


Figure 3. Clustered Data

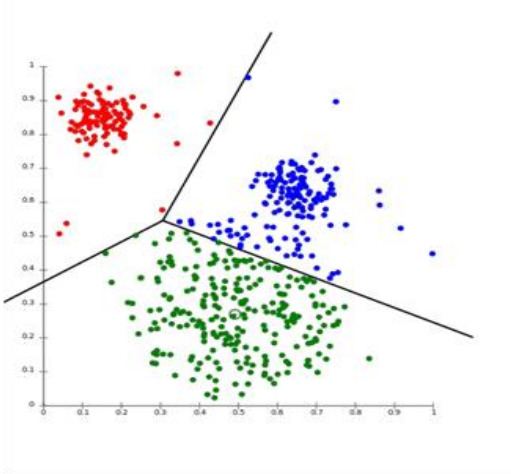


Figure 4. Spot Synchronizer

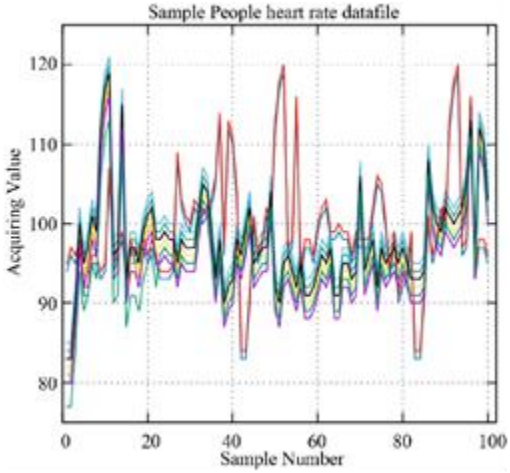


Figure 5. Heart Beat Analysis

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 4, 2021, Pages. 9461 - 9466
Received 05 March 2021; Accepted 01 April 2021.

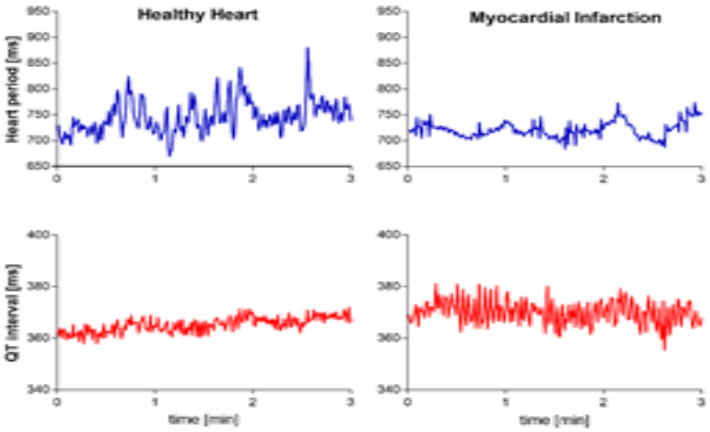


Figure 6. Sample Heart Rate Data

When the synchronization of data matches the clinical data then it directed to the next process of getting remedies, if the data doesn't match the clinical data then again started to compare the finest spot to identify the symptoms or any abnormal type for rhythm of heart rate. The spotted points in the graph will be different in colour for easy identification process for user from the user interface.

D. Data Mining:

Data mining is the process of mining accurate data from the database to produce result reports. Mining process are data selection, data pre-processing, data mining, post processing, analysed data. Analysed data is selected, then it is pre-processed to form a data set or cluster or key data to start the mining process. After completing the mining process, the data from the data mining module will be post-processed to make an accurate outcome of result, then it evaluates and produce the analysed data to show up remedies as in figure 7.

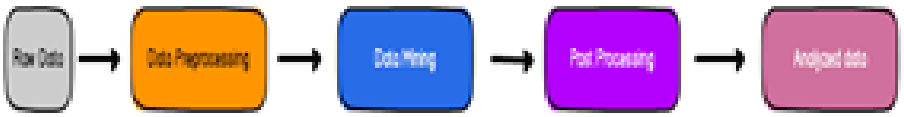


Figure 7. Data Mining Process

E. Remedy Engine (RE):

Most of the heart disease can be cured by food habitat, so that the remedy engine (RE) will contain all the food information. What food should be taken for which symptoms; Remedies will be stored in the database as datasets. In order to produce remedies, first the diseases should beclassified as a set along with the food descriptions. Analysed data from the spots synchronization (SS) will be compared with the dataset and remedy engine (RE) will produce the accurate food habitat to reduce the cause of major attacks. Remedy Engine will contain the precaution for various heart diseases, like Stroke, Coronary heart disease, Rheumatic heart disease, congenital heart disease, Aortic aneurysm and dissection, Peripheral arterial disease, Other cardiovascular diseases, Deep venous thrombosis (DVT)

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 4, 2021, Pages. 9461 - 9466
Received 05 March 2021; Accepted 01 April 2021.

and pulmonary embolism, Other factors that can damage the heart and blood vessel system. All detailed information about the above heart diseases will be stored inside the database. Diagnosed system: In this all the diagnosed da/ta will be collected from the remedy engine (RE) and it will display the report to the user through the user interface.

IV. Conclusion

In this paperwork, analysing and diagnosing heart rate at initial stage will reduce any kind of heart diseases possibility and also, we can give remedy for a particular type of disease. As this is possible, we can able to reduce death rate due to various type of heart diseases and heart attacks, which is one of the major issue throughout the world to reduce loss of human Life.

References:

[1] Temko, "Accurate Heart Rate Monitoring During Physical Exercises Using PPG," in IEEE Transactions on Biomedical Engineering, vol. 64, no. 9, pp. 2016-2024, Sept. 2017, doi: 10.1109/TBME.2017.2676243.

[2] Hongxu Yin, Student Member, IEEE and Niraj K. Jha, Fellow, IEEE, A Health Decision Support System for Disease Diagnosis based on Wearable Medical Sensors and Machine Learning Ensembles.

[3] Jarchi D, Casson AJ. Towards Photoplethysmography-Based Estimation of Instantaneous Heart Rate During Physical Activity. IEEE Transactions on Bio-medical Engineering. 2017 Sep;64(9):2042-2053. DOI: 10.1109/tbme.2017.2668763.

[4] S. E. Schmidt, C. Holst-Hansen, J. Hansen, E. Toft and J. J. Struijk, "Acoustic Features for the Identification of Coronary Artery Disease," in IEEE Transactions on Biomedical Engineering, vol. 62, no. 11, pp. 2611-2619, Nov. 2015, doi: 10.1109/TBME.2015.2432129.

[5] R. Tao et al., "Magnetocardiography-Based Ischemic Heart Disease Detection and Localization Using Machine Learning Methods," in IEEE Transactions on Biomedical Engineering, vol. 66, no. 6, pp. 1658-1667, June 2019, doi: 10.1109/TBME.2018.2877649.