International Research Journal of Education and Technology
ISSN 2581-7795

A Literature Review on Prediction of Heart Attack

Roja. R.B[1], Harshitha. S[2], Harshini H. S[3]

[1]*Student & Dept. of Bio-Technology, Teresian College, Mysore*
[2]*Student & Dept. of BSc, Teresian College, Mysore*
[3]*Student & Dept. of bio-technology,Teresian College, Mysore*

Abstract-*Heart attack is a global leading cause of death for both gender and the occurrence is not always known to us. Usually Heart Rate Calculation has traditionally been conducted using specialized hardware or device. It used most commonly in the form of pulse oximeters or Electrocardiogram devices. though these devices have higher method and they are reliable to normal user. However, these devices require users to perform their process. In this paper, we propose a system capable of estimating the heart beat rate using just a camera from a commercially available smart phone and also using a mobile stethoscope to record heart sound for detecting the occurrence of heart attack and also some other heart related disease. Fuzzy Logic is used here, which is a part of Data Mining, the expert problem solution for human illness. In general, case people could not u nderstand whenever they face this problem and this is the main cause of death. Our research is about to determine this problem earlier to reduce the death rate of heart attack. The advantage of this method is that the user does not need specialized hardware and he/she can take a measurement in virtually any place under almost any circumstances. In addition, the measurement can be used as a tool for health coaching applications or effective telecare services aimed in enhancing the user's well being.*

Key words:Data mining; fuzzy logic; smart phone; pulse detection; heart sound detection.

1. INTRODUCTION

Heart attack is also known as myocardial infarction occur when there is a reduced or blockage of blood flow to coronary artery for a period of time leading to myocardial ischemia which, if left untreated can lead to necrosis (tissue death). This resulted in the occurrence of heart attack. The average annual morality rate for congestive heart failure is 10% per year with a 50% five-year survival rate (CCS, 2010). Our project is to monitor blood pressure and heart beat. Determine the risk and hospitalize victim immediately. In the recent year, technologies have been used for health care. This technologies are based on various types of devices, such as, embedded environment, personal device like cell phones, tablets etc. Health professionals or patients to provide health care to people [3] use these devices. The main cause of death in the world is Cardio-vascular Disease (CVD), representing 30% of all global deaths. Worldwide about 17.5 million people die of Heart Attacks or Strokes each year, according to the World Health Organization (WHO) [2]. After a sudden death of any person from heart attack, it is often heard that the family members could not understand that the pain was of heart attack. Most of the people consider the pain of heart attack as a pain from some other physical problem or disease like gastric. If we can know what is the exactly pain of, then we can minimize the casualties. Our Heart condition can be measured by heartbeat. In our heart, there are four types of heart sound and first two heart sound is audio able and last two is not audio able. The most audio able heart sound is "Lub" from Apex of the heart. We can hear this sound just below medially from the left nipple and the cause of this sound is closure of the mitral and tricastid valve at the onset of Ventricular Systol. We hear the second heart sound from left Sternly Adge and the cause is closure of aortic and pulmonary valve at the onset of Ventricular Systol. The name of this heart sound is "Dub". The third and fourth heart sound is not audio able. If there is abnormal situation in our heart, it sounds like "Murmur". It causes for abnormal blood flow to valve or normal blood flow to abnormal valve [5]. In the recent years, medical technology has developed rapidly by using computer science components. Scientist has developed various algorithms, programs and devices to detect heart attack of patients early. Most of them have used conventional medical equipment to produce their result and detect heart attack accurately. We are trying to develop a method that will optimized to use less conventional equipments as much as possible but also maintain the accuracy of detection. We are trying to avoid conventional methods as they are time consuming but we are trying to detect the heart attack pain as soon as possible so that the patient can have enough time to react. We are also trying to use fuzzy logic here; this is one of the parts of Data Mining. It is an expert problem solving system, which can diagnose the human illness [1]. There are some most basic functions called Vital signs that can be measured from a person, which indicates their physical condition. It can measure the normality and abnormality by physical status. Through vital signs, most of the medical condition can be diagnosed and confirmedwith the help of some special test of these signs. Each vital sign is measured differently withthe use of specialized equipment. There are four vital signs, which are standard in most medical settings:

- Pulse rate
- Respiratory rate
- Blood pressure
- Temperature

In medical science, "Pulse" defined as the rhythmic expansion and contraction of the arteries corresponding to each beat of heart [18]. Therefore, pulse rate is the measurement of human heartbeats. Pulse rate can be measured either in the wrist of neck given by beats/min. The most prominent spots for measuring the pulses are wrist (Radial artery), neck (Carotid artery), inside of the elbow (Brachial artery), behind the knee (Popliteal artery) and ankle joint (Posterior tibial artery) [18]. Pulse rate is very helpful to determine the problems of human body but it is not used to diagnosis the problem. This rate is varies with ages and depends on physical and psychological effect on the body. If the rate of pulse is higher, it indicates the availability of abnormality in the body. It can also be caused by other reasons, e.g. anxiety, anger, excitement, emotion, asthma, heart disorder and so on. Another vital sign is Respiratory Rate, which a person takes the number of breaths within a certain amount of time or more. It also defined as the number of chest movements involving inspiration and expiration per unit time [5]. Usually it measured by counting the number of times the chest rise for a minute. Respiratory rate will increase if the demand of oxygen, due to illness, intensive physical activity is increased. The average respiratory rate for a healthy adult at rest is 12/60 Hz and it varies between 12-20 breaths/min [5]. For the babies, young adults the rate is higher than adults rate. The following table 1.1[18] shows the pulse rate and respiratory rate for different ages.

Table-1: Heart rate and respiratory rat e for different ages

Age	Heart Rate (Beats/min)	Respiratory Rate(Breaths/min)
Newborn	100-160	30-50
0-5 months	90-15	25-40
6-12 months	80-140	20-30
3-5 years	80-120	20-30
6-10 years	70-110	15-30
11-14 years	60-105	12-20
14+ years	60-100	12-20

Blood pressure is the most important vital sign for a human body. It is a force exerted by blood on the walls of arteries, veins and the chambers of the heart and it varies between a maximum pressure called systolic pressure and a minimum pressure called diastolic pressure [5]. The average value of healthy adult is 120 mmHg during the systole and 80 mmHg during diastole. There have some factors, which affect the blood pressure of a healthy person; they are pumping rate, blood volume, viscosity etc. The last vital sign and the most important sign is Temperature. Temperature can be measured by thermometer. However, there no such approach to measure temperature using mobile device. Whereas it is the era of modern technology, soon we could measure our temperature by mobile device.

2. LITERATURE REVIEW

Numerous works in literature related with heart disease diagnosis using data mining techniques have motivated our work. Heon Gyu Lee et al proposed a novel technique to develop the multi-parametric feature with linear and nonlinear characteristics of HRV (Heart Rate Variability) [6]. There many statistical and classification techniques were applied to develop the multi-parametric feature of HRV. Using HRV characteristics some experiments were conducted to assess several classifiers, such as SVM (Support Vector machine) [7], CMAR (Classification based on Multiple Association Rules) [8] etc. There some Mobile Stethoscope applications are available in our smart phone device. Apple Computer, Inc. developed a mobile stethoscope. It records accurate low noise heart, lung and bowel sounds. However, it could not detect the heart condition of a human body. Therefore, in our proposed paper we are trying to develop this section to detect the heart condition, so that people can take intermediate action. Our blood have some physical characteristics, 5-6L for male and 4-5L for female; the blood pH rate is 7.35-7.45; Salinity 0.85%; Tempe C (slightly higher than normal body temperature.) [4]. There are four heart beat sounds available, but we can only hear two sounds from the beat clearly. A healthy person have heart pump rate is 72-80/min [5]. We also trying to use Fuzzy logic, it is a problem solving control system methodology. Fuzzy logic has proved to be particularly useful in expert systems i.e. the system that can diagnose human illness and other artificial intelligence applications. In which we does not depend not only on Boolean values (0 or 1) but we can make our own prediction statements. In fuzzy logic, we can make fuzzy set, in which an element belongs partially or gradually to the set have been defined. This form of knowledge representation suitable for notations that cannot be defined precisely [1]. Moreover, the ease of use (simply placing one's finger on the camera) combined with the live feedback will likely be more appealing to the users and might play a positive role in engaging them to a process that could benefit their health; for example Health-Smart has developed breathing training applications that could help a patient practice breathing properly. Common pulse oximeters are based on the

different light absorbing characteristics of oxyhemoglobin and deoxyhemoglobin at two different wavelengths (i.e., 660 nm red and 940 nm infrared) and the pulsating nature of arterial blood flow [12]. With pulse oximeters, a finger or earlobe probe is used: a red light-emitting diode (LED) and an infrared LED is located on one side of the probe, and a photo detector is located on the other side [12]. The transmitted light received by the photo detector and divided into two components. Component A is transmitted light of variable intensity that occurs during a systole and is a function of the pulsations of oxygenated arterial blood. Component B transmitted light that has a constant intensity and is a function of various tissues. The pulse oximeters divides the pulsatile absorption of component A by the background light absorption of component B, at the two different wavelengths, to obtain an absorption ratio and calculate oxyhemoglobin saturation often based on the Mendelson and Kent equation [13]. There are many researchers, who dedicated their whole life to find out the latest technology for medical applications. Such as Shnayder et al. [15] denotes his life to find health supporting system for supporting people in chronic conditions. The only way out of this is implementing telecare solutions that will manage to increase the quality of delivered health care. It will maintain low installation and low running cost [14]. Old health services delivery is now shifting to modern technology gradually. Health services delivery is about to change, but it is the nature of the service itself that will gradually shift from reactive treatment of conditions to pre-emptive health care. Avoiding health risks can be more efficient than sustaining patients with chronic conditions that could have been avoided [16].

3. PROPOSED APPROACH

In our work, we are trying to detect heart attack by smart phone. The mechanism of our research is, place index finger on mobile camera, which is shown with a picture below

Fig-1. Holding index finger on camera lens

Then it will detect the peak of blood, which will make a set using variance calculation, and then it will choose a maximum set from the peak. Fig. 3 will show the system process of the approach. The main idea of the proposed system is to find out average distance between adjacent peaks for heart rate calculation. The system contains the followings steps,

3.1. System process 1

1. At first Signal differentiation, here it will capture the frame through the surrounding light level can change during capturing the frames by using mobile device. It provokes the signal baseline to rise up or fall down the rate of heartbeat. After the differentiation the signal's average, become close to zero in fact of the surrounding light level variability. 2. After that making of the sets that contain n highest peaks of the signal. The value of n is considered from 5 to m, where m depends on the time measurement 3. With those peaks of set Variance Calculation will calculate each peaks in set are sorted by their time of appearance in the signal. Then variance of the distances between adjacent peaks is calculated for every set of the peaks. After that, the set of minimum variance value is chosen from calculation. 4. Chosen set of minimum variance value from the previous step, the expected value of the distances between adjacent peaks is calculated. This value is considered as the distance between the hearts beats. This calculation is Heart Rate Calculation. Another algorithm for measuring heart condition through heartbeat sound,

3.2. System process 2

1. Heart sound recording, here it will record 3-10 heart sound because it will compare with the stored data, which will stored in database. In database, default normal heart sound is "lubdub" and abnormal heart sound is "murmur" will be saved. After 3-10 heart sound, user needs to stop recording. Noise free environment is essential for this step. 2. Comparing with database, here recorded sound will automatically compare with the previously stored database. If the recorded data could matched with normal sound then a message will display "Heart is normal", else if the recorded data matched with abnormal sound then message will display "Heart is abnormal". 3. Headphone must be needed to hear the heart sound and save it for future use.

Through those steps, it will also detect the lounge problem, blood pressure problem etc. Those steps are not only for heart attack because the heart sound is not only for heart attack. It could be for another heart disease. Therefore, anyone could take primary steps to save from heart attack with smart phone.

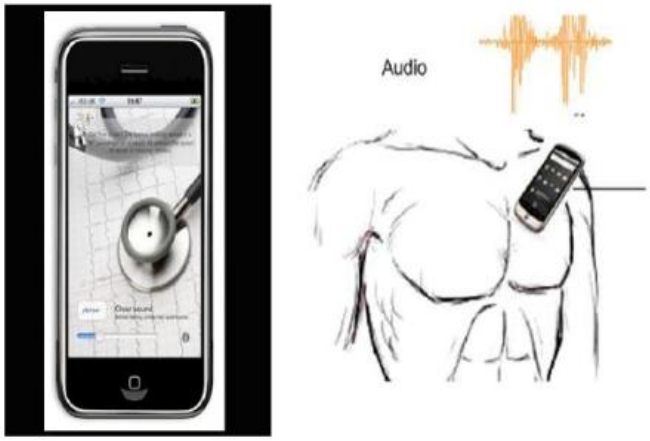

Fig. 2. Mobile Stethoscope & Human body with Mobile Stethoscope

4. RESULTS

The proposed approach gives us the how to detect heart condition using blood and heartbeat both. This approach is accurate to detect heart condition. Using our approach of recording heart sound, some heart related disease could be detected. Detecting not only heart attack, but also could be detecting heart blockage, abnormal blood and valve circulation. Following picture is showing the result of Heart sound recording.

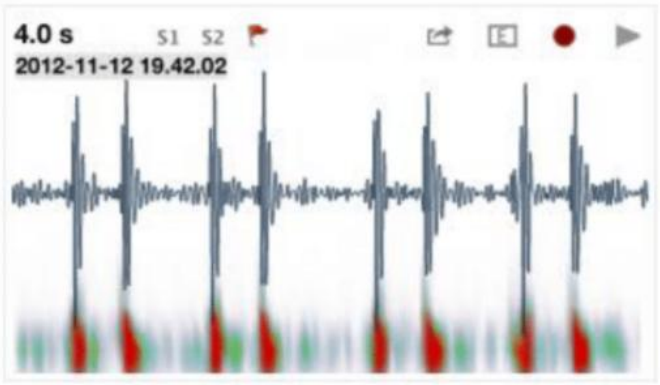

Fig-3: Recorded heartbeat sound

This is a result of sound recording from heartbeat. It could detect heart condition now. Our proposed approach will help to detect heart condition by heart sound.

5. CONCLUSION AND FUTURE WORK:

A numerous of heart attack detection techniques have been introduced so far, but they are very expensive and time consuming. Since this modern age is the era of smart phone, we believe and deserve that our proposed technique can reach to the doorsteps of people of every level in the society. As we are introducing alternative modalities to detect heart attack, because one way may fail while the others will provide the accurate outcome. By this, we can find out a solution for heart attack detection. That is why our proposed algorithm is developed. We focused on two different techniques here and we added it in one algorithm. User needs to choose what option he/she wants to apply for detecting heart attack. We think any level of our society who have smart phone, can easily take precaution for heart attack. Our Application is efficient and suitable from other non-medical application.In our proposed research, we tried to propose a complete paper for detecting heart attack using two ways. However, we have some plan about this research. Time of India, a leading newspaper in India published that "Researchers in the United States, within the next decade Heart Microeconomic Microchip will be set in blood vessel of human body. The smart phone will collect data and send the information to us". Researchers are trying to implement the requirements of Microchip for uses of the technology in smart phone. We will try to use this technology in future. If this technology will developed then we can detect heart blockage through this technology by our project. It will help our society to detect heart attack easily as well as heart blockage.

REFERENCES

[1] Kaur, L., & Kumar, M. Predicting Heart Disease Symptoms Using Future Data Mining Trends.

[2] Dinkar, P., Gulavani, A., Ketkale, S., Kadam, P., & Dabhade, S. Remote Health Monitoring using Wireless Body Area Network.

[3] da Silva, L. D., de Medeiros, L. M., & Pinheiro, M. E. (2013). A Mobile Assistant to Aid Early Detection of Chronic Kidney Disease. Information Systems and Technologies for Enhancing Health and Social Care~ autofilled~, 309.

[4] Dr. Syed Anju Hasan, Heart Specialist, Heart Foundation.

[5] Dr. S.N. Pandey. B.Sc.MBBS, "PHYSIOLOGY SHIKSHA", 12 Edition, 1994.

[6] Heon Gyu Lee, Ki Yong Noh, Keun Ho Ryu, "Mining Biosignal Data: Coronary Artery Disease Diagnosis using Linear and Nonlinear Features of HRV," LNAI 4819: Emerging Technologies in Knowledge Discovery and Data Mining, pp. 56-66, May 2007.

[7] Cristianini, N., Shawe-Taylor, J.: An introduction to Support Vector Machines. Cambridge University Press, Cambridge , 2000.

[8] Li, W., Han, J., Pei, J.: CMAR: Accurate and Efficient Classification Based on Multiple Association Rules. In: Proc. of 2001 Interna'l Conference on D

[9] Chen, J., Greiner, R.: Comparing Bayesian Network Classifiers. In Proc. of UAI-99, pp.101–108 ,1999.

[10] Quinlan, J.: C4.5: Programs for Machine Learning. Morgan Kaufmann, San Mateo 1993.

[11] A. Pantelopoulos and N. Bourbakis, "A Survey on Wearable Biosensor Systems for Health Monitoring," 30th Annual International IEEE EMBS Conference, Vancouver, British Columbia, Canada, August 20-24, 2008.

[12] L.J. Mengelkoch, D. Martin and J. Lawler, "A Review of the Principles of Pulse Oximetry and Accuracy of Pulse Oximeter Estimates During Exercise," Physical Therapy, vol. 74, no. 1, pp. 40- 49, Jan. 1994.

[13] D. Guowei, T. Xiaoying and L. Weifeng, "A Reflectance Pulse Oximeter Design Using the MSP430OF149," in 2007 IEEE/ICME Internation Conference on Complex Medical Engineering, pp 1081-1084.ata Mining .2001

[14] Scully, C. G., Lee, J., Meyer, J., Gorbach, A. M., Granquist-Fraser, D., Mendelson, Y., & Chon, K. H. (2012). Physiological parameter monitoring from optical recordings with a mobile phone. Biomedical Engineering, IEEE Transactions on, 59(2), 303-306.

[15] V. Shnayder, B. Chen, K. Lorincz, T. R. F. Fulford-Jones and M. Welsh, "Sensor Networks for Medical Care," Technical Report TR- 08-05, Division of Engineering and Applied Sciences, Harvard University, 2005.

[16] T. Orbach and J. Vasquez, "Self-care and the need for interactive ICT", Journal of Holistic Healthcare, vol. 6, pp. 35-39, August 2009.

[17] Wikipedia, \Variation of vital signs with age", http://en.wikipedia.org/wiki/Vital signs.

[18] N. Abhijit, \Normal pulse rate", http://www.buzzle.com/articles/normal-pulserate.html