Advanced Artificial Intelligence Enabled Smart watch Devices for Continuous Monitoring of CVDS

1st Author
Harshada P. Patil
Student Dept of I.T.
C.K.Thakur A.C.S. College,
New Panvel(W), M.S., India,
patilharshada880@gmail.com

2nd Author
Varsha .Dumka
Student Dept of I.T.
C.K.Thakur A.C.S. College,
New Panvel(W), M.S., India,
Varsha.dumka92@gmail.com

3rd Author
Vinit Nimkar
Asst. professor.Dept of I.T.
C.K.Thakur A.C.S. College,
New Panvel(W), M.S., India,
vinit.nimkar@gmail.com

Abstract— **Cardiovascular disease (CVD) is a generic term for conditions affecting the heart or blood vessels. Cardiovascular disorders are often sudden and deadly. It's usually compared with a build-up of fat deposits inside the arteries and an increased risk of bloodclots. It can also be associated with damage to arteries in organs such as the brain, heart, kidneys and eyes. CVD is one of the central causes of death and weakness, but it can often mostly be prevented by leading a healthy lifestyle. Each year, the world over, there are millions of CVD deaths, not due to appropriate detection and treatment and constant monitoring of patient conditions. Artificial intelligence enabled wearable smart watch devices are a new, and advance development. This study is adopted to treat and manage the CVDs by timely monitoring it. It is a picking up technology, which needs to be generally known and cost effective for which certain suggestions are made such as Button cells and alternative button cell, cloud storage, emergency alert, buzzer, Panic emergency button, GPS.**

Keywords— *CVDs, Smart Watches, Buzzers, GPS, Monitoring CVD using AI.*

I. INTRODUCTION

Cardiovascular disease (CVD) is a class of diseases that involve the heart or blood vessels [1].CVD includes coronary artery diseases (CAD) such as angina and myocardial infarction (commonly known as a heart attack) [1].Other CVDs include stroke, heart failure, hypertensive heart disease, rheumatic heart disease, cardiomyopathy, abnormal heart rhythms, congenital heart disease, valvular heart disease, carditis, aortic aneurysms, peripheral artery disease, thromboembolic disease, and venous thrombosis [1]. This may be caused by high blood pressure, smoking, diabetes mellitus, lack of exercise, obesity, high blood cholesterol, poor diet, and excessive alcohol consumption, among others [1]. High blood pressure is estimated to account for approximately 13% of CVD deaths [1]. It is estimated that up to 90% of CVD may be preventable [1].Cardiovascular diseases are the leading cause of death in all areas of the world except Africa [1]. Together CVD resulted in 17.9 million deaths (32.1%) in 2015, up from 12.3 million (25.8%) in 1990[1]. Artificial Intelligence (AI) and wearable medical (CVDs) devices are significant (AI) improvements in the diseases treatment field. It would be an exciting implementation to study the use of

Artificial Intelligence and CVDs in the timely finding and treatment of the CVDs, nearly costing so many human lives, globally. So, leading, to the study's Aim and Objectives.

A. Aim and Objectives-

The overall goal of the study is to examine the impact of smart watch devices in continuous monitoring of the cardiovascular diseases (CVDs), with the following objectives

- To examine the effects of adopting the smart watch devices technology on the patient's health with heart diseases and their influences on the lifestyle of the patients.

- To increase an accepting on the influence of smart watch devices technology on cardiovascular diseases patients.

- To study the effect of advanced approaches of artificial intelligence in improving the speed and accuracy of the smart watch devices.

- To report the challenges of smart watch devices in the future that needs to be tackled.

B. Scope of the project-

As the device is made to monitor the heart rate of cardiovascular disease it will become more effective for the patients to use. The smart watch device will be cost effective so any one suffering from CVD can afford it. When anything goes wrong then it will alert that person with the use of buzzer, if that person denies to take that person to the hospital then one panic emergency button is also available. The panic emergency button has the number of nearby ambulance. When that button is pressed the ambulance gets the message and location of that person through GPS and will get the patient to the hospital immediately. The scope of the project is to save the lives of the patients suffering from CVDs and can get immediate treatment when they are needed.

C. Problem Statement-

The overall focus of the study is to examine the impact of smart watch devices in continuous monitoring of the cardiovascular diseases (CVDs). The existing device was theoretically defined and not implemented so the new device from that theoretical basis needs to be actually implemented. The issue in the device is that it can only monitor the patient with CVD and not diagnose with proper method at that time. It should be solved in future. Device must be in connection with internet to tally and analyze the data stored in the cloud database otherwise there is no use of watch. The stated problems must be solved in future for better and reliable improvements.

II. REVIEW OF LITERATURE

A. *Effects of smart watch devices in monitoring cardiovascular diseases-*

Two (2) people in every 6 people above the age of 60 are found to be the sufferers of cardiovascular diseases. In 2010, CAD (Coronary Artery Disease) was held as the main cause for the increase in death rates and the rest of the world, and CAD accounted for 64% of all cardiovascular expiries. In India, i.e. one in every nine deaths is due to CAD. Over-all death rate has increased through the existence of various diseases, such as CVD, and CVD directly linked to the aged populace and obesity. The death rates are also increasing due to the inadequacy of the health system as well as the lack of alertness of health and illness among the general public. Among others the smart watch devices help the patient who is suffering from CVD on being better informed and take decisions wisely when it comes to treat hypertension, and CVD related problems. Through the use of smart watch devices, patient can take help of the doctor diagnose the elements of the diseases, if needed.Most importantly, it can be possible for patients with CVD suffering to provide better precaution and conduct the needed tests through developed diagnostics. Doctors can demonstrate faster reactions to diseases through checking the patients record stored in the cloud using smart watch devices. They are used for recognizing causes of diseases and most highly, they can help in fixing up health problems. Also, with the smart watch technology, same self-monitoring of CVDs conditions is possible, which greatly cases pressures of CVDs and greatly services their treatment.

B. *Impact of smart watch devices-*

In the environment of cardiovascular diseases, the latest technology has introduced of smart watch devices to detect the heart rate of the patient and buzz alarm when it sees any fault in the heart rate. This state that smart watch devices are capable of monitoring as well as recording simultaneous information about the motion activities. The technology used in smart watch devices hold heart rate detecting sensors, and cloud storage. These sensors have the capability to measure biological signs such as heart rate, blood pressure.As a result, the smart watch devices create impact on the cardiovascular diseases patient by monitoring the heart rate and keeping the record of the simultaneous heart rates.In this environment, it is pointed out that a man had been able to save his life by using features of the Smart Watch. This device has been proved as useful in providing alerts to the man in case his heart jumps to a rare level.

Smart watch sensor, mobile technologies and machine learning techniques - heart disease can be monitored in an effective and efficient manner. In the developing countries like India, Smart watch devices are used for monitoring and real time identification of variability in heart. In countryside areas, the use of these devices is useful in terms of continuous monitoring and initial examination and identification of heart disease. Based on

It is accordingly essential to choose features on the basis of supplies related to smart watch biosensor schemes. It is important to ensure practical consumption of energy and multiple parameters are to be measured for creating efficiency in the device.

identification, it is possible to take basic measures for reducing the power of diseases.

C. *Influence of artificial intelligence upon the Smart watch devices-*

In this age of artificial intelligence, AI technology has designed these Smart watch devices as fitness bands as well as intelligence platforms to track down the signal activities, pulse rates, and heart rate. The impact of artificial intelligence on Smart watch devices takes out the fact that smart equipment is installed to design the devices that detect brainpower to body language as well as movements. The quickness and accurateness levels of the devices are set to give the perfect capacities of physical reaction, heart rates, and energy level to detect cardiovascular diseases. The speed and accuracy of Smart watch devices have donated to maintaining efficiency in the health service. Through the monitoring technology, it has come possible to record large amounts of biological data. Mobile phones are shown to have computational control so that MLAs (Machine Learning Algorithms) can be supported. Smartest and cloud are used as smart watch devices for signal and data attainment. As far as exactness and speed of Smartest is concerned, it can be said that it is exclusively an achievement device.

D. *Challenges and improvements –*

Battery technologies and energy searching: In the case of Smart watch devices, the most common challenge observed is the battery and energy drainage due to continuous use. Therefore, it is a severe concern to improve the reliability, security, and efficiency of the Smart watch devices through energy scavenging. A suggestion is accepting to use button cell as compared to solar cell as they will become cost effective and easily affordable to everyone and will keep and alternative button cell for emergency, easily and efficiency power the smart devices. Smart watch technology is used in the healthcare sector under different forms, which are used for tape and monitoring physical actions. However, over-use of these technologies can create issues with respect to the decrease of battery life, which in turn can affect efficiency of smart watch devices. In recent time, smart watch devices have experienced security and privacy risks, which aim to hack the patients record stored in the cloud to use for illegitimate purposes. So, it is suggested that the smart watch constructer to pay attention to the management of the devices design with a trustworthy supply chain. It is also recommended that the patients should not expose the data to any service provider. However, privacy is given care for setting up devices and applications have planned an encryption technique for storing data in the cloud from the patient smart watch device in order to avoid this private information in the wrong hands. The planned system is considered strong and computationally fewer expensive compared to other algorithms. Through continuous use of battery, inefficiency of smart watch devices is decreased. On the other hand, safety and privacy related issues can result in leaking of personal information.

III. PROPOSED SYSTEM

A. *Working of Smart Watch device –*

The algorithm of working of the device depicted by the diagram is that firstly the mobile hotspot should be enabled using Bluetooth tethering and connected to the Smart watch device for the features to work like recording initial heart rate, and the heartbeat rates recorded will be stored in the cloud. The data is then analyzed regularly and tally is recorded, on daily

basis. If the heartbeat rates observed by the tally shows some abnormalities, like it will raise higher than the normal heartbeat rate Or it will be lower than the normal heartbeat rate then the buzzer(alarm alert) is activated, it will give a health checkup alert to the patient otherwise no alerts will be activated. If the nearby person denied to take the patient to the hospital then the emergency panic button is pressed by the patient so the nearby ambulance gets the message of that patient as Smart watch will have the nearby ambulance number. The Ambulance will track the patients location with the help of GPS fitted in the Smart watch and will take that patient to the hospital immediately. This is how the device is going to work, and this can be proved to be an efficient device for keeping a healthy body and to keep the cardiovascular diseases monitored properly.

B. Implementation of new IDEAS in the existing Smart watch devices –

According to the journal Aging, HRV (heart rate variability) is probably the most analyzed index in cardiovascular risk stratification technical literature, therefore an important number of models and methods have been developed, even though the use of HRV alone for risk stratification of SCD is limited and further studies are needed. In existing technologies like smart watches, we have most of the required features for health track but some more features can be added which can be more helpful for specifically heart problems.

One of those features is the HRV evaluations received by tracking heart rates through the wearable devices. Use of non-rechargeable batteries can be done to reduce the initial cost of the device, plus it will not demand the charging of the device in alternative days. Also an alternative backup battery can be fitted for emergency situation, if in case the running battery loses its power, the battery which is kept as a backup will be put into use. This will help the patient to remain in touch with the device all the time, even if the first battery drains out, and also in the time of emergency conditions.

One panic button can be introduced for emergency call to emergency contacts or to call the ambulance fed on the device after an alert alarm so that the person can decline if not necessary, in case of sudden abnormalities observed in the graph. The data of the heartbeats, as captured by the device will be stored in the Cloud, where the data will be analyzed and if the heartbeat rates will go below or above the normal rates, the device will pass the alarm, and the person wearing

the device will get alert, and visit the doctor for further procedures. For storing data in the cloud the mobile phone must be first connect to the internet using the Bluetooth tethering so the data can be stored automatically in the cloud and can be used for further emergency needs. Stored data is used by the heart rate sensor to analyze the data stored initially and compare with the current heart rate of the patient. If any difference is noticed then the alarm is activated.

C. Flowchart and Algorithm –

ALGORITHM FOR WORKING OF SMART WATCH DEVICE

- Start
- Enable mobile hotspot and Connect smart watch with internet using Bluetooth tethering.
- Initial Heart rate will be recorded.
- It will be stored to the cloud using internet (Bluetooth tethering).
- It will analyze the heart rate according to the patient's heart beats.
- It will tally the record stored in the initial of the smart watch and will generate result according to it.
- If the heart rate goes more than the normal heart rate then it will send action to the buzzer to buzz.
- Buzzer will wake everyone and they will take patient to the hospital.
- If nearby person denied to take the patient to the hospital then
- Panic emergency button is pressed which has the number of nearby ambulance
- With the help of GPS the ambulance track the patient and take them to the hospital immediately
- Stop

The figure below illustrates the flowchart of the working of smart watch device. The above is the algorithm for working of smart watch device.
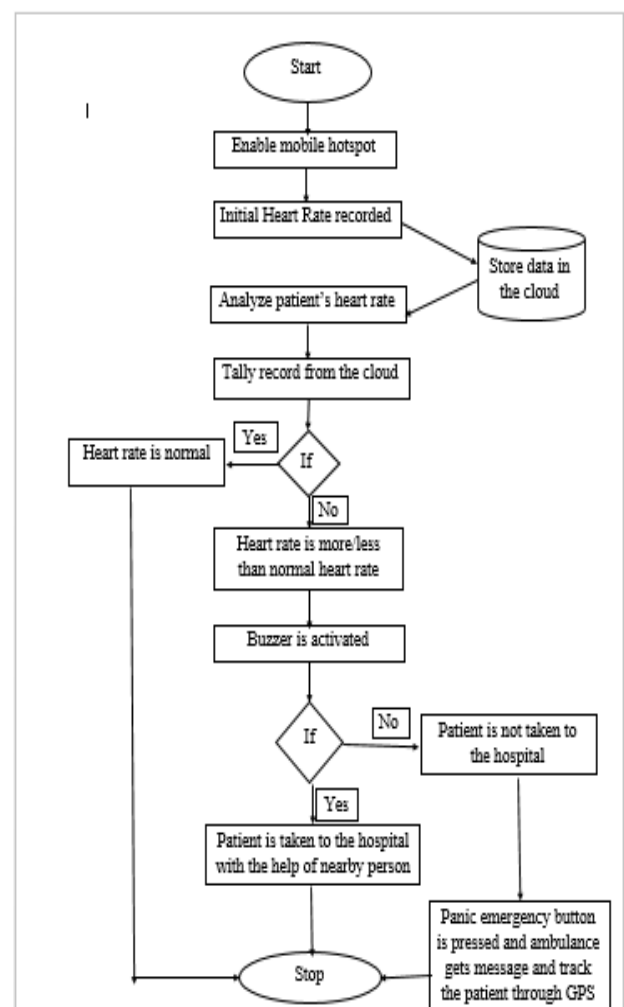

Fig. 1. Flowchart: Working of Smart Watch Device

IV. DISCUSSION

Medical Smart watch devices establish a computable way of calculating patient's health by tracking their status while they are away from the hospital. Collecting such data may reduce the percentage of death of people. Also, it may reduce the period of the treatment required in the remedy, which will result in refining the quality of a patient's life. The doctors discovered their confident practice results upon using Smart watch devices by boosting patients to use these devices. Additionally, using Smart watch devices will move the patients into a more preventive healthcare model that will give the public the capability to play a more active role in personal health organization by shifting healthcare from the hospitals to the homes. The examination shows numerous interesting results regarding further improvement in Smart watch devices. An area of increasing interest has been indicated in the field of Smart watch technology by presenting artificial intelligence. For, artificial intelligence play's a serious role in developing these devices and make them effective and efficient by adding heart rate sensors and device to achieve timely detection of change in a patient's state, which may require scientific intervention, especially with cardiovascular disease which require following the hearts rate of the patients all the time to prevent any danger that may happen to them. This Smart watch device is cost effective so any one can afford it.

Overall, Smart watch devices are becoming popular in various fields due to their positive influence in long-term health monitoring. On the other hand, no well-organized solutions have been proposed for the tasks faced by these technical devices, which might be understood in further research. The graph shown below is the graph of normal heart rate changes according to the age.
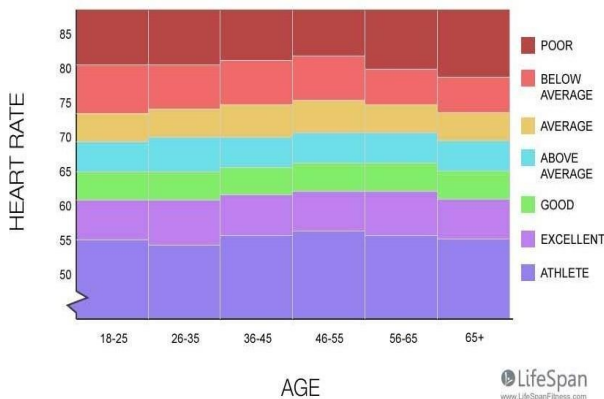

Fig. 2. Heart rate vs. Age [5]

V. CONCLUSION

As per the ideas put in the research by us we can come to a conclusion that a cost effective Smart watch device can be made for detection of heart related diseases such as CVD. This device would be efficient for tracking the heart rates and taking possible action when any abnormalities are detected which could be a sign of any heart related problems such as sudden cardiac arrest. This device can be used by larger group of people who cannot afford heavy tools for cardiac disease detection on regular basis. This way the increased amount of death rates because of CVD can be controlled. Moreover the concept of using non rechargeable device can make it easier for the person to use it, they don't have to put it on charge very often, plus the addition of a backup battery, which is an alternative to the running battery failure. It will help the person to assist it in the emergency cases and not just the patients but any person who is health conscious and hope for a better health can use such device for a regular health track.

VI. ACKNOWLEDGMENT

REFERENCES

[1] https://en.wikipedia.org/wiki/Cardiovascular_disease

[2] Mounir M. El Khatib, Gouher Ahmed , Management of Artificial Intelligence Enabled Smart Wearable Devices for Early Diagnosis and Continuous Monitoring of CVDS, Blue Eyes Intelligence Engineering & Sciences Publication (International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-9 Issue-1, November 2019)

[3] Vinit Nimkar, Sushopti Gawade, Kazi Fakir Mohammed, The Integration of Heterogeneous Distributed Database using Supplier Integrated E-commerce System

[4] https://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds)

[5] https://www.google.com/search?q=normal+heart+rate+graph&tbm=isch&ved=2ahUKEwjDosXFnMTnAhVBA7cAHfvmD2kQ2cCegQIABAA&oq=normal+heart+rate+graph&gs_l=img.3..0l5j0i7i30j0i5i30l4.326108.326108..326942...0.0..0.219.219.2-1......0. ..1..gws-wiz-img.If0VpvBSMzk&ei=xdk_XoOsLMGG3LUP82_yAY&bih=625&biw=1349&rlz=1C1CHZL_enIN811IN812&hl=en-US#imgrc=TGjpZAMu7RBKMM