International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 04 | Apr 2020 www.irjet.net p-ISSN: 2395-0072

Smart Wrist Band for Alzheimer's and Sleep Apnea victims

Rekha N[1], R K Aishwarya[2], Pallavi C[3], Rekha K S[4]

[1]*Proffessor, Department of TCE, K S Institute of Technology, Bangalore, Karnataka, India*
[2,3,4]*IV year student, Department of TCE, K S Institute of Technology, Bangalore, Karnataka, India*

Abstract - *Alzheimer's disease is one of the most common cause of dementia among older adults. A huge amount of people suffering from Alzheimer's and similar memory loss diseases have been reported to be missing every year. As a result, the person suffering from dementia frequently requires monitoring of his/her present location. Sleep apnea is a sleeping disorder, where one cannot sleep. Causing the body to lose its function and causes lack of sleep. The patient will be affected both mentally and physically. Thus, to improve the quality of life of both Alzheimer's and Sleep Apnea victims and their respective families, hence a reliable and economic tracking system with health parameters is necessary. The purpose of system is to integrate the GPS systems with arduino for real- time tracking of dementia patients in order to make sure their safety when they go outside of their house. The current location of the patient will be sent to the Android app in caretaker's mobile phone when they cross a certain range. And one special feature of this wristband is it produces soothing music by sensing the body movements of the patient when their sleep is disturbed. Weekly health reports are sent to the family doctor and immediate report will go to the doctor incase, if there is any abnormalities in the health condition of the victim.*

***Key Words*: GPS, dementia, IOT server, ECG, cloud, WIFI module, Arduino, *music* therapy.**

1. INTRODUCTION

Alzheimer's is a 6th ranked disease which causes deaths in USA. This disease starts mild and gets progressively worse. There are three stages, first is the mild one where, we can observe short term memory loss. Second is moderate where the victim is confused to carry out daily tasks and get lost easily. Third, friends and own family members. Friends and own family members.

In earlier days based on the illness and its intensity the patients were kept in hospitals and were monitored the recorded data was in paper format based on which doctors diagnosed the patients .When the diagnosis or prescription is written illegibly on the paper there may be chances of no good treatment given to the victim. Hence usage of sensors for manufacturing temperature and heartbeat seems more efficient. Sensors are used for measuring the health conditions are studied, monitored and analyzed to measure patient health conditions from a remote area or from a specific distance by using low power system.

This system consists of wearable device with android application. Science and Engineering is very much required to solve the problem of these victims, else the consequence may be devastating for both the victim and their family.

The caregiver is emotionally, physically, emotionally and financially burdened by such victims. As the major p problem is identified with regard to the security of the victim, due to their loss of sense with respect to time and place. Six out of the ten victims wander and become lost. But many do so repeatedly and it can happen at any stage of the disease. If not found within 24 hours, up to half of the individuals will suffer death or serious injury. It's necessary to be aware of the risk factors.

Sleep apnea is a potential sleep disorder in which breathing repeatedly sleeps and stops. Sleep is basically one of the fundamental requirements of human being. Sleeping is a necessity Such as breathing, eating and drinking. Sleep rejuvenates our body without sleep we become physically, emotionally, psychologically vulnerable. Major sleep disorders are insomnia, sleep apnea, narcolepsy and restless leg syndrome.

2. LITERATURE SURVEY

Sleep Apnea is a syndrome where one either has pauses of breathing in their sleep or have very low breath while asleep. apnea is pause or gap in breathing. Total lack of breathing during sleep is called hypo apnea. There are 2 types of sleep apnea one is Obstructive sleep apnea and another one is central sleep apnea. Obstructive sleep apnea is caused in middle age people of about 2 to 4% and in preschool children of about 1 to 3%. Human beings spend around 1/3rd of their lives in sleeping. It is well known that sleep is highly important for both physical and mental health. [12]

In[1] data acquisition system to measure body parameters like temperature and heart beat is developed and module functionality is realized using ultra low power digital sensors.LM35 is used to record temperature and ECG which keeps one eye on heart beat. Immediate reports will be sent to the doctor if there is any variation in either of these. It consumes low

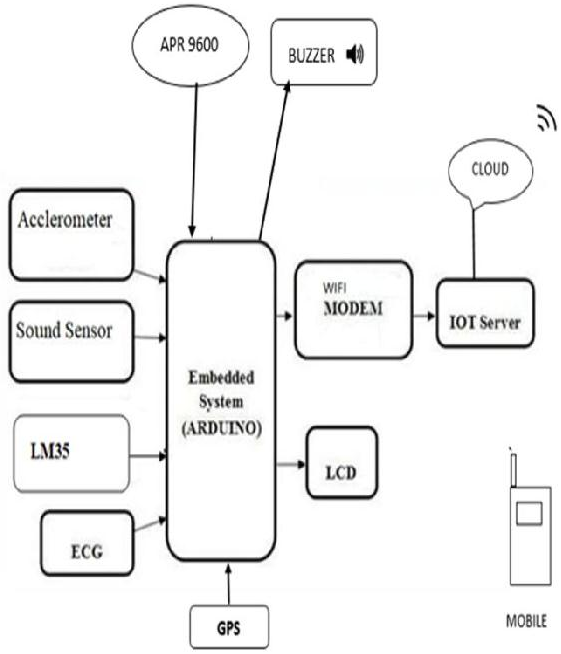
power which makes it cost effective. Image based techniques are used which aquires and analyses the constant streaming of the signals through camera by capturing information extraction and analysis is performed using MATLAB tools. [2]

Multi health parameter monitoring system is designed based on PLC which helps to record and analyze multi parameters of patient from home. It consider health parameters such as temperature, heart beat and pulse oximeter to find oxygen saturation and hemoglobin of a person. Accelerometer which detects the position the person. It processes the data continuously but the complexity is more and inexpensive. [6]

Several methods have been suggested for the identification of sleep apnea over past few years satisfied features of different signals such as nasal air flow, the thorax and abdomen effort signals, acoustic speech signal and electrical activity of heart are commonly used in the detection. ECG is defined as the most efficient feature to detect sleep. [12]

Sensors such as accelerometers which detect the position of the victim whether he is awake or sleep. And sound sensor detects the sound produced the person continuously. [12] on the basis of data obtained by these two sensors APR9600 detects whether the person is having a disturbed sleep or not. If the person is having a disturbed sleep then produces a soothing music which induces sleep.

3. PROPOSED SYSTEM



Methodology

In this smart watch to monitor pulse rate ECG sensor is used. This records the pathway of electrical impulses through the heart muscle and can be recorded on resting and ambulatory subjects, or during exercise to improve Information on the heart's response to physical exertion. It is used to measure pulse rate of the victim suffering from Alzheimer's and Sleep Apnea. LM25 is used to monitor body temperature of the victim. In this the output voltage is linearly proportional to the centigrade. Hence the output is measured in Celsius. To monitor body position Accelerometer is used. Proper acceleration, of the body is measured with accelerometer with its own instantaneous rest frame. In this project it is used to know the body position like whether the victim is sleeping, standing or walking. The sound sensor module is used to detect the intensity of the sound. This sensor employs a microphone to provide input to the buffer, peak detector and an amplifier. Particularly APR9600 is a single chip voice recording sensor. It will play the soothing music to improve sleep quality. To notify the caregiver, if the patient goes out of a desired range buzzer starts beeping. Because the WIFI gets disconnected after reaching a desired range. After crossing the range, there is a notification which is sent to two caregivers about the location of the victim, there will also be some information (phone number of caretaker) about the victim which will be displayed on the LCD screen so that when the victim is lost people near him can contact their caretakers. The buzzer stops beeping after it receives the acknowledgement that the care giver has seen the message with telegram, Status can be monitored on the app itself Events can be assigned to buzzer to create alerts. All data is stored on a remote server. In this

smart watch to monitor pulse rate we are using ECG sensor. This records the pathway of electrical impulses through the heart muscle and can be recorded on resting and ambulatory subjects, or during exercise to improve information on the heart's response to physical exertion. Here we use it to measure pulse rate of the victim suffering from Alzheimer's and Sleep apnea .We are using LM25 to monitor body temperature of the victim. In this the output voltage is linearly proportional to the centigrade. Hence the output is measured in Celsius.

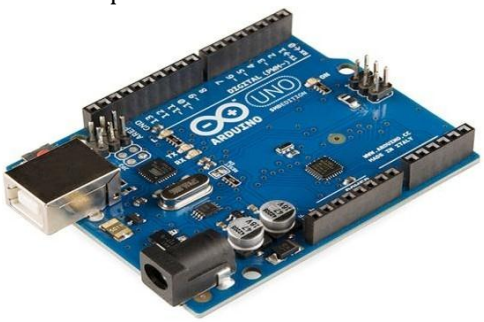
Music Therapy

sleep apnea is a common sleep disorder in which individuals stop breathing during sleep. Usually aged people are finding difficulty in sleeping, According to a survey made by the community leaders and screened using Pittsburgh sleep quality index and Epworth sleepiness scale. So the sleeping sickness results in tiredness, fatigue, depression, anxiety, irritability and lack of day time alertness. [15]few studies have focused on the effect of music, a non pharmacological method of improving sleep quality in older adults. Music induces a significantly a better sleep quality, longer sleep duration, greater sleep efficiency, shorter sleep latency, long sleep duration and less sleep disturbance. [12] the healing power of music has been recognized for many years. The positive effect of music relaxation in depressive disorders, Insomnia and dementia.

HARDWARE REQUIREMENTS

ARDUINO

Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital



and analog input/output (I/O) pins that may be interfaced to various expansion boards ('shields') or breadboards (For prototyping) and other circuits. The microcontrollers can be programmed using C and C++ programming languages. The Arduino project provides an integrated development environment (IDE) based on the Processing language project.

Accelerometer

Accelerometer measures the amount of acceleration due to gravity and it can figure out the angle it is tilted with respect to the earth. So this sensor will detect the position of a person like whether is he is standing, walking or sleeping.

Sound sensor

This sensor is a type of module used to notice the sound. This module is used to detect the intensity of the sound. This sensor employs a microphone to provide input buffer, peak detector and an amplifier. So this sensor will detect whether the person is having a normal or disturbed sleep.

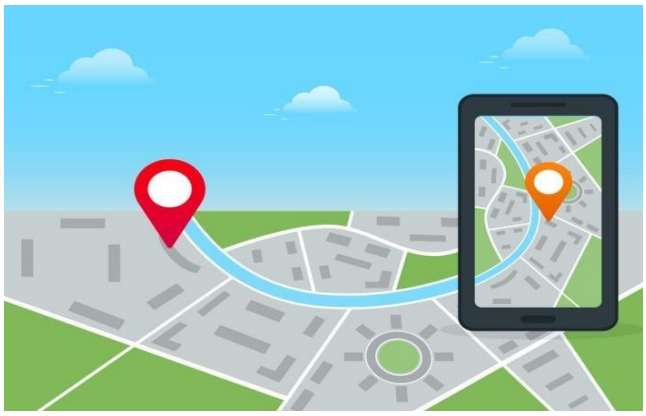
LM35

This sensor detects the body temperature

ECG

Electrocardiogram measures the electrical activity of the heartbeat. With each beat, an electrical impulse travels through the heart this wave causes the muscle to squeeze and pump the blood from heart. When the cardiac rhythm is regular, the heart beat can be determined by the interval between two successive QRS complex. Irregular heart beat can also be measured. The number of QRS complex should be counted over a 6 second interval and multiply by 10 to determine heart rate.

GPS



This device has both Wi-Fi and GPS. Wi-Fi can improve the GPS location in mobile devices. And it can be used to send information about a network back a GPS company so that they can determine where the network is. It is used for real time tracking.

APR9600

This is a single chip, voice recording and low cost high performance sound recording analogue storage technique. The recorded sound is retained after power supply is removed from this module. The replayed sound exhibits high quality with low noise level. So we should record the soothing music, so if the person is having a disturbed sleep then it plays the recorded music so the person can have a better sleep.

SOFTWARE REQUIREMENT

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board.

The Arduino platform has become quite popular with people just starting out with electronics, and for good reason. Unlike most previous programmable circuit boards, the Arduino does not need a separate piece of hardware (called a programmer) in order to load new code onto the board -- you can simply use a USB cable. Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program. Finally, Arduino provides a standard form.

4. CONCLUSIONS

This paper presents the design of the wearable device. This smart band acts as a tracking device as well as it provides the information about the health condition of the victim using various sensors. Reports are sent to doctor. Both Alzheimer's and Sleep Apnea victims are benefited through this device. It is inexpensive and wearable.

Tracking the patient is also not a tough task. Since this is a real time tracking, the caregiver will get a message as soon as the patient goes out of a certain range. So this device will help them in a variety of ways. Saving money, time and also the caregiver's quality of life. And in future, more sensors can be added to measure some more parameters to make it still more effective.

REFERENCES

1. V.G. Girhepunje, Santosh D. Chede , "Realization of Low Power Telemedicine System to Monitor Temperature and Heart Beats" , 2015.
2. Sebastian, Neethu Rachel Jacob, Yedu Manmadhan, Anand V. R.,M.J. Jayashree , "Remote patient monitoring system", 2012.
3. Jun Liu ,Fei Xie, Yaqi Zhou , Qian Zou , Jianfen Wu," "A wearable health monitoring system with multi-parameters", 2013.
4. Brian Roark,Margaret Mitchell, John-Paul Hosom, Kristy Hollingshead, and Jeffrey Kaye, "Spoken Language Derived Measures for Detecting Mild Cognitive Impairment", IEEE Transactions On Audio, Speech, And Language Processing, pp 2081- 2090,Vol. 19, NO. 7, September 2011.
5. Kelvin Lee, David Murray, Danny Huges, " Extending Sensor Networks into the Cloud using Amazon Web Services", 2010.
6. Panduranga H V D S Suresh Rajendra C J R Sekar , " Interface Design for Multi Parameter Health Monitoring System Based on PLC",2015.
7. Raymundo Cassini, Tiago H. Falk, Francisco J. Fraga, Paulo A. Kanda and Renato Anghinah, "Towards Automated EEG-Based Alzheimer's Disease Diagnosis Using Relevance Vector Machines", 5th ISSNIPIEEE Biosignals and Biorobotics Conference (2014): Biosignals and Robotics for Better and Safer Living (BRC), pp 1-6,26- 28 May 2014.
8. Ahmad Akl, Babak Taati, and Alex Mihailidis, "Autonomous Unobtrusive Detection of Mild Cognitive Impairment in Olde Adults", IEEE Transactions On Biomedical Engineering, pp 1383- 1394, VOL. 62, NO. 5,MAY 2015.
9. G. Matar and J. Lina, "Unobtrusive sleep monitoring using cardiac, breathing and movements activities: an exhaustive review", IEEE Access, vol. PP, no. c, pp. 1–1, 2018.
10. Y.Yuce , K.Gulkesen, "A Novel Social Support Intervention for Locating and Securing Wandering Alzheimers Patients As Soon As Possible",IEEE Proceeding,IWCMC, pp.1405-1411,2013.
11. K.Lam, N.Tsang, "SmartMind: Activity Tracking and Monitoring for Patients with Alzheimers Disease" , IEEE proceeding, ICAINA, pp 453- 460,2015.
12. Y.Hsu, P. (Julia) Chung, M.Pai, "Gait and Balance Analysis for Patients with Alzheimers Disease Using an Inertial-Sensor- Based Wearable Instrument", IEEE Journal Of Biomedical And Health Informatics, Vol. 18, No. 6, pp 1822-1830, November 2014
13. H. Moreira , R. Oliveira , N. Flores, "STAlz: remotely supporting the diagnosis tracking and rehabilitation of patients with Alzheimers" , IEEE Proceeding, ICeHNAS, pp. 580-584, 2013
14. R. B. Berry, R. Brooks, C. E. Gamaldo, S. M. Harding, C.Marcus, and B. Vaughn, "The aasm manual for the scoring of sleep and associated events," American Academy of Sleep Medicine, 2018.
15. Miss. Smita S. Auti, Prof. Nagnath B. Hulle, "Advanced shoes with embedded position tracking and path guidance to keep track of Alzheimer's patients", International Journal of Scientific and Research Publications, Volume 5, Issue 1, January 2015.
16. C.P. Figueiredo, Student Member, IEEE, K. Becher, Member, IEEE, K.P. Hoffmann, Member, IEEE, P.M. Mendes, Member, IEEE. "Low Power Wireless Acquisition Detection of Obstructive Sleep Apnea Through ECG Signal Features".
17. Laiali Almazaydeh, Khaled Elleithy, Miad Faezipour, "Detection of Obstructive Sleep Apnea Through ECG Signal".
18. Module for Wearable Health Monitoring Systems." 978-1-4244-4124-2/10/$25.00 ©2010 IEEE.
19. Hui-Ling Lai PhD RN Director, Community Health Center, Buddhist Tzu-Chi General Hospital, Hualien, Taiwan, ROC, "Music improves sleep quality in older adults".