Real time Paralysis Patient Health MonitoringSystem using Wireless Communication

Saloni Tambakhe[1*], Vaishnavi Suryawanshi[2], Gauri Khadatkar[3], and
Corresponding Author- **Prof. K. S. Belsare**

Prof. Ram Meghe Institute of Technology & Research, Badnera, Amravati,India
+919373258753, salonitambakhe0192@gmail.com

Abstract

A survey of the Global Burden of Diseases (GBD) estimated that, approximately 5.8 million peoplelose their lives due to stroke. Stroke is the major cause of paralysis, which affects almost 33.7% of the population with paralysis. But there is no optimal tracking system to monitor the patient's healthand daily needs. In this high-speed world, it is not possible to constantly take care of their near oneswho need their help. To overcome such difficulties paralyzed patient monitoring equipment is introduced. During the survey we come across many hospitals and NGOs serving paralytic patientswith their whole or partial body disabled by the Paralysis attack. Those people in most cases are notable to convey their needs as they can't be able to speak properly nor can they convey through signlanguage due to loss in motion control in their brain. In this way the Automated Paralysis Patient Care System truly automates the care taking ability of the patient which ensures a timely attention to the patient and thus for a good health of the patient.

Keywords: *Wireless Communication, WI-Fi, IOT, Node MCU, Pulse-oximeter, Ardiuno Uno*

Introduction

The paralysis patients are unable to move their muscles for their purposes. There are so many symptoms and causes for this condition, especially spinal cord injury which affects the nervous system. There are some existing systems for individual comforts. But this system will help to monitor the overall need of the patients. Their messages will be displayed on the LCD screen. In this, we also have some sensors. The aim is to create a novel device which helps disabled people. Itwill help them to interact with other people with minimum efforts. This device may one day improve the lives of the people with paralysis. Even though, there are so many innovative approaches for curing these people, but here this will help them to adapt with paralysis by making them as independent as possible. Fortunately, the last decade has seen promising technology advances to address these concerns. In addition, the accelerometer will also give a buzzer sound when patients fall on the floor. In this project we using Wi-Fi module which is Wi-Fi serial transceiver module, based on ESP8266 SoC. This chip implements a full TCP/IP protocol stack and the very interestingfeature is that it has also a great computational power onboard. That means that you can use this board as a simple Wi-Fi connection board, offloading the main processor of your controller from

the Wi-Fi communication management. Location information plays an important role in most of theapplications in Wireless Sensor Network (WSN). Recently, many localization techniques have beenproposed, while most of these deals with two Dimensional applications. Whereas, in Three Dimensional applications the task is complex and there are large variations in the altitude levels. Inthese 3D environments, the sensors are placed in mountains for tracking and deployed in air for monitoring pollution level or health monitoring.[17] The Internet of Things (IoT) concepts have been widely used to interconnect the available medical resources and offer smart, reliable, and effective healthcare service to the patients. Health monitoring for active and assisted living is one ofthe paradigms that can use the IoT advantages to improve the patient's lifestyle. Our proposed system is to help the paralyzed patient to convey the basic requirements and emergency messages by just moving the finger to display the required message in order for the patient to be motivated asmuch as possible. It also consists of a beep sound to alert the attender when a message is displayed.

Literature Survey

The opportunity for patients to have constant monitoring of their health state is now possible by means of intelligent sensors [1]. The continuous monitoring of health status is a fundamental practice for paralytic patients. In a hospital either the nurse or the doctor has to move physically from one patient to another for continuous health monitoring, due to which it is not possible to monitor one patient continuously[2]. Thus, any critical condition cannot be identified unless the doctor or nurse checks the patient's health at that time[3]. So, a system is developed to convey a message from patient to person monitoring his health [4].

Another author, Anetha K.et.al., presented different ways to recognize hand gestures and sign language. It has been proposed by various researchers in the past. Sign language is the only option for the hearing impaired and mute communication. These disabled people use sign language to express their feelings and thoughts. To others [6]. Priyanka R. Potdar et al. proposing a system that supports communication between hearing-impaired people and dam's Human communication with ordinary people whose hand gestures are transformed using Indian Sign Language (ISL) Matching SMS. The main goal is to design an algorithm that converts dynamic gestures into text inreal time. Once tested, the system will eventually be implemented on the Android platform and available as an application. For smartphones and tablet PCs [7].

Another author proposed a hand gesture system based on real-time vision Detection of human-computer interactions in many applications. The system can recognize 35 different hand gestures Itis provided faster and more accurately by Indian Sign Language and American Sign Language, or ISL and ASL. RGB to GREY .A segmentation technique was used to minimize the possibility of false positives. The authors suggested a method Features were extracted using the same improvisedscale-invariant feature transformation (SIFT). The system is exemplary Use MATLAB. The GUI model was developed to design an efficient user- friendly hand gesture recognition system. Implementation [8]. Information analysis cooperation, intelligent aid diagnosis, healthcare information technology, and patient monitoring are the four most recent developments in this field.[16]. The Internet of Things (IoT) platform offers a promising

technology to achieve the healthcare services, and can further improve the medical service systems. IoT wearable platforms can be used to collect the needed information of the user and its ambient environment and communicate such information wirelessly, where it is processed or stored for tracking the history of the user. Such a connectivity with external devices and services will allow for taking preventive measure (e.g., upon foreseeing an upcoming heart stroke) or provide immediate care (e.g., when a user falls and needs help).This paper proposes a system that converts identified signals into actions using 2 interfaces namely distance sensor interface for actions such as volume control, scrolling, keyboard shortcuts. The actions of the mouse are controlled using user's fingertip. The system uses binary crystal growth algorithm for its working and the recognition algorithm used for recognizing gestures [5].

This paper proposes a device which interprets sign language for English alphabets. The data is collected using data collection module, then data is mapped to its corresponding sign and sign is converted into alphabets. This system uses the dynamic time warping (DTW) and nearest mapping algorithm which translates data into English alphabet and compare the acquired data with trained data set to identify the most appropriate sign.[9]

Block Diagram

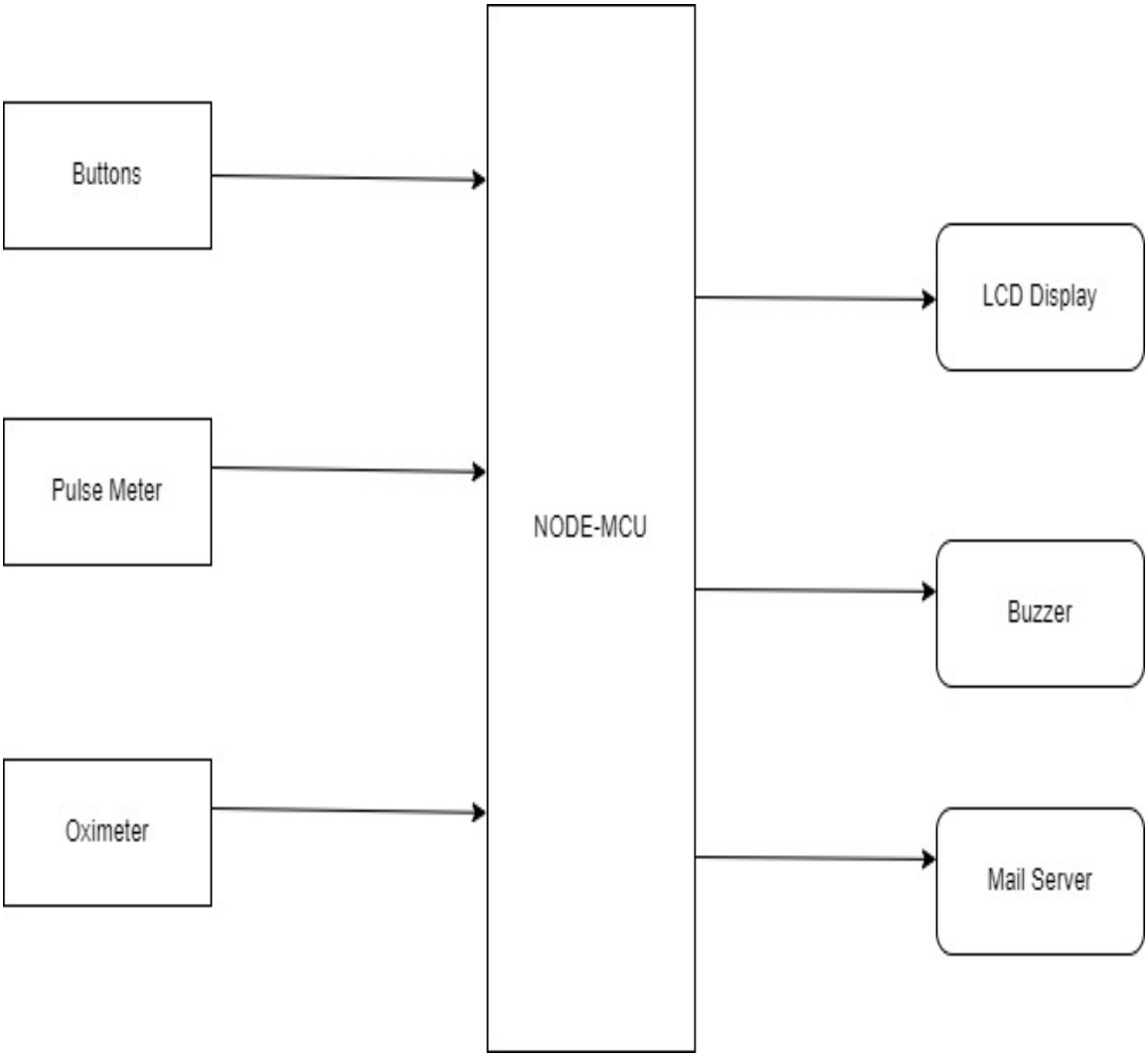

Figure No 1 : Block Diagram of Proposed System

Proposed Flowchart

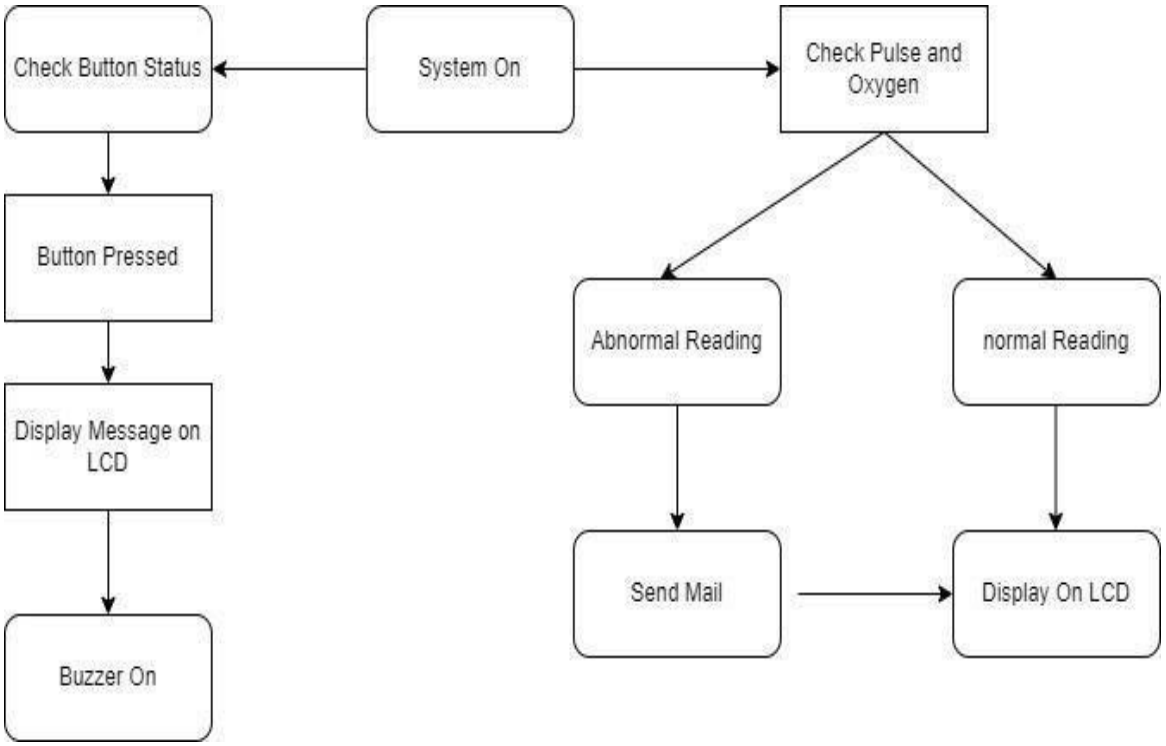

Figure No 2 : Proposed Flowchart

Existing Problem

Paralytic patients who have their whole or partial body disabled by the Paralysis attack. These peoplein most cases are not able to convey their needs as they are neither able to speak properly nor do they convey through sign language due to loss in motor control by their brain.

Hardware Implementation

There are several existing systems available for patients with paralysis but this system helps to constantly monitor and understand the patient's needs. The sensor in the system aids to transmit thepatient's message, and the message is displayed on the LCD display. The message will change according to the position of the accelerometer. We must then know their needs and assist them on the basis of their needs. The temperature sensor, humidity sensor and pulse meter were used in thissystem. These sensors should be for patients with issues, or gloves; they can feel the temperature ofthe patient, moisture and pulses. If the patient is in a critical situation, it will soundalert with a buzzerwhen the patient is on the floor or when the pulse speed is above normal levels. This system can helptreating patients suffering from paralysis, and it's also very cheap and easy to buy without debts.

Hardware Use-

Node-MCU – Node MCU is an open-source LUA based firmware developed for the ESP8266 wi- fi chip. By exploring functionality with the ESP8266 chip, Node MCU firmware comes with the ESP8266 Development board/kit i.e. Node MCU Development board. It supports serial communication protocols i.e. UART, SPI, I2C, etc.

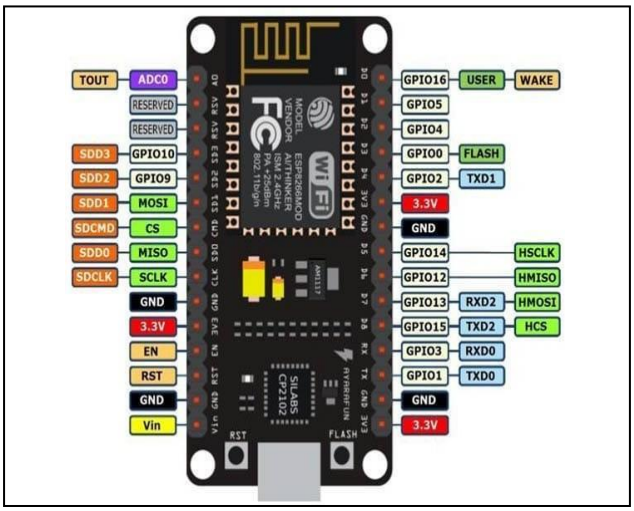

Figure No .3 Node-MCU

LCD Display - LCD (Liquid Crystal Display) screen is an electronic display module and find a widerange of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over given segments and other multi segment LEDs. The reasons being LCDs are economical easily programmable, have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

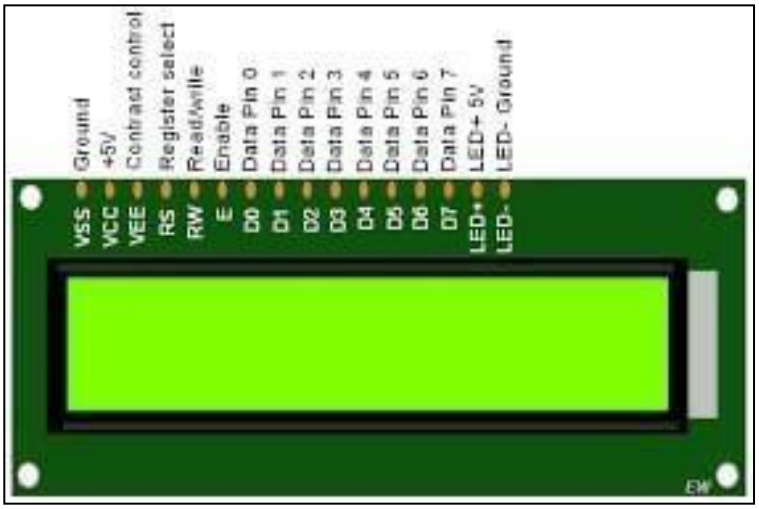

Figure No .4 LCD

Pulse-oximeter (MAX30100) - MAX30100 is an integrated pulse oximeter and heart rate monitor sensor solution. It's an optical sensor that derives its readings from emitting two wavelengths of lightfrom two LEDS-a red and an infrared one-then measuring the absorbance of pulsing blood througha photodetector This particular LED color combination is optimized for reading the data through thetip of one's finger it is fully configurable through software registers and the digital output data is stored in a 15-deep FITO within the device. It has an (2C digital interface to communicate with a host.

Figure No .5 Pulse-oximeter

Proposed Methodology

This project will be available for monitoring at the operational levels. The normal heart beat range ofa paralyzed can be nearly 60-100 beats per minute. If the range goes below 60, it may lead to heart block, syncope and when the range goes above 100, it may lead to anxiety and tachycardia. So, when it increases or decreases the status of the patient pulse rate will be intimated. The oxygen level of aparalyzed patient shall be above 93%. If the range reaches below 93%, it leads irrational thinking and health problems. This can be measured to know the fall in oxygen. The normal respiratory rateof a paralysis can be nearly 12-20 breathes per minute. The rate is usually measured when a person is at rest and simply involves counting the number of breaths for one minute by counting how many times the chest rises. If the paralysis increases for the paralyzed patient, then the respiration increases

.this can be the basic parameter of the paralyzed. If the respiration rate increases or decreases 12-20breathe per minute, it will be intimated. All the basic parameters are monitored and if there is a dangerous change in paralyzed patient's status then a message will be intimated to the doctor and caretaker about the condition of the paralyzed. This contribution of paralysis monitoring system is for better process management, superior flexibility and increased efficiency within hospitals is further underlining the appeal of wireless networking options for paralysis patient monitoring systems.

Data Acquisition is carried out by the sensors that measure the various physiological data and carries these bioelectrical signals to the microcontroller. Data Transmission Typically the data collected by the microcontroller is transmitted to the internet using IoT module and an SMS can besent to the caretaker if any critical parameter is recorded. Individual sensor's data can be accessed via computer or mobile connected to internet. Cloud based Processing Diagnoses and prognosis of a number of health conditions and diseases can be done using the sensor data. Long term storage of patient's health information can be done and the health information can be accessed using internet

The IOT just is the web of stuff. Independent technologies can collect and transmit data without human intervention via a wireless network. There are endless personal or business opportunities. In the health care industry, remote monitoring has been possible with IOT-enabled devices that release the possibility of keeping patients safe and healthy and that enable doctors to provide superlative health care. Respond to and enable physical objects to collect information and respond to instructions. To collect, store, handle, manipulate, and manipulate data. The communications infrastructure that includes protocols and technologies that permit two physical objects to exchange at his most important. We used Mysql and PHP as a simple and easy-to-use IOTplatform for data storage, data viewing and device control. By using some backend program, we sentan alert on mail, Connect the respective sensors to a node MCU which gets connected to a database.

By using this value, we can monitor the data gathered by the sensors. Based on the patient needs it will give sound and the output will be displayed on the LCD display and if the patients pulse or oxygen become abnormal it will be displayed on the lcd which will be monitored continuously. Also, a mail will be triggered.

Proposed Solution

The proposed solution of our system is to help a person adapt to life with paralysis by making themas independent as possible. Where we see a problem with these types of devices that are being developed is that they are very large and expensive machines. They seem to be only available in hospitals and not able to be used at the patient's home or at their convenience.

Experimental Results

This is the result of 3 IR sensors in which we get result of paralysis patient who need food, water and if patient wants to go to washroom, as shown below

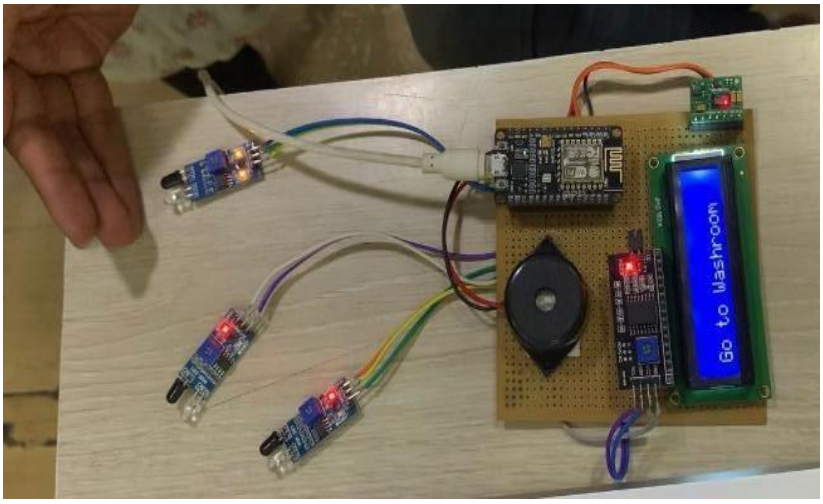

Figure No 6.a : Output of IR Sensor 1 Go to Washroom

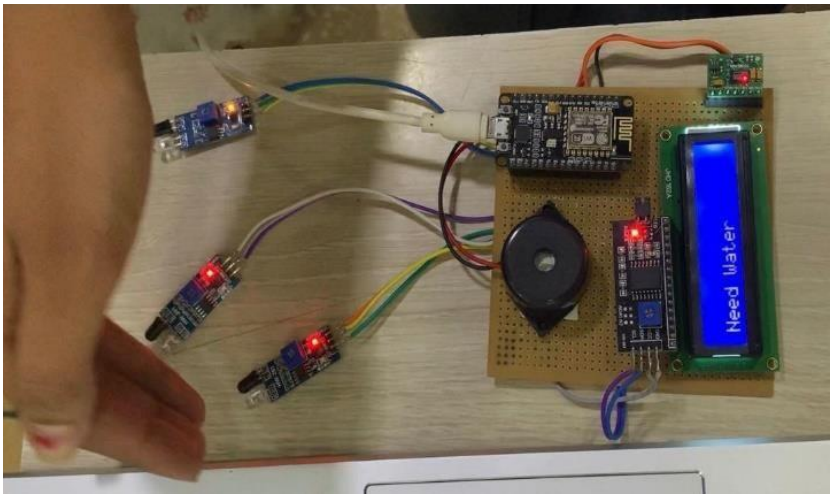

Figure No 6.b : Output of IR Sensor 2(Water)

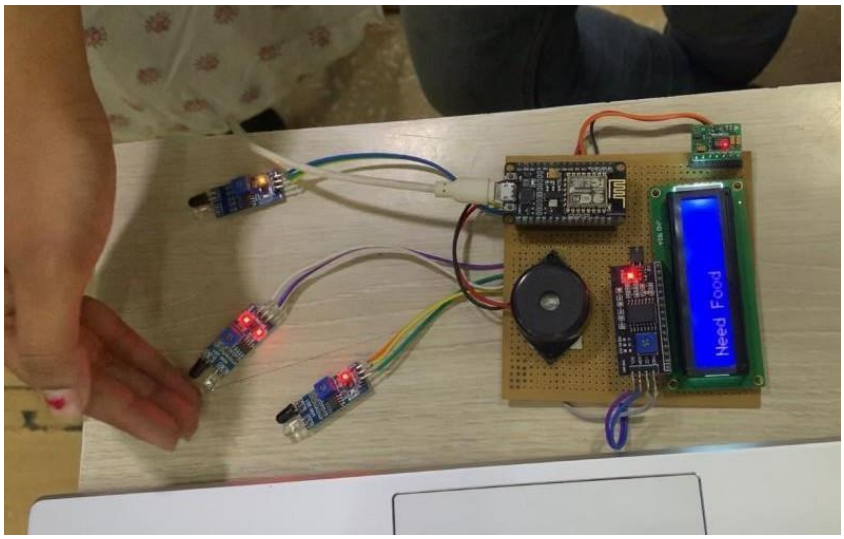

Figure No 6.c: Output of IR Sensor 3 (Food)

OUTPUT TABLE

Sr No	Age	Heart Rate (BPM)	Respiratory Rate (Breaths/min)
1	0-5 months	30-150	25-40
2	6-12 months	80-140	20-30
3	1-3 years	80-130	20-30
4	3-5 years	80-120	20-30
5	6-10 years	70-110	15-30
6	11-14 years	60-105	12-20
	14+ years	60-100	12-20

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Table No 1: Heart Rate and Respiratory Rate for Different Ages

Sensors	Pin Connection	Output of Sensors	Time Required
IR1	Connected to NodeMCU-D4, VCC,	Go to Washroom	74 µs
IR2	Connected to NodeMCU-D5, VCC,	Need Water	82 µs
IR3	Connected to NodeMCU-D6, VCC,	Need Food	94 µs

Table No 2: Output Table of Sensor and Time Period

Sensor	Pin Connection	Output of Oximeter	Time Required
Oximeter	VCC - VCC GND - GND SCL - D1 SDA - D2	To Detect Pulse of Patient	28 µs

Table No 3: Output of Oximeter sensor along with connection pins

Conclusion

To achieve independence in mobility for people with physical disability, right mobility equipment has to be designed based on the severity and type of disability. This is not a trivial job just because the nature and type of disability varies from person to person. So different methods areessential to help those peoples and as future engineers it is our duty to develop newer technologies to assist paralyzed patients.

The primary objective of this paper is to develop an IoT based health monitoring system that able to provide health data monitoring of the user. The proposed system is able to send the health data to the visualization platform in real-time, and sends alarm notifications to emails. User'srelatives or authorized users are able to view the health data of the patient. The alarm notifications can be sent to any related personnel when there are sudden changes in heart rate and abnormal bodytemperature. The health data are stored in a local and cloud database, which allow the user to keep track of their health condition by tracking the health data.

Future Scope

In future, we can use the chipset to implement this system. All parts are integrated in the chip, so that we can. This chip fits easily with the patient with paralysis Gloves and bands avoid clothes. But there is one disadvantage that will happen increase cost but the increase.

The LM35 temperature can be included as a cheap alternative for body temperature monitoring. The temperature output of the LM35 temperature sensor is not reliable since the outputsof the sensor fluctuates a lot during the experiment. As a result, false alarms may be triggered fromtime to time which reduces the reliability and efficiency of the health monitoring system. Besides, other medical sensors such as ECG sensors and blood pressure sensors can be added into the systemto improve the functionality of the system. The users will be able to track their health conditions better if the system is capable of tracking more other health data accurately.

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