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Design of Wireless Electromyography Monitoring System for Muscle Activity Detection on Parkinson's Disease

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Abstract - *Parkinson's disease is affecting the elderly people nowadays, the main symptom of this disease is being resting tremor. People has to go to the clinic regularly to treat the disease and take medication. The objective of the project is to detect the Parkinson's disease using EMG sensor and store the data on cloud proving the patient help button, buzzer and medication notification either to guardian or to the patient. It is very important to predict and treat the disease at the early stages. The proposed system uses the EMG sensor to monitor the Parkinson's disease and NodeMCU as a microcontroller and ESP8266 as a WiFi module and Blynk application for setting up notification.*

1.INTRODUCTION

Parkinson's disease is a neurological disorder that effects the lives of patient and their families. With researches it is said that the people over sixty are been affected with this disease. Actually, it has no cure only a proper diet and medication is necessary at the starting stage. Most of patients will be obsessed with visiting to the clinic frequently. Parkinson's disease is caused due to lack of dopamine neurons in the body as dopamine neurons control body movements. Parkinson patients will have issue in doing all the daily activities and causes tremor in hands and legs. Medical specialty tests and brain scans are done to diagnose it. Victimization voice analysis malady is diagnosed remotely at an early stage with a lot of reliability and economic way. Diagnosis of Parkinson malady is extremely tough and no diagnostic science laboratory tests are accessible. These strategies are terribly costly and want high level of experience. Some physical identification can even be done however patients are needed to be ascertained for an extended time and this identification provide results once nearly eightieth of dopamine gets terminated. Concerning seventieth of individuals with Parkinson shows tremor that's most distinguished in hands and fingers. Stiffness within the muscles, slowness of movements and lack of coordination whereas doing daily routine activities also are vital signs of Parkinson. The disease is caused by genetical issues or environmental factors, genetic issue is one amongst the reason for this malady.15% of the patients have their case history.

2. PROPOSED SYSTEM

The proposed system aims to record and detect the muscle activity on Parkinson's disease patients using the some of the sensor like Electromyography (EMG) for the muscle activity detection. Here the EMG sensor can detect the development, recordings and analysis of the Patients condition. According to Parkinson's disease here we can development the early stage detection of the Patients condition. There is necessary to give better drugs to Patients who are suffering from the Parkinson's disease. because Parkinson's disease is the one of world's second most common Neurogenerative disease. Parkinson's disease caused by the Some of deficiencies. Patients cannot walk properly, lack of energy, resting tremor, muscle rigidity can cause difficulty to stand and walk. So we are using the EMG sensor that is attach to the left hand of the Patients.so this sensor the doctors can observe the Patients health condition by the graph level. by Observing the graph doctors can start the treatment to Patients. Now the covid-19 situation the Patients cannot go to the hospital so this method is very useful for aged people. we are also giving the alert messages through the respective mobiles to Patients home. we are giving the tablets alert messages to Patients for the by the buzzer. They want to take tablets on conditionally otherwise the doctors can observe and inform by messages through the Patients home.in this research people are comfortable to take treatment on time.

3. METHODOLOGY

Electromyography (EMG) is an experimental method related to the developments, recordings, and analysis of the

myoelectric signal, a signal formed by the activity or physiological variation of muscle fiber membrane. Myoelectric signal is one of the many forms of bio potential signals.

The components used in the design of the following wireless EMG hardware includes NodeMCU as the microcontroller equipped with an ESP8266 Wi-Fi module as a wireless component, Muscle Sensor as the main EMG sensor, three Ag-AgCl surface electrodes as the Transducer, and power, connected using a USB cable. Fig. 1 shows the illustration of the overall wireless EMG circuit used. The signal acquisition process starts from the Ag/AgCl electrodes as the transducer that captured the bio potential Signals of muscle (EMG signals) found on the surface of the skin. Afterward, the signal would be received by Muscle Sensor for amplification, rectification and integration. The acquired signal will be displayed on the IoT server-based monitoring system contained in ESP8266. Blynk is used for the following data logging is divided into two parts, namely the part that displays the GUI and the other part that reads the data acquired by the sensor. However, the signal is able to be displayed on a PC monitor or smartphone via the IoT server.

Help button is provided to be pressed in an emergency cases or in any trouble. Blynk is also used to have the timer interval for medicine take up.

4. MODELLING AND ANALYSIS

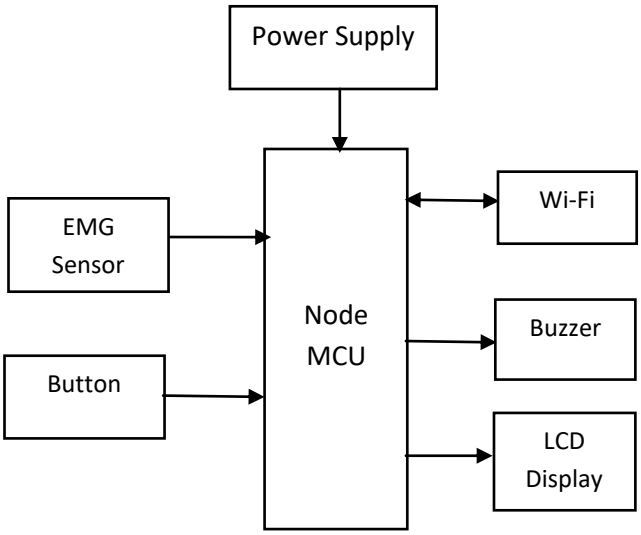

Figure -1: Block diagram

NODEMCU: The ESP8266 is the name of a micro controller designed by Espressif Systems. The ESP8266 itself is a self-contained Wi-Fi networking solution offering as a bridge from existing micro controller to Wi-Fi and is also capable of running self-contained applications. This module comes with a built in USB connector and a rich assortment of pin-outs. With a micro-USB cable, you can connect NodeMCU devkit to your laptop and flash it without any trouble, just like Arduino. It is also immediately breadboard friendly.

Figure -2: NodeMCU

EMG Sensor: EMG Muscle Sensor Module V3.0 With Cable and Electrodes will measure the filtered and rectified electrical activity of a muscle; outputting 0-Vs Volts depending the amount of activity in the selected muscle, where Vs signifies the voltage of the power source. Power supply voltage: min. +-3.5V. By detecting the electromyogram (EMG), measuring muscle activity has traditionally been used in medical research, however with shrinking but more powerful microcontrollers and integrated circuits advent EMG power Road and sensors can be used for various control systems. This Muscle Sensor v3 measures, filters, rectifies, and amplifies the electrical activity of a muscle and produces an analogue output signal that can easily be read by a microcontroller, enabling novel, muscle-controlled interfaces for your projects.

Figure -3: EMG

BUTTON: When button is pressed a help message is sent to the guardian or any concern person.

Figure -4: Button

LCB: This is 16x2 LCD display screen with I2C interface. It is able to display 16x2 characters on lines, white characters on blue background. Usually, LCD displays projects will run out of pin resources easily, especially with any board. And it is also very complicated with the wire soldering and connection. This IC2 16x2 LCD Screen is using an I2C

communication interface. It means it only needs 4 pins for the LCD display: VCC, GND, SDA, SCL. It will save atleast 4 digital/analog pins on the board. All connectors are standard XH2.54 (Breadboard type). You can connect with the jumper wire directly.

Figure -5: LCD

POWER SUPPLY: A power supply is an electrical device that supplies electric power to an electrical load. The primary function of a power supply is to convert electric current from a source to the correct voltage, current, and frequency to power the load. As a result, power supplies are sometimes referred to as electric power converters. Some power supplies are separate standalone pieces of equipment, while others are built into the load appliances that they power. 5V 2A Power Adapter takes an AC INPUT of 100-240V and gives 5V 2A DC output.

5. RESULTS AND DISCUSSIONS

Figure 6 shows the observing framework program that is effectively executed for the instance of one ordinary individual's EMG information to guarantee that the information can be moved and generally welcomed by means of the WiFi stage. The observing framework preliminary is done in two conditions, specifically wired and remote. In wired condition, the information is effectively shown on the page as per the orders on the source code utilized, which is information/second. Notwithstanding, during the remote preliminary, the gained examining esteem is less steady than it is in wired. Despite the fact that the framework has effectively shown information/second during persistent time, at a specific time, it would change to a lower esteem. In any case, steady or not, the yield acquired in these remote conditions is still reliant upon the web association or Wi-Fi that is utilized for the NodeMCU. In the event that the switch is being gotten to by numerous gadgets without a moment's delay, it would influence the exhibition of the remote program.

To think about the discoveries, Figure 7 portrays the EMG chart with accurate information procured from the checking framework's table, replotted on the graphical view.

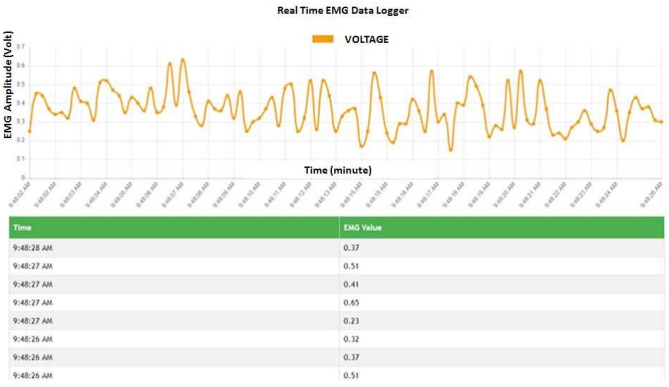

Figure -6: EMG monitoring system display interface

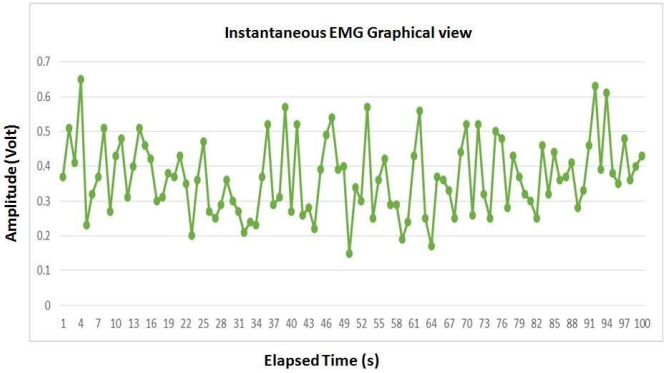

Figure -7: EMG monitoring system program display is replotted on the graph.

6. CONCLUSION

In our study, a system using IoT is finally developed where different parameters are taken into consideration to measure and determine the current health status of a person. The use of connectivity of different sensors in a network to monitor the data remotely has solved many issues regarding the unwillingness of people to visit the clinics. In this way, people can work as per their busy lifestyles as well as receive medical care simultaneously. The doctors can prescribe the medicines based upon the time of medicine to be taken, timer is set for notification. The monitoring system that utilizes NodeMCU with ESP8266 and IoT server has been developed. Data acquisition and EMG signal data processing on wireless EMG will be carried out with NodeMCU as the compiler component in an IoT server-based monitoring system. The monitoring system provides real-time data and medicine reminder for the guardian and patient.

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