Available online @ https://jjem.jnnce.ac.in
https: www.doi.org/10.37314/JJEM.SP0203
Indexed in International Scientific Indiexing (ISI)
Impact factor: 1.395 for 2021-22
Published on: 08 December 2024

IoT-driven Parkinson's disease identification

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Abstract

Parkinsons' disease is one among the central nervous system illnesses. This is the primary issue in old age people. Early detection of this illness could be beneficial for effective treatment and management. Patients may fall anywhere or anytime due to this disease, which can lead to a critical situation or death. To stay clear of all these issues, this work helps to develop an IoT-based wearable device that identifies the fall and informs their family members or caretakers. To identify the fall, the wearable device may include a MAX30102 sensor and a MPU6050 sensor. An Arduino UNO receives data from these sensors and sends information by using a GSM module; it may be in the form of a message, an alarm, or a call. Here, the project mainly focuses on the development of wearable devices. A wearable device must be sensitive and accurate.

Keywords: *Parkinson's disease, wearable-device, max30102, mpu6050, Arduino uno, gsm module.*

1. Introduction

One of the neurological conditions that is currently fastest-rising is the illness known as Parkinson disease (PD), which is connected to various other illnesses. It is usually founded on a clinical observation and evaluation of a client's health, and dopamine insufficiency brought on by the death of cells is the root cause of it. There is also a problem with the interplay between genetic and environmental factors that produce it. However, not been clearly known what exactly the causes and why of this condition are. The autonomic nervous system is a system comprising several cells that act to join the central part and the outermost of the human brain. One might frequently fall as a result of this identification of Parkinsons' illness. At the age of sixty, some people are severely suffering from this PD. For each of these people, a diagnosis was made before the age of fifty. Abnormal body movement and persistent degeneration of brain cells may also cause this PD. The device can identify falls via wearable sensors. Fall detection will be aided by these sensors. The proposed study would use sensory inputs to provide PD patients with an efficient IoT framework. A system of monitors or gadgets that are networked collectively so they can acquire procedures and convey knowledge instantly is known as the internet of things. The system we use continually monitors various metrics by utilizing sensors in addition to other internet of things components. Real-time monitoring is one of the primary benefits of the IoT-based Parkinson's disease identification system. It helps gather enormous amounts of data over time and provides precise and comprehensive information on the patient's problems. Sharing important details with family members will be simple with this Parkinson's disease identification system. By giving warning messages to family members, it reduces the effect of an unexpected fall,

improving the overall well-being and safety of PD patients. It can be partially correlated with reducing the burden on the healthcare system, which is another crucial objective.

1. Literature Survey

In related study includes a number of technologies and methodologies have been reviewed [1] Akhila H et al. (2023) proposed the technique of machine learning and IoT in a Parkinson disease fall detection system although it provides early detection and therapy for Parkinson disease. PD an official diagnosis should always come first the technology will track the current state of that particular Parkinson's disease patient and provide real-time updates for fall detection its main components are an ESP32 and an accelerometer the tool will notify family members of the patient in the instance that a fall is detected. [3] for patients with Parkinson disease Hashim, Huda Ali et al. (2020) have created an accurate falls detection technique via nodes with wireless sensors and an event algorithm and they used a receiver node a Myoware detector and an accelerometer as wireless measurements in that the entire system is user-friendly lightweight and power- efficient the main flaw with this suggested method is that it's limited in its operational range. [6] Ozcan et al 2013 suggested automated identification of falls activities categorization utilizing connected to your body integrated intelligent cameras an approach for integrated lens design uses citric the main objective of the crossbow telos mote in this work is to transmit data without wires the fall rate for identification with this embedded technology is 86.66%. [9] In order to provide home security Yu suggested a computer vision-based approach to body position assessment and fall detection. It only takes one camera the low detection rate and the inability to track the body if the camera is out of focus are the two key drawbacks additionally the expense for the lenses outside sensing is going to be considerable [2] Patel et al even developed wearable sensor-based software to track patient fluctuations assistive vector machines once a film has been evaluated support vector machines (SVM) are utilized to compare and classify clinical assessments for various motor task categories the primary flaw with this system is that it makes use of eight interconnected sensors to estimate the fall. [4] using a range of internet of things devices and the client-server design Nooruddin et al created a connected device type invariant fall identification system several of these iot gadgets internal parts comprise Arduino and nodeMCU smartphones and raspberry pis a working network connection among the client machine and the server is required for this method the customers machines restricted ability to detect falls only happens when the device is oriented left or right which is another significant drawback the machine learning model operating on the server then assesses the data received from the gadget in order to identify whether or not the fall is truly occurred [7] this research primarily focuses on smartphone explanations as proposed by Hassan et al in for an elderly populations fall detection technique in the section that follows the input data from audio is categorized after that the techniques of machine learning model is applied to ascertain whether a patient has Parkinson disease the model analyzes the sensory inputs from the smartphone to identify falls for this it uses the mobiact accessible data set which is a conventional combination deep learning model intended for online fall identification this method can occasionally result in inaccurate measurements and in situations where specificity is lacking family members are misinformed [5] Gai et al. suggested an a low-power node as sensors for the iot-driven fall alert device the internet-based communication protocol acts as its general structure and compares modern electronics to portable technologies. [8] by applying an artificial intelligence acquiring

technique M Shahidul Islam et al offered a smartphone-based fall prevention system to assist individuals suffering Parkinson disease pd the investigation suggests utilizing sensors on your smartphone with neural networks to find a fall visibility method. [10] S Y Seo et al proposed a method that uses inertial measuring devices and neural networks to identify falls among individuals who have Parkinson's disorder this research uses various algorithms for machine learning.

2. Methodology

This study established a wearable device, this technique used to recognize Parkinson's sickness. The development of this wearable device includes an Arduino UNO microcontroller which monitor the overall system, a MPU6050 sensor, a MAX30102 sensor, a GSM module which transmit the message about the condition of PD patient to their family member or a guardian, a buzzer and a power source are necessary hardware components. The connection established between all these components through jumper wires.

2.1 Hardware specification

2.1.1 Arduino UNO

Fig 2.1.1 Arduino UNO

Electrical equipment for identifying obstacles environment scanning and navigation assistance is managed by an Arduino uno.

2.1.2 Accelerometer

Fig 2.1.2 Accelerometer

A person or anything going while within their immediate remainder frame is tracked by a kind of detector named a velocity sensor a speed that isn't continuous this is useful for a lot of different kinds of electronics particularly telephones and connected technologies.

2.1.3 MAX30102

Fig 2.1.3 MAX30102

This one likewise analyzes or tracks the rate of your heart but it may also serve as a pulse oximeter as well it includes a computer-controlled instrument aimed at enhancing the transparency of the information produced a sensor in the infrared range that emits luminescence and also a heart rate monitor that requires a voltage source between 18 and 33 volts to operate.

2.1.4 GSM Module

Fig 2.1.4 GSM Module

GSM component provides an item which allows particular interactions across cellular networks utilizing GSM technology.

2.1.5 Buzzer

Fig 2.1.5 Buzzer

A gadget that runs on electricity is called a buzzer because it vibrates and normally operates in the 5 volts to 12 volts electrical energy spectrum its main purpose is to function as an aural alarm or warning system.

2.1.6 Power supply

Fig 2.1.6 Power supply

It powers the board in a number of ways straight hooking within a controlled power source device via an ac adapter a USB cable or a battery all Arduino boards use electricity.

2.2 Block diagram

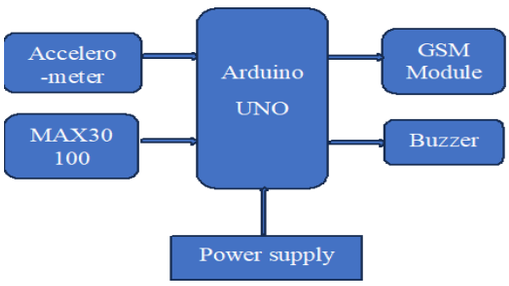

Fig 2.2 Representation of module

The above figure explains that the inputs to an Arduino uno from an accelerometer and a max30102 sensor are used to detect Parkinson's disease through the monitoring of motions and vital signs of the patient, the max30100 sensor monitors blood oxygen level and pulse rate while an accelerometer detects motion patterns. The subject to identify any types of tremors or abnormal motion if the Arduino detects aberrant movement patterns or irregular health metrics that point toward the symptoms of Parkinson's disease it immediately turns on a buzzer to alert the patient further using a GSM module it sends an SMS to a selected guardian or family member to update them in real time for timely assistance. If required it improves patient safety by making possible continuous observation and tracking potential health problems on time.

3. Results

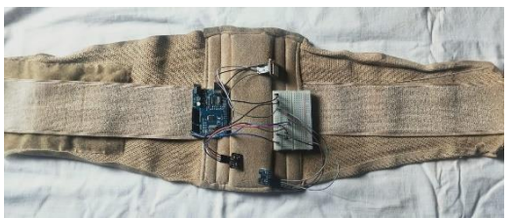

Fig 3. Fall detection device

Enhancing Parkinson's detection and therapy can be greatly aided by integrating an accelerometer, a max30102 sensor and a GSM module into an internet of things architecture. The context of addition to providing important data regarding a patient's condition occasional constant surveillance can aid in timely identification improved treatment with the use of cutting-edge iot technologies this integrated strategy provides an effective answer to medical problem.

4. Conclusion

A powerful method for tracking and identifying the wellness of parkinsons disease patients makes use of an internet of things architecture that combines a GSM module an accelerometer and the max30102 sensor heart rate and pattern of movement readings can continuously trigger early warning signs of parkinsons disease by detecting falls in real-

time which is prevalent in Parkinson disease patients this improves patient safety and instantly notifies a family member or guardian. This will not only offer continuous real-time health monitoring but it will additionally effectively enhance the early diagnosis duty because of this the wireless internet of things system represents a significant advancement in the proactive and remote handling of Parkinson's disease using current tech.

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