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Smart Wearable Monitoring System for Alzheimer's Patient

Bhoomika M M[1] Chaithrashree G[2] Prajwal G S[3] Sahana G D[4] Yogesh N[5]
[5]*Assistant Professor*
[1,2,3,4,5]*Department of Electronics & Communication Engineering*
[1,2,3,4,5]*Vidya Vikas Institute of Engineering & Technology, Mysuru, India*

Abstract— *Elderly people need 24-hours care support and supervision for their physical disability and mental weakness. With the ever-growing number of the elderly people with such kind of disorder this section needs some importance. But 24-hours caring, nourishing and monitoring can't be provided by the family members and caregivers because of their daily affairs. Therefore, with the help of portable smart wearable monitoring devices it will be easier to detect emergency situations and monitor the wellbeing and conditions of elderly people, allowing them to stay independently as long as possible. Here the system is developed to make sure when any fall occurs or when the emergency button is pressed, it should be correctly detected and the alert of this is sent to the mobile. This leads to very small and cost-effective solution such as a wearable device that can be synchronized with recent technology such as Internet of Things (IoT) for security measures. We are using sensors, Internet of Things to connect the sensors with real time application, Blynk application to alert the caretaker through messages and a GPS module for real time tracking of the user.*
Key words: *Alzheimer's disease, smart wearable medical device, fall down alert, Internet Cloud access, health care aids, Wi-Fi micro controller*

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I. INTRODUCTION

Alzheimer's disease is a brain disorder that slowly destroys memory and thinking skills and, eventually, the ability to carry out the simplest tasks, it is still incurable. The disease is named after Dr. Alois Alzheimer. In 1906, Dr. Alzheimer noticed changes in the brain tissue of a woman who had died of an unusual mental illness. Her symptoms included memory loss, language problems, and unpredictable behavior. After she died, he examined her brain and found many abnormal clumps (now called amyloid plaques) and tangled bundles of fibers (now called neurofibrillary, or tau, tangles). These plaques and tangles in the brain are still considered some of the main features of Alzheimer's disease. Another feature is the loss of connections between nerve cells (neurons) in the brain. Neurons transmit messages between different parts of the brain, and from the brain to muscles and organs in the body. Many other complex brain changes are thought to play a role in Alzheimer's, too. The emotional and psychological repercussions are distressing for both patients and relatives.

It has been reported that the progression of AD takes 12 years in three stages. The first stage, which lasts one to three years, starts with signs of aberrant biomarkers and recurring mild to moderate cognitive problems. In the second stage (three to ten years), the AD patients suffer from temporal memory loss, repetitive moderate cognitive impairment, and the presence of pathophysiological biomarkers. Eventually, the third stage, which is also called dementia, persists for eight to twelve years. Regrettably, AD patients will likely suffer apparent memory loss, evident cognitive deterioration, and frequent unexpected aberrant biomarkers. Further research suggests that cognitive, behavioural, sensory, and motor changes may begin to appear prior to the appearance of clinical symptoms of AD several years in advance. Unfortunately, AD's prevalence is expected to influence around 74.7 million people by the year 2030. The wandering of elderly people with dementia is one among the numerous behavioural problems and largest concern for the caretakers and family. As such, new applications using various technologies like Internet of Things (IOT) provide safety and security to dementia affected people.

II. METHODOLOGY

IoT-based health monitoring with GPS live location is a system that uses connected devices to monitor a person's health and location in real-time. This system is designed to track the vital signs of a person, such as heart rate, blood pressure, and temperature, and send that data to a cloud-based server for analysis. In addition, the system uses GPS technology to track the person's location and provide real-time updates on their whereabouts.

This system is set to measure AD patient's temperature, pulse rate, SpO2, acceleration, angular velocity and GPS location every 10 seconds and share the readings through the blink with medical care providers. The fall down of the AD's patient can be detected when the gyro/accelerometer sensor reads up normal values for acceleration and angular velocities. The heart rate and the Oxygen saturation (SpO2) in blood are measured using BPM &SPO2 sensor.

The system consists of several components, including wearable devices such as smartwatches or fitness trackers that capture the person's vital signs, a microcontroller that collects and processes the data from the wearable devices, and a cloud-based server that stores and analyzes the data. The system also includes GPS-enabled devices that can track the person's location, such as a smartphone or GPS tracker.

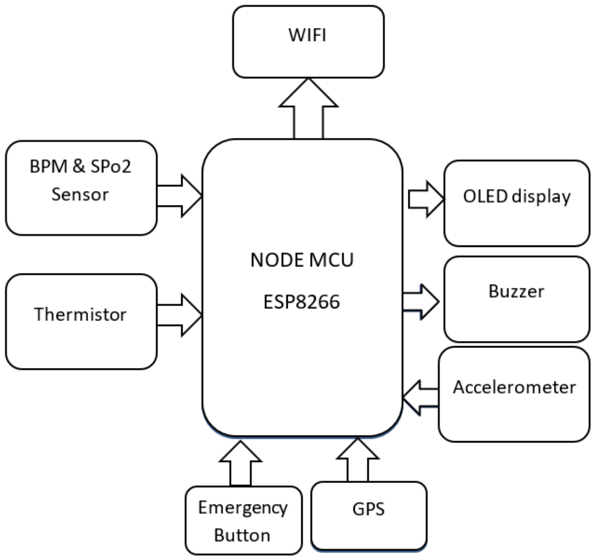

Fig 1: Block diagram of smart wearable device

The IoT-based health monitoring with GPS live location system has several benefits. It provides real-time updates on a person's health and location, which can be used to monitor the health and safety of elderly people or individuals with chronic illnesses. The system can also be used to track the location of children or individuals with cognitive disabilities, providing peace of mind to their caregivers.

Moreover, the system can be used by athletes and fitness enthusiasts to track their progress and performance, and to set and achieve fitness goals. The system can also be used in workplaces to monitor the health and safety of employees, especially those working in hazardous environments.

Overall, the IoT-based health monitoring with GPS live location system is an innovative technology that has the potential to transform the healthcare industry and improve the quality of life for many people.

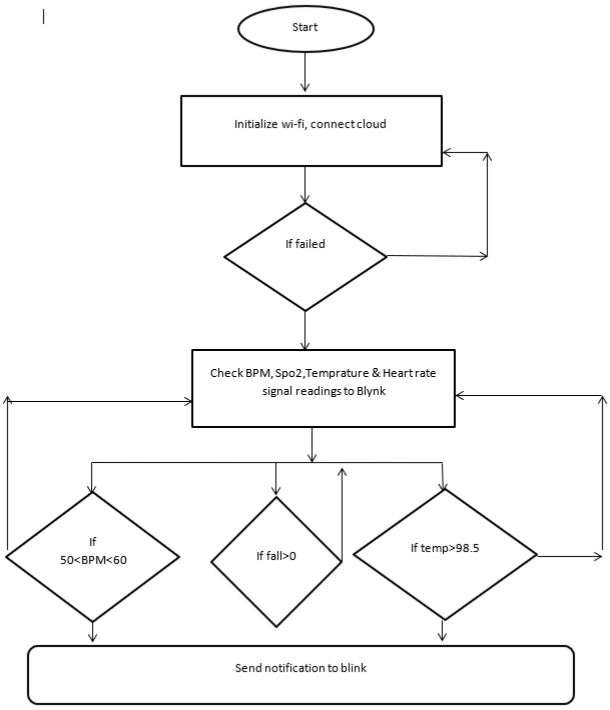

Fig 2: Flow chart of smart wearable device

This is the flow chart for Smart wearable monitoring device. First, the SWMD is turned on. Then, it starts searching and connecting to a Wi-Fi network. If it does not connect to a Wi-Fi network, the Smart wearable monitoring device will be turned off. If it is connected to a Wi-Fi network, then the touch sensor will be checked to make sure that the Smart wearable monitoring device is worn properly by the user. After confirming proper internet connecting and wearing of the Smart wearable monitoring device, sensors will start operating and sending measurement to the LCD and through the microcontroller. The Smart wearable monitoring device is set to measure AD patient's temperature, pulse rate, SpO2, acceleration, angular velocity and GPS location every 10 seconds and share the readings with medical care providers. If any of the measured values goes beyond normal readings, the Smart wearable monitoring device will turn the alarm buzzer on and will send a warning message to relatives or medical care provider through the internet cloud.

III. RESULT & CONCLUSION

A. Result:

Key	output
Switch 1	food
Switch 2	medicine
Switch 3	call
Emergency button	need help

Table 1:Keys and outputs

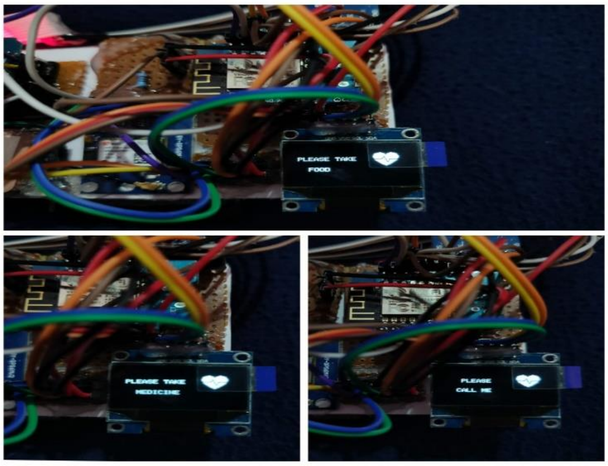

Fig 3: output

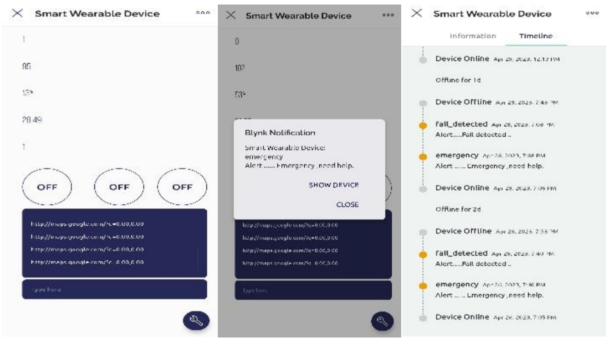

Fig 4: output

An assistive wearable prototype that can be used as a solution to locate the Alzheimer's patient while also monitoring other vital parameters such as temperature, heart rate, and oxygen level. The prototype can also send an alert if the patient suddenly collapses due to any health complications. It incorporates a Wi-Fi microcontroller that allows saving daily information as well monitoring the GPS location of the AD patient. Caregivers find it difficult to keep track of them all of the time, and they occasionally lose track of their health issues. To address this issue, this system was created, which consists of a smart wrist band that transmits any activity or health status updates to the caregiver via an application connected to the smart wrist band via an IoT platform.

B. *Conclusion:*

Wearable computing is changing the face of digital health in a variety of ways. First and foremost, these wearables are facilitating a shift away from the traditional IT-centralized systems for storage, processing, creation, and management of health-related data into a completely new model era, which is distributed data sharing with patients and the caretaker or the doctor. Second, the integration of wearables and IoT and the data they generate is leading us to use some of the powerful AI techniques for better treatments and automated diagnosis.

The aim of this study is to develop an assistive wearable prototype that can be used as a solution to locate the Alzheimer's patient while also monitoring other vital parameters such as temperature, heart rate, and oxygen level. The prototype can also send an alert if the patient suddenly collapses due to any health complications. It incorporates a Wi-Fi microcontroller that allows saving daily information as well as monitoring the GPS location of the AD patient.

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