

SMART HEALTH MONITORING WATCH FOR ALZHEIMER'S CARE

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Abstract

Alzheimer's is a neurological disorder. This disease affects the memory and thinking of a person who has this disease. Because of this disease, patients can walk away from home without telling. So they needed more care. This project is a wearable smart watch for patients. It is a simple device, and it is small and comfortable for patients to wear. Elderly people can also wear them easily. This device has a GPS module that easily tracks live location, a heartbeat tracker, and an accelerometer that detects a sudden fall of a patient. In an emergency, it automatically sends an SMS with the location of a patient to the phone and any other device. It helps increase safety and improve health.

Keywords: *GPS module, heartbeat tracker, accelerometer.*

I. Introduction

Alzheimer's disease is a brain disorder. This disease affects the memory of the patients, where Alzheimer's patients often lose track of essential personal information such as their name, address, and day-to-day tasks. So many people are affected by Alzheimer's disease worldwide. Because of the memory loss of Alzheimer's patients, they may leave their home and cannot find their way back home. Sometimes they are unable to remember their address or their own name. It is a concern for patients and their families.

Our project, "smart health monitoring watch for alzheimer's care." It is a smartwatch that can be comfortable to put on and simple to work. Even elderly people can also wear them comfortably. Some existing solutions are either too expensive or too complex.

This smartwatch monitors the patient's moments. It has a GPS module tracker that tracks the real-time location of patients and sends it to the caregiver. When some sudden falls are detected by the smartwatch, it automatically sends an SMS alert, or a patient can also send a manual alert by pressing a button. It is also used for medication reminders through beeps as well as vibration. This smartwatch also has a heart rate sensor for monitoring pulses. This project is very useful for making patients safer and helps to recover fast. It creates a more supportive environment for them and their families.

II. Problem Identification

Alzheimer's disease is a serious brain disorder. Patients often forget simple and important things in their daily life. Patients may become confused about their surroundings and may also go anywhere without informing anyone. Someone needs to keep an eye on the patient to make sure they are safe. Alzheimer's patients struggle to express their thoughts and can't even ask for help when needed. Once a patient is lost, they often struggle to communicate with new people properly. If a patient falls, they may be unable to call out for help. If help does not arrive quickly, then the patient's medical condition may aggravate. Family members also face many difficulties while taking care of Alzheimer's patients. Some existing medical monitoring devices are expensive as well as difficult to understand. Some devices require special training to use them properly or are not comfortable for elderly people to wear. While elderly patients generally prefer simple devices that they can wear easily and understand. A smartwatch can be very helpful in solving these problems.

2.1. Drawbacks

While the smartwatch offers a lot of benefits, there are still several drawbacks. One of the main problems is battery usage. The watch needs to be charged regularly for daily use. If the battery becomes empty, the smartwatch will stop working. This can create a risky situation for patients. The smartwatch is highly dependent on the mobile network. If the patient is in an area where the mobile network signal is weak or not available, then the smartwatch may not be able to send messages immediately to the caregiver. As well, if the smartwatch gets damaged or, in any case, the patient takes it off, the smartwatch won't work. The accelerometer is programmed to detect falls, but it's hard to make it perfect. It may send false alarms. These drawbacks should be understood so that future improvements can be made to them.

2.2. Existing system

Right now, most Alzheimer's patients depend mainly on their family members or caregivers for daily care and safety. Family members usually stay with the patient to make sure they are safe and not in danger. Some families try to use mobile phones to keep track of the patient. It rarely lasts a long time because Alzheimer's patients often leave their phones behind or forget to charge them. There are also GPS tracking devices available, but they do not monitor the patient's health condition or detect sudden accidents like falls. Some fitness bands are available that are mainly designed for fitness and health monitoring, but they weren't made just for Alzheimer's patients. In addition, many existing systems do not include an easy emergency alert feature.

Literature Survey

3.1. Literature Review

1. Another review by Lee et al. (2019) highlighted the need for devices that balance patient independence with safety. They noted that simple, wearable devices could improve quality of life for patients and reduce caregiver stress.
2. Pathak, A. M., et al. (2024). Smart Shield: An IoT-Based Fall Detection, GPS Tracking, and Health Monitoring System. International Journal of Advance Research, Ideas and Innovations in Technology. They introduced the idea of a "Shield" where these modules function as a joint hardware architecture. If the heart rate spikes and the GPS shows the patient is moving fast, the system automatically classifies it as a high-risk wandering event.
3. A study by Wang et al. (2020) looked at wearable devices for dementia patients and found that GPS tracking and fall detection were key features caregivers valued. However, many devices were too complex or expensive for widespread use.
4. Reddy, S., & Kumar, P. (2023). Algorithm Optimization for Fall Detection using 3-Axis Accelerometers in Wearable Devices. Journal of Sensor Networks and Data Communications. The research focused on reducing the time between the fall and the SMS alert, suggesting that an alert should be sent as soon as possible to ensure a quick medical response.
5. RADAR-AD Consortium (2021) – Patient & Caregiver Preferences. This was a massive study involving hundreds of real families. They found that instead of data, caregivers needed clear alerts. They don't need to see every heartbeat; they just want a beep when the heart rate is too high.

3.2. Literature Summary

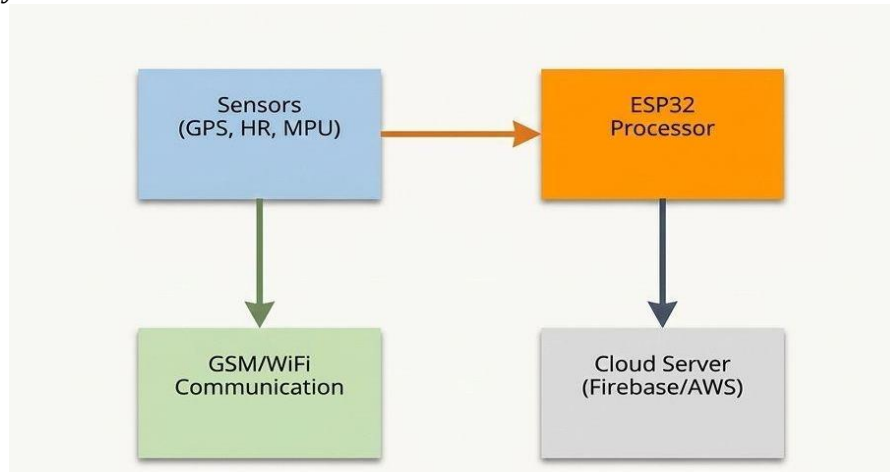
When we look at all the research papers and medical studies from the last few years, we can see a very clear picture of how technology for Alzheimer's care is changing. A major theme in the research by Pathak et al. (2024) is that traditional tracking (like Bluetooth tags) isn't enough for someone with Alzheimer's. If a patient wanders out of the house, they don't just go to the next room—they can go miles away. And also researchers like Reddy & Kumar (2023) have spent years trying to solve the "accidental alerts" problem. By using a 3-axis accelerometer (ADXL345). Their research shows that if we can alert a caregiver within the first hour of a fall, the patient has a much better chance of recovery. The RADAR-AD Consortium (2021) reminds us of the most important lesson: if the patient doesn't like the watch, they won't wear it. Their studies with real families showed that patients do not want to wear big, heavy-looking gear.

3.3. Research Gap

There are many devices in the market that have been developed to help elderly people and patients with memory problems; however, most of these devices are designed for health monitoring and not specifically for Alzheimer's disease patients. Some devices only provide GPS tracking but do not monitor health conditions, as well as other devices that can measure heart rate, but they cannot detect falls or send emergency alerts to caregivers. There isn't a single simple device that does all of these things at once. If you search for a medical grade smartwatch you will find some amazing devices, but they are usually very expensive; most middle-class or low-income families simply cannot afford these commercial devices.

Methodology

4.1. Proposed System



4.1.1. Proposed System

Working principal:

The working principle is built on automation. The proposed system works as a smartwatch designed to help Alzheimer's patients. The Pulse Sensor (MAX30100) uses light to measure the blood flow and calculate the heart rate. This data is sent to the ESP32 microcontroller every second. The ADXL345 accelerometer is used to detect sudden movements or falls because it is constantly measuring movement in three directions. The GPS module (Neo-6M) that tracks the patient's location. The ESP32 detects when the heart rate goes above or below a safe limit. It also provides medication reminders through beeps and vibration. The ESP32 wakes up the GSM/SIM800L module in case of emergency to send the SMS signal to the caregiver. There is also an SOS push button for patients for their safety. Which they can press if patients feel scared or confused. This smartwatch creates continuous protection for Alzheimer's patients.

4.2. Main Features

- Real-Time Location Tracking: Its GPS tracks the patient's location in real time, so caregivers know where they are in real time. This feature helps prevent situations where patients get lost.
- Continuous Health Monitoring: The heart rate sensor checks the pulse and detects abnormal conditions using a heart rate sensor.
- Fall Detection System: In the smartwatch, an accelerometer sensor is used in the device to detect sudden movements or falls. This helps in providing help quickly to the patient.
- Manual SOS Button: The smartwatch includes a simple push button that acts as an SOS button which directly sends an SMS to the carer in case of emergency.
- Medication Reminder: This feature reminds patients to take medicines at the correct time with the help of beeps and vibration.
- User-Friendly Design: The smartwatch device is designed to be simple to use comfortably. Even elderly patients can also wear them comfortably.

4.3. Hardware Used

- Microcontroller (ESP32 / Arduino / NodeMCU)
- GPS Module (Neo-6M)
- GSM/SIM800L Module for communication
- Heart Rate Sensor (Pulse Sensor / MAX30100)
- Accelerometer (ADXL345)
- fall detection OLED/LED display
- Push button SOS
- Rechargeable battery

4.4. Software Used

- Arduino IDE Embedded C / MicroPython coding
- Mobile App or Web Dashboard
- Cloud platform for data storage

V. Advantages

- Improves patient safety: The smartwatch helps keep Alzheimer's patients safe by continuously monitoring their movement and health conditions.
- Health monitoring: The heart rate sensor keeps track of the patient's pulse. If the heart rate becomes abnormal, the system can alert the carer so that medical attention can be given.
- Quick emergency alerts: In emergency situations, the smartwatch can automatically send an alert message with the patient's location to the carer. This helps carers respond quickly and provide help when it is needed.
- Medicine and routine reminders: The device can give reminders for taking medicines or following daily routines through vibration or sound alerts. This helps patients manage their daily schedule better.
- Easy emergency help with SOS button: The device includes a simple SOS button. If the patient feels unwell, scared, or confused, they can press the button to send a help alert to the carer immediately.
- Low cost and functional design: Compared to many commercial medical smartwatches, this device can be built at a lower cost while still providing important safety and monitoring features. This makes it a practical solution for many families.
- Reduced search time: The GPS module allows carers to know the exact location of the patient at any time. This is very helpful if the patient wanders away or gets lost, which is common in Alzheimer's disease.

VI. Application

- Home Care and Private Use: The most obvious place for this device is in the home. Most Alzheimer's patients prefer to live in their own houses for as long as possible. This watch allows them to do that safely. Elderly Care Centers: The device can be used in old-age homes or care centers to watch many patients at once. Caregivers can easily track the condition and location of each patient.
- Clinical Data for Doctors: The watch provides a history of heart rate and movement data. A doctor can look at this data to see if a new medication is working or if the patient's physical health is declining, leading to much better medical decisions.
- Post-discharge care: When a patient is discharged after a surgery or a fall, they are at a very high risk for the first few weeks.

VII. Conclusion

In conclusion, this project successfully connects between high-end medical technology and affordable home care. By designing this smart wearable, we have created a tool that doesn't just "track" a person but actively protects them. For someone living with Alzheimer's, the world can become a confusing and dangerous place very quickly; this device acts as a guardian, ensuring that they are never truly alone, even when they are physically by themselves.

One of the most rewarding outcomes of this work is the balance we found between advanced sensing and simple usability. While the "insides" of the watch are complex—using GPS for location, accelerometers for fall detection, and GSM for emergency communication—the "outside" remains easy for a senior to wear. We've proven that we can use inexpensive components and a pulse sensor to provide the same level of security found in expensive commercial watches, making this technology accessible to families who might otherwise struggle to afford it.

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