1. **Project Proposal Reference No.:** 46S_BE_4192

2. **Title of the project:** SMART WEARABLE MONITORING SYSTEM FOR ALZHEIMER'S PATIENT

3. **Name of the College & Department:** Vidya Vikas Institute of Engineering and Technology, Electronics and Communication Engineering.

4. **Name of the students & Guide(s)**

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5. Introduction

Alzheimer's disease is a progressive brain disorder that destroys memory, thinking skills, and the ability to perform daily tasks. It is named after Dr Alois Alzheimer, who in 1906 identified brain abnormalities in a woman with an unusual brain disorder. Symptoms of Alzheimer's include memory loss, speech problems, and erratic behaviour. The disease is characterized by the presence of amyloid plaques and neurofibrillary tangles, which are considered hallmarks of the condition. Alzheimer's also involves the loss of connections between neurons, impacting communication within the brain.

The disease is divided into three phases, taking about 12 years to progress. The first stage lasts 1-3 years, with abnormal biomarkers and mild to moderate cognitive impairment. The second stage spans 3-10 years and includes memory loss, recurring hallucinations, and the presence of pathophysiological biomarkers. The third stage, known as dementia, lasts 8-12 years and involves severe memory loss, cognitive decline, and a reduced ability to detect biomarkers. Research suggests that changes in cognition, behaviour, emotions, and physical health may begin years before the onset of visible Alzheimer's symptoms.

One such application includes a GPS module designed specifically for patients with mental disorders. This module allows caregivers to track the location of individuals

with dementia over time. The Android app Blynk facilitates the tracking of a person's location and health, providing an effective, safe, and cost-efficient solution. These technologies aim to mitigate the risk of individuals with dementia getting lost, especially in scenarios like driving or using public transport, where larger areas need to be monitored. By utilizing IoT-based solutions, caregivers can enhance the safety and well-being of individuals with dementia, addressing the concerns of homelessness and improving their quality of life.

6. Objectives

➢ Safety: Alzheimer's patients often wander off and get lost, which can lead to dangerous situations. A smart wearable monitoring system can provide real-time location tracking and alert caregivers when a patient wanders off.

➢ Health Monitoring: Alzheimer's patients may have difficulty communicating symptoms or changes in their health. A wearable monitoring system can track vital signs, such as heart rate and blood pressure, and alert caregivers if there are any abnormalities.

➢ Medication Management: Alzheimer's patients often have multiple medications to take at different times of the day. A wearable monitoring system can provide reminders for when medication needs to be taken and track compliance.

➢ Improved Quality of Life: Alzheimer's patients may become isolated or feel disconnected from their surroundings. A wearable monitoring system can provide reminders for activities of daily living, such as eating, drinking, and socializing.

➢ Caregiver Support: Caregivers of Alzheimer's patients often experience stress and burnout. A wearable monitoring system can provide peace of mind and reduce the burden on caregivers by providing real-time information and alerts.

7. Methodology

Smart wearable monitor for Alzheimer's patients is a solution designed to monitor the health and safety of Alzheimer's patients it is as shown in figure1 below. The system has many features such as Wi-Fi, BPM and SPO2 sensors, thermistor sensor, panic button, GPS, accelerometer, buzzer, ESP8266 microcontroller and OLED display. Wi-Fi hardware allows the device to connect to the internet, allowing it to send reports and information to doctors or nurses. BPM and SPO2 sensors measure a patient's blood pressure and oxygen levels, respectively, providing important information about their health. Thermistor sensors measure temperature changes that could indicate fever or other health problems.
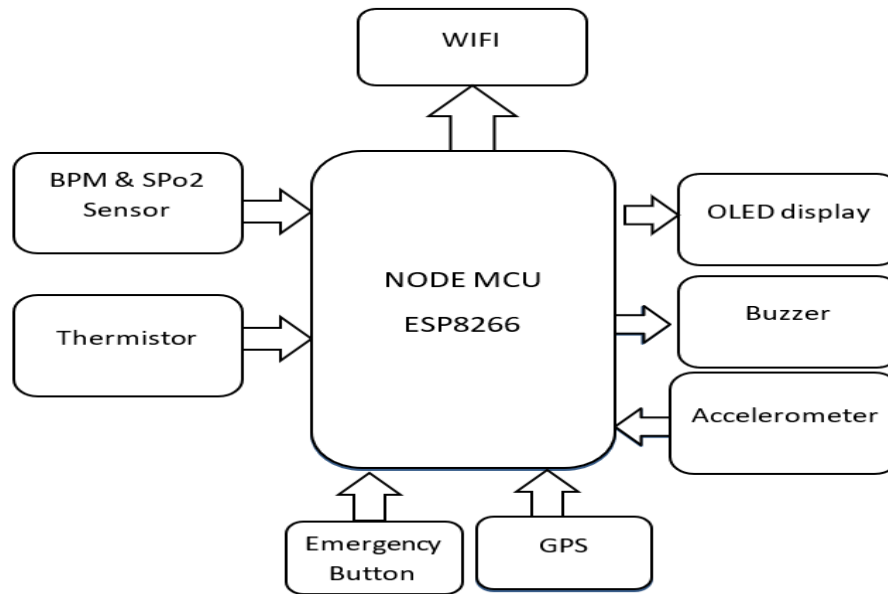
Figure 1: Block diagram

In an emergency, the alarm button will be pressed to send a message to the doctor or nurses. The GPS component tracks the patient's location in real time, making it easy to locate them if they are lost or lost. The accelerometer sensor detects motion and can be used to identify drops or sudden movements that could indicate a problem. In an emergency, the bell will alert the patient or caregiver. The ESP8266 microcontroller is the main control unit that processes all the data from various sensors and sends it to the OLED display for viewing by doctors or medical professionals.

8. Results and Conclusions

This research aims to create a service model for locating Alzheimer's patients while monitoring vital signs such as temperature, pulse, and oxygen levels. It includes a Wi-Fi microcontroller for data recording, GPS tracking, and a fall alarm system. Tested on 13 volunteers, the model showed 93% sensitivity in detecting falls and 95% specificity in avoiding errors. This reliable tool can support the daily life of Alzheimer's patients, update the healthcare system, and facilitate data sharing. It contributes to the development of medical knowledge and preventive measures. The future of medical technology lies in IoT-based devices and wearables, enabling better understanding of the disease and personalized treatment plans. Smart facial care devices provide independence and dignity to patients, reducing the burden on caregivers. However, privacy, data security, and usability must be addressed. Overall, smart care products offer an opportunity to improve Alzheimer's care, ensuring patient

safety, supporting caregivers, advancing research, and enhancing the lives of patients and their families.

9. Scope for future work

- **Advanced monitoring capabilities:** Smart devices of the future may include advanced sensors and monitoring capabilities to monitor a variety of physical parameters, including heart rate, blood pressure, body temperature, sleep patterns and even brain activity. This will provide doctors with more information to monitor the progression of Alzheimer's disease and adjust their treatment plans accordingly.

- **Behaviour Analysis and Advanced Modelling:** Through the use of machine learning and artificial intelligence algorithms, wearable monitor systems of the future can analyse collected data to identify patterns and predict behaviour changes or cognitive decline. These predictive models can help caregivers and doctors predict and manage Alzheimer's-related conditions such as walking or anxiety.

- **Location Tracking and Geofencing:** Integrating GPS technology into smart devices enables real-time location tracking of Alzheimer's patients, allowing caregivers and loved ones to keep them safe and breathing fast.
  The geofencing functionality can also be used to create virtual boundaries and send alerts when a patient leaves a previously safe area.

- **Communication and Alert:** Smart devices can act as communication devices by allowing people responsible to send messages, alerts or reports directly to the device by humans. Alzheimer's disease. This feature can help people with memory loss remember appointments, schedule medication, or perform daily tasks by providing timely instruction and guidance.

- **Fall Detection and Emergency Response:** Integrating fall detection into smart devices is critical to the safety of Alzheimer's patients from pain related to falls and injuries. Systems of the future can detect loss and send immediate alerts to doctors or emergency services, providing timely assistance and reducing the risk of accidents.

- **Integration with the healthcare ecosystem:** The smart wearable monitoring systems of the future will integrate seamlessly with existing healthcare infrastructure such as electronic health records (EHR) and telemedicine platforms. This integration will allow doctors to access information in real time and make informed decisions, while also allowing for remote monitoring and virtual consultation, reducing the need for regular visits.