WEARABLE SMART BAND FOR ELDERLY FALL DETECTION

Denusha Logeswaran[1], Thayananthan kirisan[2],Kumareshan Vishwarubini[3], Piranaka Kesavarasa[4], Denusha Logeswaran[1]*

[1]Technology, Gampaha Wickramarachchi University of Indigenous Medicine, Gampaha, Sri Lanka

*Corresponding author: gwu-bhbt-2021-53gwu.ac.lk

Abstract

Falls are a major health concern for older adults and those with mobility impairments, and traditional approaches such as emergency call buttons may not alert carers quickly when a fall occurs unexpectedly. In this paper, we present a lightweight and comfortable wearable smart band for real-time fall detection, vital-sign monitoring, location tracking and emergency alerting in elderly care. The system is built around an ESP32 microcontroller that combines an MPU6050 motion sensor, a MAX30102 sensor for heart rate and SpO2 monitoring, a GPS for location tracking and a wireless communication for emergency SMS notifications. Falls are detected with a threshold-based algorithm that combines the acceleration magnitude, change of orientation and inactivity after the fall. If the alert is to reduce false alarms, a push button allows the user to cancel an alert before it is sent. A push button allows the user to cancel an alert before it is sent, to try to avoid false alarms. If the alert is not cancelled, an SMS with the user's health status and location is automatically sent to a designated carer. The prototype was tested in a controlled environment with 20 simulated fall trials and 20 non-fall trials. The system correctly identified 16 of the 20 simulated falls, resulting in an overall accuracy of 87.5%, a sensitivity of 80%, and a specificity of 95%. The findings showed the feasibility of a low-cost, portable, and elderly-friendly wearable system for real-time fall detection, vital-sign monitoring, location tracking, false alarm prevention, and emergency response. A practical way to support safer independent living comes from the integration of these functions into a single wearable platform. The integration of these functions into a single wearable platform provides a practical approach to support safer independent living and to improve emergency assistance for the older adults.

Keywords: Fall Detection, Wearable Device, Elderly Care, Real-time Monitoring, Emergency Alert