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Fitriawan, H.^a, Purwiyanti, S.^a, Faturrohman, E.A.^a, Santoso, M.F.^a, Darajat, A.U.^a, Gunawan, T.S.^b

Development of a Low-Cost Fall Detection System for the Elderly with Accurate Detection and Real-Time Alerts
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^a University of Lampung, Department of Electrical Engineering, Bandar Lampung, 35145, Indonesia

^b International Islamic University Malaysia, Electrical and Computer Engineering Dept., Kuala Lumpur, 53100, Malaysia

Abstract

Falls are a substantial health concern for the elderly, with approximately 28-35% of individuals aged 65 and older experiencing them annually. An estimated 684,000 individuals die from falls each year, with over 80% of these deaths occurring in low-and middle-income countries. Falls are the second most common cause of unintentional injury deaths worldwide, with adults over the age of 60 suffering the highest number of fatal falls. Additionally, 37.3 million falls annually require medical attention. Prompt and accurate detection and real-time alerts to caregivers or medical personnel are crucial in mitigating these risks. This study aims to develop a low-cost fall detection system for the elderly, emphasizing accurate detection and real-time alerts. Utilizing an Arduino UNO and Gyroscope MPU-6050 sensor, the system integrates a Global Positioning System (GPS) module and a Global System for Mobile Communication (GSM) module to detect falls and transmit the location to predetermined contacts via SMS and calls. The gyroscope monitors body movements and identifies falls based on threshold values, while the GPS provides precise location data. Experimental results indicate a GPS location accuracy disparity of 4 to 12 meters due to environmental conditions. Nevertheless, the system consistently detects falls and promptly notifies caregivers. The findings suggest that this low-cost, easily deployable system can significantly enhance the safety and independence of elderly individuals by ensuring timely assistance during fall incidents. Effective prevention strategies should prioritize fall-related research, establish policies to reduce risk, create safer environments, emphasize education, and include comprehensive training. © 2024 IEEE.

Author Keywords

accelerometer; fall detection; global positioning system; gyroscope

Index Keywords

Accelerometers, Fall detection, Global positioning system, Global system for mobile communications; Detection system, Detection time, Fall detection, Global positioning, Health concerns, Low income countries, Low-costs, Middle-income countries, Positioning system, Real-time; Gyroscopes

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Correspondence Address

Fitriawan H.; University of Lampung, Indonesia; email: helmy.fitriawan@eng.unila.ac.id

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