

E-CARE ELECTRONIC MONITORING USING IMAGE PROCESSING FOR ELDERLY CARE

Nur Shahira Binti Awang Kechik, Nora Yanti Binti Che Jan

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022464078@student.uitm.edu.my , noray084@uitm.edu.my

Abstract

The elderly population is growing rapidly, with projections indicating 2.1 billion people aged 60+ by 2050. To address the risks faced by elderly individuals living independently, the E-Care: Electronic Monitoring using Image Processing for Elderly Care system was developed. This web-based platform integrates MediaPipe and OpenCV for real-time fall detection and health monitoring, alerting caregivers instantly. Built with Python, Flask, and MySQL, it ensures efficient data processing and notifications for emergency situations. The system's development followed the Agile methodology, allowing iterative design, testing, and user feedback to ensure continuous improvement and better meet user needs. Functionality and user acceptance testing confirmed the system's effectiveness in improving emergency response times. Future enhancements may include AI for better fall prediction and scalability. E-Care offers a cost-effective solution for elderly care, supporting independent living while ensuring safety.

Keywords: *Image Processing, Elderly Care, Fall Detection, MediaPipe, Electronic monitoring system, Real-time notifications.*

1. Introduction

With the global population aging rapidly, the safety of elderly individuals, especially those living alone, has become a major concern. Accidental falls are a significant risk, often leading to severe injuries or fatalities when undetected. This project aims to develop the E-Care electronic monitoring system, which leverages image processing technology to monitor elderly individuals in real-time. The system's objective is to detect falls or abnormal movements and send immediate alerts to caregivers, ensuring timely assistance. E-Care operates through a web-based platform using technologies like HTML5, CSS, JavaScript, and OpenCV. By focusing on fall detection in areas such as living rooms and bedrooms, the system provides enhanced protection for elderly individuals, offering peace of mind to both the elderly and their caregivers.

2. Methodology

The E-Care system utilizes MediaPipe, an image processing framework, to detect falls and abnormal postures of elderly individuals. A webcam captures real-time video feeds, which are processed using Python and OpenCV for motion detection and posture analysis. The system triggers alerts via WhatsApp notifications, ensuring caregivers and family members are promptly informed. The system is developed using a web-based platform, facilitating remote monitoring. Testing includes functionality testing for real-time fall detection and user acceptance testing to ensure ease of use.

3. Results / Findings

The E-Care system successfully detected falls and abnormal movements with a high degree of accuracy, ensuring timely alerts to caregivers. Functionality tests showed that the system could process video feeds in real-time and trigger notifications with minimal latency. User acceptance testing indicated that caregivers found the system easy to use, with intuitive interfaces for accessing live video feeds, historical data, and real-time alerts. Feedback from test participants highlighted the system's potential to enhance elderly care, particularly for those living alone or with limited caregiver support.

4. Novelty of Research / Product / Project

The novelty of the E-Care system lies in its ability to function like a personal CCTV system within the home, but with the added feature of remote monitoring and fall detection. Unlike traditional CCTV systems that only provide surveillance, the E-Care system actively tracks the elderly's movements and detects falls in real-time using MediaPipe and OpenCV technologies. When a fall is detected, the system immediately sends a notification via Telegram, alerting caregivers or family members. The system operates on a web-based platform, offering easy remote access without the need for additional equipment. By combining real-time fall detection with remote monitoring and notifications through Telegram, the E-Care system offers a practical and cost-effective solution for elderly care. It enhances safety and well-being for elderly individuals living independently, ensuring a quick response in case of emergencies and providing peace of mind to caregivers while allowing seniors to maintain their independence at home.

5. Conclusion or Future Work

Future improvements for the E-Care system include adopting YOLOv5, a deep learning model, for enhanced fall detection accuracy. YOLOv5 uses convolutional neural networks (CNNs) for real-time object detection, ensuring precise identification of falls. Additionally, implementing GPU or cloud-based solutions will optimize video processing and reduce lag, while expanding functionality with wearable sensors, IoT devices, and a mobile app will enable broader, real-time remote monitoring and improved accessibility.

REFERENCE LIST

- Haynes, S. (2020). Understanding aging and its impact on health. *Journal of Aging Research*, 45(3), 189-197.
- Kakara, R., Oladunjoye, A., & Park, J. (2023). The impact of falls on elderly health: A review of risk factors and prevention strategies. *Journal of Geriatric Health*, 33(2), 105-115.
- Laba, A. (2024). Real-time monitoring systems in healthcare: The role of image processing and web-based platforms. *International Journal of Health Informatics*, 17(1), 43-55.
- Soman, A., Rao, N., & Patel, V. (2022). A novel fall detection system using MediaPipe for elderly care. *Journal of Computer Vision in Healthcare*, 29(6), 341-349.
- World Health Organization. (2024). Ageing and health. WHO. <https://www.who.int/news-room/fact-sheets/detail/ageing-and-health>