

Smart Wireless, Flexible Hybrid Electronic for Fall Risk Monitoring

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Abstract: Falls give a serious public health issue among the elderly (people aged 65 years or older) since they not only cause significant injuries and even mortality, but also result in enormous costs for healthcare services. In general, about 28~35% of older adults 65 years old or over and 32~42% of older adults 70 years old or over experience fall-related injury more than one time each year based on the World Health Organization (WHO) Global Report. The number of older adults suffered from fall-related injury will gradually increase as time goes on since their population is growing faster than any other age group; their population was 49.2 million in 2016 (about 15% of U.S. population) and is expected to reach 98 million by 2060 (about 25% of U.S. population). In addition, the medical costs associated with falls for older adults was estimated as \$56 billion dollars by 2020. In order to minimize adverse consequences of falls and provide adequate medical response and care, a cost-effective, reliable and immediate fall detection system is essential. Therefore, this research focuses on the development of a skin-wearable hybrid electronic system for fall risk monitoring, which offers signal fidelity for accurate fall detection and user comfort for long-term use. We have designed and fabricated the skin-wearable device including a 6-axis motion sensor to collect motion data for different human activities (e.g., walking, running, and falls). A number of deep-learning algorithms were tested using collected data to identify an optimized fall detection algorithm. The collective results will significantly improve the life quality and independence of older adults as minimizing adverse consequences of falls and fall-related injuries.

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