Signal Processing of Geospatial and Biometric Data from Wearable Devices for Fall Detection

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Abstract. In this paper, we present a detection algorithm that accurately differentiates the event of a person falling from normal activities of daily living (ADL). Our algorithm processes signals recorded from accelerometers built into wearable activity monitoring devices typically worn on an individual's wrist. Given the potential danger of injury resulting from a fall, especially for the susceptible elderly population that often results in traumatic brain injury (TBI), an accurate fall detection algorithm could be the precursor to an autonomous emergency services alert system for paramedics. Immediate medical intervention is critical for survival in urgent situations such as a stroke, cardiac event, or TBI; unfortunately, in many of these cases the individual may be unconscious and unable to intervene on their own behalf. With the advancement of geospatial technology, an algorithm that can distinctly detect the event of a fatal fall can automatically trigger a call for emergency medical services to a specific a GPS location based off a mobile device or the wearable wrist device itself. *We will explore the use of principle component analysis to expedite the processing of geospatial data and introduce biometric features to detect cardiac events (in which case the wearer might not be able to indicate they need assistance.*

Keywords: fall detection · activities of daily living (ADL) · signal processing