Yogesh G. Gholap / Prof. P. C. Pandey (Supervisor): "A Fall Detection Module for Assisted Living", *M.Tech. dissertation,* Department of Electrical Engineering, Indian Institute of Technology Bombay, June 2016.

Abstract

Fall detection devices assist elderly persons in their activities of daily life. A fall detection module, using an integrated sensor with tri-axial accelerometer, tri-axial gyroscope, and tri-axial magnetometer and wireless connectivity, is developed. It is a microcontroller-based module with Bluetooth interface for wireless alert, operation control, and data transfer. After studying the signals for different orientations of the device during simulated falls, a signal processing technique using accelerometer outputs is developed and tested for orientation-independent discrimination of fall from activities of daily life. The technique is based on multi-dimensional decomposition of the output of the tri-axial accelerometer and finding the envelope of the deviation from the baseline for each of the components, and amplitude-deviation thresholding of the maximum of the deviation envelopes. The real-time implementation of the technique is carried out on the microcontroller for providing wireless alert on fall detection. It continuously monitors and records all sensor outputs at sampling frequency of 100 Hz in an internal flash memory for up to over an hour. The recorded data can be wirelessly transferred for analysis of physical activity of the person wearing the device. With lower sampling frequency, the device can be used for larger duration recording as needed for actigraphy.