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A floor based motion sensing system to detect falls, assess gait, and count the number of simultaneous people on the system

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There are numerous technologies to detect falls and monitor the frail elderly including those with dementia. Falls are a rare event but cause drastic consequences: a fall may result in a fracture with hospitalization, physical therapy, loss of functionality, depression, and loss of life. Obviously the more rapid the discovery of the fall and subsequent intervention the better. Further more because it is a rare event devices that act autonomously can record the data continuously, and processed for a regular report for useful clinical information. We have developed a floor based monitoring system, which we call the smart carpet, originally to detect falls, but we can take advantage of the continual 24/7 monitoring capability to get important information on gait, which is a foundation of assessing activities of daily living, We have developed several fall algorithms, the best one uses multilayer perceptron classifier on 10 fold cross validation with accuracy of 96%, sensitivity of 81%, and specificity of 98%. We have extended this to detect gait parameters including walking speed stride time and stride length. We have compared the smart carpet to the gaitRITE and measured gait estimation accuracy (and correlation) in walking speed of 1% (90%), stride time of 6% (80%), and stride length of 4% (90%). These high accuracies are confirmed by many other tests we have run. We have also run experiments to count the number of people traversing the carpet and studied the waveform for useful information.

Biography

Harry W Tyrer has over 130 papers and 2 patents. His most recent work has been in eldercare. He is currently Professor Emeritus after serving over 33 years at the University of Missouri – Columbia. His main research work has been in the design contraction and testing of systems for floor sensing of people. Most recently it has been to provide computational intelligence to these devices and long term cloud storage. His PhD is in Electrical Engineering from Dule University, and he has been a fellow of the cytopathology division of Johns Hopkins University and a fellow in the Sinclair school of Nursing at the University of Missouri.

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