

Project No.	Project Title	
2022-01-048	A Computerized System for Measuring the Risk of Falls among the Elderly	
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## Abstract

Older adults are at a higher risk of falling than any other age group. Falls are associated with greater morbidity and mortality and have an impact on quality of life, health and health care costs. The consequences for an individual falling include functional decline, loss of mobility, depression, increase in dependency and disability, a fear of falling, loss of confidence, pressure-related injury, infections and even death. According to the CDC (Centers for disease Control and Prevention), one in four older adults falls each year and one out of five falls causes a serious injury such as broken bones or a head injury. Declines in both gait speed and gait stability have been associated with increased fall risk in older adults, where the majority of falls occur during walking.

The system includes software to monitor and analyze the risk of falls among the elderly through a six-meter walking test on a narrow path. The Narrow Path Walking Test (NPWT) is a common and simple tool for estimating the risk of an individual to fall. Narrow-base walking requires increased frontal plane stability and can be used to assess postural control, and may be useful in understanding the cause of falls when walking and in identifying individuals with an increased risk for falls. Today, due to the complexity of the test, there is no practical examination in clinics.

In the first part of the project, system evaluation was conducted with 19 students to a series of 120 experiments, which was monitored by two RGB-D cameras (Realsense D435) developed in previous project. The results showed that the system was unable to recognize the participants walking. To address the issue a nonlinear calibration was added to the system to improve system recognition. Results revealed a decrease between 56%-69% in the RMSE index.

The second part of the project included evaluation and validation of new cameras and algorithms, due to the announcement of stopping production of Realsense cameras. The Realsense camera was tested with two different algorithms, Nitrack (current) and Mediapipe, and two Zed 2i cameras (2mm and 4mm lenses) with a ZED ANN algorithm. Each of the 25 students did 5 identical experiments, all were documented and recorded by different cameras and algorithms in comparison to the Vicon system as ground truth. Results will be presented.

**Keywords:** Older Adults, Narrow Path Walking Test (NPWT), Computerized system, Falls.