Clinical research has identified a clear link between human gait characteristics and different medical conditions. We are particularly interested in gait and balance analysis for fall risk assessment in elderly people. This dissertation proposes the use of multiple inexpensive web cameras for three-dimensional gait and balance analysis in a voxelized space. The main advantages of this approach include low cost, unobtrusive monitoring compared to wearable sensors, and three-dimensional voxel reconstruction which provides a non-camera view-dependent capability. It is thus suitable for daily assessment and continuous monitoring of elderly people’s non-controlled daily living environment.

The gait parameters results are validated in lab settings as well as in a realistic retirement community setting. Excellent matching results were achieved when compared with Vicon motion capture system, GAITRite mat, and a physical therapist expert, which has provide us confidence in terms of the accuracy of the system performance. The various gait parameters extracted provide a detailed gait profile and can be easily used to screen out people at risk of fall. The system proposed here is inexpensive, has good accuracy verified by ground truth. The passive sensing nature of the system makes it ideal long term home gait monitoring to detect gait changes.