

F. WANG, M. SKUBIC. *Body sway measurement during standing and walking for fall risk assessment using inexpensive webcam. Gerontechnology 2010;9(2):259;*

doi:10.4017/gt.2010.09.02.283.00 **Purpose** Fall related injuries have a profound impact on the physical and psychological health of older adults. An accurate and continuous assessment of body sway offers a method for detecting those at risk for falling. Current body sway tests are mostly done only in clinic/lab environments using expensive equipment^{1,2}. With the inexpensive webcam system we have developed, body sway can be evaluated daily in the normal living environment. Since many falls occur during walking, we developed our system to assess body sway in standing and walking conditions. **Method** Privacy needs to be addressed in order for this technology to be used to monitor an elderly person in a daily living environment. Therefore, instead of using raw images, we perform a silhouette extraction, namely, segmenting the human body from the background with the camera at a fixed location, as the initial stage in the analysis. Using two calibrated cameras, our three-dimensional human model, called voxel person, is constructed in voxel (volume element) space by back projecting silhouettes from multiple camera views³. Participants were monitored by our camera system while a Vicon motion capture system recorded the motion of reflective markers attached to participants' shoes and back. Body sway while standing and walking was studied. For standing body sway, the participant was asked to stand still with eyes open, and sway in the anterior-posterior direction at two different rates and then sway laterally at two different rates. Both anterior-posterior and lateral sway angles were extracted from the voxel model and compared with those obtained from the Vicon system. For walking body sway, participants walked 5.8m on a straight pathway, with different gait patterns. The lateral body sway angle was extracted by comparing body centroid locations between double support and single support stances. **Results & Discussion** Both sway angle results (*Figure 1b,c*) while standing are in good agreement with the Vicon results. Lateral body sway angles extracted while walking are also in good agreement with the Vicon results. Further work will examine the body sway in a more realistic home environment with elderly adults.

References

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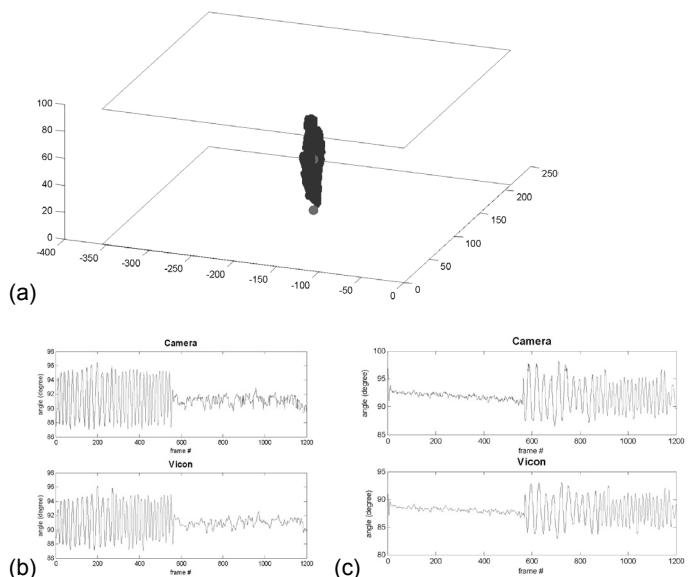


Figure 1. (a) Sample voxel person model. (b) Anterior-posterior sway angle while standing extracted from the voxel model; (c) Lateral sway angle while standing extracted from the voxel model