

Public Abstract

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Graduation Term:SP 2010

Department:Electrical Engineering

Degree:MS

Title:Activity Segmentation With Special Emphasis on Sit-to-Stand Analysis

The average life span of an adult is continually increasing. With the progress of medicine and technology, more emphasis is being put on research to assist older adults in leading more independent, fulfilling lives. In order to achieve this, we are doing risk assessment using continuous video surveillance at a living place for older adults in a mid-sized college town in the Midwest, an "ageing in place" location. A large part of fall risk can be analyzed using balance disorder measurements including assessment of sit-to-stand motion and sit-to-stand time. This study presents three different techniques to identify activities such as sitting, standing, and the transition between the two postures. Techniques implemented include using three dimensional modeling of the person by using camera images from two perpendicular views with a technique called, "voxel person," which is a model of a person made from 1 x 1 x 1 blocks. This three dimensional modeling, along with techniques such as using the orientation of the silhouette of the person and the ellipse fit method on the silhouette, yielded extremely positive results. The proposed algorithms were tested on 9 subjects with ages ranging from 18 to 88. The classification results were the best for the voxel height with the ellipse fit algorithm at 96.6%; using the voxel height alone gave a classification rate of 86.7%. The comparison was done against the marker-based Vicon motion capture system as ground truth as well as a manually controlled stop watch. The average error in sit-to-stand time measurement was the best for the voxel height with the ellipse fit technique at 270 ms and worst for the voxel height alone at 380 ms. This application can be used as a part of a continuous video monitoring system in the homes of older adults and can provide valuable information which could help detect fall risk and enable them to lead an independent lifestyle for a longer time.