Alzheimer's patient activity assessment using different sensors

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C.F. CRISPIM-JUNIOR, V. JOUMIER, Y.-L. HSU, M.-C. PAI, P.-C. CHUNG, A. DECHAMPS, P. ROBERT, F. BREMOND. ***Alzheimer's patient activity assessment using different sensors.*** *Gerontechnology 2012;11(2):xxx;* doi:10.4017/gt.2012.11.02.597.00 **Purpose:** Older people population is expected to grow dramatically over the next 20 years (including Alzheimer's patients), while the number of people able to provide care will decrease. We present the development of medical and information and communication technologies to support the diagnosis and evaluation of dementia progress in early stage Alzheimer disease (AD) patients. **Method**: We compared video and accelerometers activity assessment for the estimation of older people performance in instrumental activities of daily living (IADL) and physical tests in the clinical protocol developed by the Memory Center of the Nice Hospital and the Department of Neurology at National Cheng Kung University Hospital – Taiwan. This clinical protocol defines a set of IADLs (*e.g.,* preparing coffee, watching TV) that could provide objective information about dementia symptoms and be realistically achieved in the two sites observation room. Previous works studied accelerometers activity assessment for the detection of changes in older people gait patterns caused by dementia progress, or video-based event detection for personal self-care activities (ADLs)[1, 2, 3], but none has used both sensors for IADLs analysis. The proposed system uses a constraint-based ontology to model and detect events based on different sensors readings (*e.g.*, 2D video stream data is converted to 3D geometric information that is combined with *a priori* semantic information, like defined spatial zones or posture estimations given by accelerometer). The ontology language is declarative and intuitive (as it uses natural terminology), allowing medical experts to define and modify the IADL models. The proposed system was tested with 44 participants (healthy=21, AD=23). A stride detection algorithm was developed by the Taiwanese team for the automatic acquisition of patients gait parameters (*e.g.*, stride length, stride frequency) using a tri-axial accelerometer embedded in a wearable device. It was tested with 33 participants (healthy=17, Alzheimer = 16) during a 40 meters walking test. **Results & Discussion**: The proposed system detected the full set of activities of the first part of our clinical protocol (*e.g.,* repeated transfer test, walking test) with a true positive rate of 96.9 % to 100%. Extracted gait parameters and automatically detected IADLs will be future analyzed for the evaluation of differences between Alzheimer patients at mild to moderate stages and healthy control participants, and for the monitoring of patients motor and cognitive abilities.

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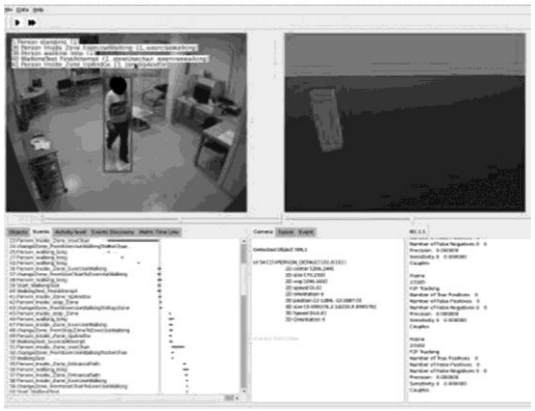

Figure 1. Multi-sensors monitoring sys-tem results being analyzed in the evaluation platform (VISEVAL)