# AALISABETH: Home environment cooperating to health assessment

*G. VESPASIANIA, I. CORRADETTI, N. PIERANTOZZI, R. CULMONE, M. QUADRINI, M. FALCIONI, G. MATRELLA, I. DE MUNARI, P. CIAMPOLINI.* ***AALISABETH: Home environment cooperating to health assessment.*** *Gerontechnology 2014;13(2):293;* doi:10.4017/gt.2014.13.02.350.00 **Purpose** In order to keep the pace with the demographic trends, health services all over the world are shifting from care to prevention paradigms. Technology can speed up the implementation of healthy-aging and aging-at-home policies, but need to second the same shift: in this work, the design and implementation of a prevention-oriented, ambient-assisted-living environment is introduced. The AALISABETH (Ambient-Aware LIfeStyle tutoring for A BETter Health) project, a 2M€ project partially funded by INRCA (Italian National Institute of Health and Sciences on Aging) and by Regione Marche, targets the healthy elderly population. These participants are free from severe illness or impairments but are considered at risk of endemic age-related diseases such as diabetes or hypertension. Such pathologies are often related to bad lifestyle habits, and most notably to unhealthy food intake and to poor physical exercise. Clinical monitoring of such risk conditions involves the use of physiological sensors (e.g., measuring blood pressure, or glycaemia): despite the availability of inexpensive models, regular checkups are often missed due to boredom or lack of motivation. AALISABETH aims at integrating such information with lifestyle-related information; it may provide a less intrusive, yet comprehensive and effective, way to monitor health status. **Method** The AALISABETH framework integrates a number of different technologies: first, a set of clinical sensors was selected; they are suitable for home use and capable of network connectivity. Then a set of environmental sensors were considered, including presence sensors, bed- and chair-occupancy, door sensors, and light switches. Among many off-the-shelf sensors, some are being designed with a specific purpose in mind: for instance, since feeding habits are relevant, kitchen activity sensors and food frequency recognition devices are considered (e.g., RFID-tagged dishes and food jars). Finally, wearable devices are utilized for detecting falls and for qualitative and quantitative assessment of movement. **Results & Discussion** Data coming from such devices populates a database and feeds an inference model, looking for behavioral and health-related indicators. A specific ontology (named OntoAALISABETH) has been defined, by suitably modifying the DogOnt[1] ontology. The system database is then mapped to OntoAALISABETH, thus providing dynamic data with semantic meaning. These filtered data, in turn, support the process mining approach, aimed at discovering events matching predefined patterns (scenarios). In building such scenarios related to target lifestyle checks, medical insights are accounted for. The AALISABETH software and hardware system architecture has been designed; the system is undergoing lab tests, whereas field tests are planned, with pilots starting later this year. An application example illustrates how the AALISABETH system may utilize data fusion to support the automatic formulation of a heart failure (HF) diagnostic suspicions. Of course, while such a condition can be easily ascertained by a physician with clinical sensors data, it is impractical to have frequent clinical checks when no disease symptoms show. The HF scenario defines a number of symptoms that can be evaluated by the system through environmental sensors only: nocturia is detected by bathroom presence sensors and by toilet-flushing sensors; edemas are revealed by the bodyweight scale or by 'analogic' (i.e., embedding a load cell) bed/chair sensors; weakness can be detected by wearable sensors assessing a decrease in the speed of movement and by increases in time spent in bed or armchair. Whenever the system finds a condition matching the scenario, the user is automatically shown the proper self-checking of clinical parameters: for example, the user is asked to perform a check with the network-connected pulse oximetry device. If a decrease in the oxygen saturation is detected, the system issues a warning to caregivers. Similarly, a hypoglycemia scenario involves checking of home sensors (reduced food quantities or cooking/feeding activity, slowing down of movement, and nightly access to fridge or food storage), and provides recommendations for a glucometer automatic check and alerting caregivers when needed. With this respect, the system acts as an 'automatic triage' tool, based on the unobtrusive, continuous checking of lifestyle parameters. The hierarchical AALISABETH vision still encompasses the use of specialized clinical sensors and medical intervention, but triggers their involvement when actually necessary, at the same time as it increases the effectiveness and reliability of the care scheme and limits the user's burden. The same approach can be extended by designing suitable scenarios such as sedentary behaviors, or unhealthy feeding habits.

**Reference**

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