F. Grossi, V. Bianchi, G. Matrella, I. De Munari, P. Ciampolini. A versatile home control and monitoring network. Gerontechnology 2008; 7(2):116. Health of older persons typically deteriorates with increasing age[1], sometimes compromising Ageing-in-Place, especially when living alone. Daily living needs that might be fulfilled with ambient assisted living (AAL[2]) technologies include: safety and security, enhanced communication (to compensate for reduced mobility or sensorial impairments), health monitoring, support in accomplishing demanding or repetitive tasks, care. However, cost is still a critical issue. In this study, a cost-effective, high-performance home control and monitoring system is presented, based on distributed intelligence and featuring large versatility and expandability.

Methods A fully-functional home automation and monitoring system has been designed and realized that exploits standard LAN (wired and wireless) media and IP communication protocols. Assistive tasks (ranging from simple light control to more complex monitoring routines) are thus delivered by sharing the very same environment of home data network encompassing all home appliances and devices. The adoption of mass-market networking technologies makes low-cost devices available and fosters device interoperability. Flexibility is enhanced by designing a configurable network interface[3] that allows for networking devices (sensors, actuators, user interfaces), even with lacking built-in network ports. A hierarchical and modular network topology is exploited that makes the network easily scalable and upgradeable. Reliability and fault-tolerance is obtained by means of redundant devices and control processes. Remote and vocal controls have been implemented. Through internet connection, remote monitoring, maintenance and control are enabled. Data may come from the home environment (light switch, power outlets, smoke sensors, infrared detectors) or from personal devices (wearable sensors or health-monitoring devices). All activity data are logged by the system and can be exploited for health-related behavioral analysis, providing an inherently non-invasive, virtual health sensor[4]. **Results and discussion** A prototype system has been deployed at a sheltered house including 5 apartments. All rooms were equipped with smoke, flood, temperature, and intrusion sensors. Lights and appliances are controlled by the system. Infrared sensors are used for security purposes, and provide tracking and activity information as well. Video-communication devices, featuring simplified interfaces conceived for older persons, are connected to the system, as well as a small tele-health desk capable of acquiring blood pressure, body weight, blood glucose level and oxygen saturation. The system features over 700 peripheral devices, and is monitored and controlled from a remote location. Figure 1 shows a simple example of the 'virtual' sensing capability. It refers to the activity logged by an infrared detector in a given room: a reference activity profile and 'normal' activity bounds (dotted line: only the upper bound is shown here) are captured by statistical analysis of data acquired during a prolonged observation period. Then, the current sensor outcome (solid line) is compared against the reference. In the given sample of a real case, peak activities are found in the night hours, which largely exceed the reference. Such a perturbation of the customary wake/sleep cycle is likely to be due to sickness. More accurate inferences could be extracted by analyzing and correlating multiple sensors responses.

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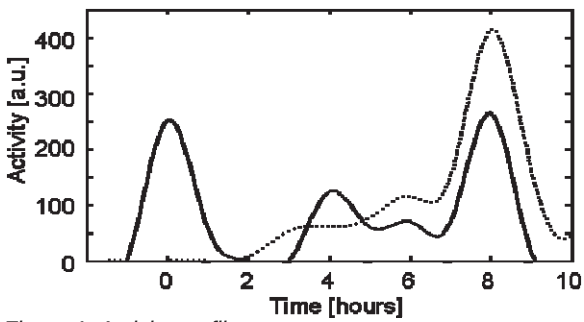

Figure 1. Activity profiles