Senior-friendly kitchen activity: The FOOD Project

Purpose Among daily-living activities, kitchen tasks may profit most for ICT-based, elderly-assistive solutions: (i) for safety; (ii) for complex and cognitively-demanding tasks; and (iii) since most home technology is found in kitchen appliances. Food-related activities, moreover, play a major role in social and cultural life, and could be exploited to foster inclusion and active ageing. The FOOD (Framework for optimizing the process of feeding) project (EU-AAL joint program), is based upon these premises, and aims at building a 'smart' kitchen environment, providing older adults with services supporting safety, motivation and fun in the kitchen, and a healthy lifestyle. **Method** FOOD utilizes a networked kitchen, in which appliances and environmental sensors communicate, both at the local and the remote level. An open, flexible infrastructure has been devised. Wireless communication is implemented with IEEE 802.15.4/ZigBee protocol, embedding ZigBee transceiver nodes into white goods. For the sake of interoperability, devices are compliant with the ZigBee Alliance 'Home Automation' profile. The infrastructure is supervised by a local gateway that bridges the system toward the external world. Openness is a concern, and interaction (local as well as remote) with the system is managed through 'web services' in the framework of a service-oriented architecture (SOA). This makes it possible to pursue a 'platform' approach, in which different services from different providers, may access the system. This allows for customization and fostering of an effective business model. Besides the assistive solution described here, accessing the kitchen network is also relevant to energy management (e.g., power metering, load balancing) and to maintenance purposes (e.g., remote diagnostics, firmware upgrades). Services could be as simple as basic safety monitoring tasks (e.g., detecting floods or gas leaks, or checking for cooking appliances forgotten in the active state), or involve more elderly-oriented support. For instance, a recipe database can be accessed through nutritional and medical 'filters'; step-by-step guidance is provided for selected recipes (intended for the use of cognitively-impaired people); automatic set-up of the cooking appliances (most notably the oven) can be connected to the desired recipe. The data stream coming from the kitchen network is also exploited for profiling the user's habits and for early detection of behavioral changes (connected to feeding and possibly suggesting health issues). Eventually, inclusion-oriented services are planned, stimulating social and playful sides by fostering sharing of cooking experiences and food talks. For instance, if a user is especially good at preparing a given dish, the system may enable her/him to teach friends about it, by guiding her/him through the technical steps needed to record a clip, writing down the recipe, uploading images, and publishing in the FOOD circle news. In order to move from service concept to its actual design and implementation, a user-centered approach was followed[2], engaging end-users with talks, cooking habits assessment, mock evaluations, and tuning. **Results & Discussion** The complete FOOD infrastructure has been implemented, and extensive lab testing was carried out. Pilot sites have recently been developed, involving about 30 households distributed over 3 different European countries (the Netherlands, Romania, and Italy). Each household has been equipped with 'smart' appliances (hob, fridge, and oven) and a set of sensors. After the infrastructure installation, a blind period followed, during which the network was active but no service was available to the user in order to assess the kitchen 'baseline' usage and to serve as a reference for evaluating the impact of subsequent service introduction. Services were localized to the specific pilot site by providing the user with local language interfaces and recipes consistent with local customs. The overall FOOD network is managed over the Internet, exploiting the platform approach; for instance, the central database that uses data from all households is located in Romania, whereas remote management of appliances (e.g., downloading new cooking cycles on the oven) is taken care of by the appliance manufacturer. Continuous evaluation will be carried out both at a subjective level (through periodical interviews and questionnaires) and at an objective one, based on usage data analysis.