A Personalisation Platform for Older Adults with Mild Cognitive Impairments

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The AAL PETAL project has developed a platform for personalising remote assistance of older adults with mild cognitive impairments. The platform is targeted at caregivers without programming knowledge in order to help seniors in their daily activities at home.

ICT technologies have great potential to help prolong the time elderly people can live independently in their preferred environment. However, several barriers exist when it comes to seniors actually using existing technologies: older adults may have different needs and attitudes to younger generations - for example, attitudes towards technology, physical or cognitive limitations, and interests. Furthermore, the needs of elderly people are not static; they are likely to evolve over time depending on variables such as evolving health conditions and preferences. Thus, the personalisa-tion of ICT-based support is a funda-mental challenge.

In the AAL PETAL project [L1] at the HIIS Laboratory of CNR-ISTI [L2] we are developing a platform for personal-ising remote assistance of older adults with mild cognitive impairments, with a particular focus on the support of lighting systems in order to provide ori-entation over time and in space. This category of users suffers from cognitive issues, such as the tendency to forget tasks/events and/or other issues such as cardiovascular issues, reduced sight, and irregular eating habits, often associ-ated with increased risk of social isola-tion and depression. The platform moni-tors the user's environment and behav-iour, and personalises applications and control devices to better support seniors in their daily lives. Thus it exploits smart objects, such as lights, to provide appropriate activation or relaxation stimuli, and it generates alerts and reminders for physical and social activi-ties, orientation over time and space, and sleep quality.

The user or caregiver can set the device to control lights and other digital devices when relevant events occur. In this way it is possible to personalise control of the lights and other digital appliances, to set personalised warning messages to be issued in risky situa-tions, and persuasive messages to encourage healthier habits (e.g., more physical activity). The possible person-alisations are expressed in terms of simple trigger-action rules [1, 2, 3]. Triggers represent situations or events that might be useful for caregivers to know: e.g. health/cognitive/emotional status, cognitive/physical/social activity, especially when the caregiver is not present (remote monitoring). The information associated with triggers is derived from various sensors (e.g. motion, proximity, lights, noise, respira-tion, heart). Actions represent what the technological equipment within the home could do: control appliances (e.g. switch on/off lights, close/open doors, play tv/radio), send reminders, send alarms, provide information about the user's needs. Personalised rules that can be obtained with this approach include:
- When the user leaves the house and rain is forecast, a phone alert can sug-gest taking the umbrella;
- A message can be sent to the caregiv-er when the user leaves home during the night;
- When a caregiver sends a message "where?", an automatic answer pro-vides the user's location;

Figure 1: An example of home involved in the trials.
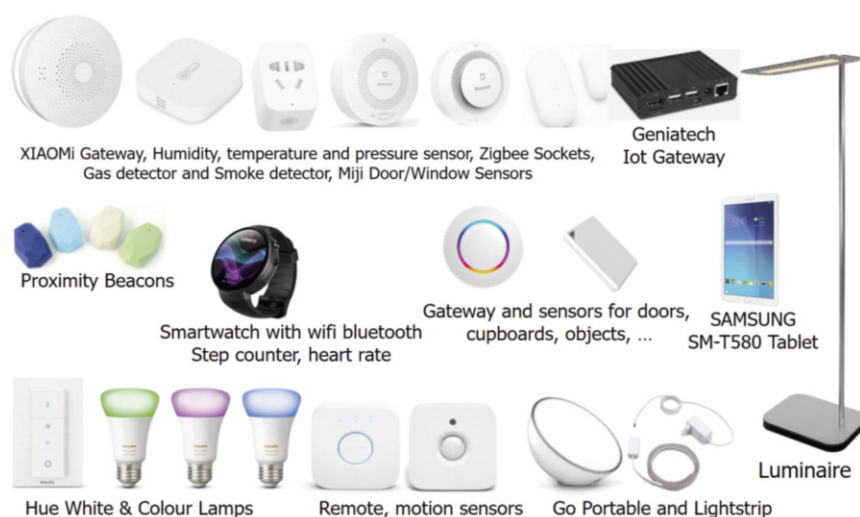

Figure 2: Sensors and Objects in the Trials.

- If a user has not done the planned cognitive exercises, a blink of the light acts as a reminder to continue this activity;
- If the user is close to the living room and time is 4 pm, turn on the TV.

We have organised trials in homes with older adults with mild cognitive impairments, distributed across various European countries (Figure 1 shows one home involved in the trials). Figure 2 shows the types of sensors, objects, and devices we use in such trials. Each user has a tablet, and a smartwatch. We have selected a smartwatch that, in addition to detecting physiological parameters such as heart rate and step counter, is able to connect and communicate at the same time through Bluetooth and Wi-Fi. This is exploited to obtain indoor positioning with the support of proximity beacons. For light, we use the GREAT luminaire (designed by Bartenbach, a company involved in the PETAL project), which aims to provide health-stimulating, biorhythm-stabilising, high-quality light for high visual demands, and creates an activating or calming room ambiance with different light scenes. The extremely high light intensity (1000 lx at eye level) of the GREAT luminaire leads to effects comparable with classic light therapy within five hours of use. It compensates missing daylight and provides distributed light within a whole room of about 16 m2. In addition, we use various types of Philips Hue lights to support similar effects in other parts of the home. Other sensors detect gas, smoke, humidity, use of objects, whether windows or doors are open and so on. The platform is also connected with an app developed by Ideable (a Spanish company involved in the PETAL project), which supports serious games for cognitive stimulation in order to allow caregivers to define rules depending on the user's cognitive and emotional state or depending on the training results.

Supporting this technology is a personalisation platform that includes a middleware (context manager) to gather raw information from the various sensors and convert it into data that can be analysed in terms of logical events and conditions. In this way, when the personalisation rules are created by the user or caregiver, it is possible to detect dynamically when they should be triggered and the consequent actions performed.

Links:
[L1] http://www.aal-petal.eu/
[L2] https://giove.isti.cnr.it/lab/home

References:
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Technological Memory Aids for Neurodegenerative Diseases and the AuDi-o-Mentia Approach

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Rates of dementia are increasing, putting pressure on national health systems. Digital health can help both patients and national health systems in a range of ways. One technology that is being developed is AuDi-o-Mentia, an acoustic memory aid to help people in the early stages of dementia.

The progress and the use of modern technologies and digital services have changed the way people monitor health and well-being. The ability to access personal data for remote monitoring and self-management can greatly improve healthcare.

Broadly speaking, there are two aspects to digital health: the perspective of the patient, and that of the state. For the patient, digital health represents personalised and higher quality care that adapts to their needs. For the state, digital health can reduce inefficiencies in healthcare provision and costs in national health systems. Thus, digital health has resulted in a significant increase in the quality of life of patients, as well as a significant positive effect on the global economy.

The rise of digital health raises the urgent need for technology to support "smart care" in the home environment, enabling people to live independently, for longer, in their preferred environment, whilst offering their physicians and carers resources and tools to manage their patients effectively and efficiently.

Many factors contribute to the development of neurodegenerative diseases, which mainly affect people over the age of 60. Some of the most common neurodegenerative diseases include dementia (with its most well-known form being Alzheimer's disease), Parkinson's disease, and epilepsy. Several digital health systems have been proposed to support people suffering from neurodegenerative diseases, with an emphasis on dementia, since it is the most common neurodegenerative disease. The total population with dementia is projected to reach 82 million in 2030 and 152 million by 2050 [L1]. The increasing prevalence of this disease is putting pressure on national health systems worldwide.