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Independent ageing: support from interdependent ICT

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With Europe's population aging rapidly, technologies and services that help older people stay healthy and lead active, independent lives are likely to be in high demand in the future. A new open software architecture developed by EU-funded researchers promises to make implementing them as easy as plug-and-play.

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Europe already has 19 of the world's 20 oldest countries in terms of population age, and by 2030 a quarter of the continent's population will be over 65. Technology and advances in medicine have played a big role in extending life expectancy, now technology promises to help people overcome many of the problems associated with old age, from the need for regular monitoring of their health to averting social isolation, helping them move around and even continue working.

Various applications and services, largely based on a combination of ambient intelligence, sensor networks and communications technologies, already exist that can help older people. Wearable devices have been developed to remotely and intelligently monitor blood pressure, breathing and physical activity. Smart home systems can automatically control lighting, temperature and humidity.

And communications and location-based technologies are helping everyone stay in touch with family and friends, work remotely and find their way around.

'There are lots of technologies out there, but many are proprietary or they are not designed to be interoperable. This creates a lot of challenges, increases the cost of implementation and often makes assisted living systems difficult to install and use,' explains Silvio Bonfiglio, the New Business Opportunities Manager at Fimi, an Italian technology company.

Mr Bonfiglio coordinated the Oasis [2] * project, which set out to address the interoperability challenge facing applications and services designed for older people.

'We wanted to ensure that systems and the data and content they generate are interoperable, that they can all work together seamlessly to provide a range of services to the end user in a transparent way,' he says. 'If you have one sensor for service A that reads room temperature information for example, why should you have to install another room temperature sensor for service B? That's just not efficient.'

The Oasis consortium, composed of 33 partners from Europe, China and Mexico and supported by EUR 8.5 million in funding from the European Commission, addressed the interoperability challenge by developing an ontology-driven architecture framework specifically for ambient assisted living applications.

Based on the Common Algebraic Specification Language (CASL), the common ontological framework has been described as a 'hyper-ontology' - an open, modular, holistic, easy-to-use and standards-abiding way of describing a shared concept of applications and services. In practice, the approach means that software and systems can share data and interoperate seamlessly even if they have different application domains and are designed by different developers.

One open architecture, endless applications

'For example, one service might monitor the health of an older person suffering from diabetes, while another service could help him plan his diet. By ensuring interoperability and data sharing between the two services, the diet application knows how to adjust the person's food intake depending on his health,' Mr Bonfiglio says. 'This, in turn, could be linked to an activity monitoring application that might tell the diet tool to prompt the user to drink more liquids or eat certain food after a period of physical exertion.'

The Oasis ontological framework supports the Oasis open reference architecture, enabling the automatic or semi-automatic connection of services and applications, and the Oasis platform, which manages the services, provides user interfaces for the applications and automatically adapts them to different devices, usage contexts and user preferences.

To test the technology the team implemented 12 different types of applications, all of them integrated in the Oasis architecture and covering a range of scenarios and use cases including independent living services, socialisation tools, mobility services and smart workplaces. Trials were conducted with hundreds of end-users, mostly people over the age of 65 and care providers, at four sites in Germany, Italy, the United Kingdom and at a combined site covering Bulgaria, Greece and Romania.

'Feedback from users was generally positive. They particularly valued applications related to monitoring their health, as that is often the issue they are most concerned about,' Mr Bonfiglio says.

'In addition, we consulted end-users throughout the project to help ensure the technology met their requirements, particularly with regard to user interfaces.'

Mr Bonfiglio points out the end-user trials were designed to validate the team's work and highlight potential uses for the technology and architecture. The biggest challenge and innovation, he emphasises, was getting all the applications to work together.

'Designing a new ontology from scratch is a big challenge, but we have successfully achieved that and showed how different applications and services can work together regardless of their context of use, purpose or who created them,' the project coordinator says. 'The architecture is open source and available for other developers to work on, we have taken a Wikipedia-like approach to the continuity of our work, allowing anyone to contribute.'

In that vein, the Oasis project's architecture and ontology is now being used in other projects such as UniverSAAL, which is creating an open platform for ambient assisted living solutions, addressing many of the financial, technological and practical impediments to more widespread deployment of technology to assist the elderly. The Oasis team also succeeded in launching its own standardisation initiative on ontology integration and interoperability and to have it included in the standardisation program of ISO TC37/SC3, a sub-committee of International Organization for Standardization devoted to systems to manage terminology, knowledge and content.

Meanwhile, project partners such as Vodafone, FIMI Barco, FIAT, Mizar and PTV are likely to also exploit elements of the Oasis research in their products, Mr. Bonfiglio says.

'The market for these kinds of solutions is large and will continue to grow rapidly in the future as the population ages, but there are still barriers to more widespread adoption, largely financial ones. The big question is who will pay for these services? The end-users? Governments?' Mr Bonfiglio says. 'If that question can be answered, the long-term benefits are clear and far outweigh the costs: a healthier, more active and less dependent older population.'

Oasis received research funding under the European Commission's Seventh Framework Programme.

* 'Open architecture for Accessible Services Integration and Standardisation'.

Useful links:

- Project website for 'Open architecture for Accessible Services Integration and Standardisation' [2]
- Oasis project factsheet on CORDIS [3]

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