IT AND TELECOMMUNICATIONS

INFORMATION TECHNOLOGY FOR PEOPLE WITH DOWN'S SYNDROME

An EU project involving ICT research is producing visual and touch apps to help people with Down's syndrome become more independent in their daily lives.

Many people with 'Down's syndrome' (DS) face barriers to taking part in community activities the rest of us take for granted. Whether it's travelling on public transport, paying for items in a supermarket or getting to appointments on time, there may be times when they need help, especially if they get into difficulties.

"Many people with DS cannot take advantage of the standard functionality, since it is not adapted to their skills and abilities."

The EU-funded POSEIDON project (PersOnalized Smart Environments to increase Inclusion of people with DOwn's syndrome) is an exciting three-year project running until November 2016. Its aims include using information technology to help people with DS achieve: a greater level of independence in their lives; more autonomy at home, at work, in education and during leisure time; and increased opportunities for socialising. The types of technology being developed in the project include apps for tablets and smartphones, virtual reality programmes and interactive tables.

Tools for learning and travelling safely

Knut Melhuus, a young Norwegian with DS, will be one of those users testing some of the apps POSEIDON produces. He confesses to being a bit of a technology nut: He owns a tablet, a smartphone and a PC, and regularly phones, emails and sends SMS messages to his friends. 'Technology is "awesomely useful",' he says enthusiastically. 'I use the calendar a lot for appointments and birthdays. Then I can see what I'm supposed to do, like remind Mum about something, or send someone an SMS when it's their birthday. I also use social networks, like Facebook and Snapchat.'

One of the apps the POSEIDON partners in the UK, Germany and Norway are designing is a calendar which displays the day's events in a simple way, and links in with school timetables, weather information and instruction videos. On a given day, for instance, it will tell the user which schoolbooks to pack, which clothes and shoes would be most suitable to wear, and whether he or she needs an umbrella or not.

'We want to give people with Down's syndrome additional support in comparison to that provided by standard smartphones and tablets,' explained POSEIDON coordinator Terje Grimstad, of Karde AS, an innovative product developer in Norway. 'Many people with DS cannot take advantage of the standard functionality, since it is not adapted to their skills and abilities.'

The partners are taking a user-centric approach, examining the needs of around 20 people with DS and their families, as well as carers and teachers. The prototypes they are seeking to develop and are beginning to test with the target group include virtual and photo-based navigation apps, and tables with touch and free-air gesture technology which interact with large screens that could be useful in classrooms. They are also looking at shopping apps which help when it comes to handling money.

High level of tailor-making required

Questionnaires have been sent out through DS associations in 10 countries in Europe. Two user workshops were also held earlier this year — in Oslo and Mainz, Germany — to try out a few ideas. Hundreds of replies to the questionnaires were received and, along with what was learned in the workshops, reveal that people with DS are generally familiar with ICT equipment. Some 85 % and 57 % of them already use tablets and smartphones, respectively. The project partners will be running a pilot phase with families starting mid-2015 and hope to introduce their first apps to the market in early 2016, after which they will hold a third workshop in the UK in Autumn 2016.

One of the key conclusions at this early stage is that the apps need to enable a high degree of tailor-making. 'One size doesn't fit all,' says Terje. 'People with DS and their carers need to be able to load in, for example, their own timetables, instruction videos and transport information and photographs. Norway looks very different when there's snow on the ground! Currencies are another issue, whether it's the euro, pound or krone.'

The partners also want the platform they are building to be widely available to other system developers worldwide to enable them to develop new apps for the target group. They plan to talk to technology companies in the project's final year about how their results can be used on a bigger scale.

POSEIDON is a three-year project involving nine partners from four countries and runs until 31 October 2016. It is receiving EUR 3 million from FP7.

POSEIDON
★ Coordinated by Karde AS in Norway.
★ Funded under FP7-ICT.
★ http://cordis.europa.eu/result/rcn/151858_en.html
★ Project website: http://www.poseidon-project.org/

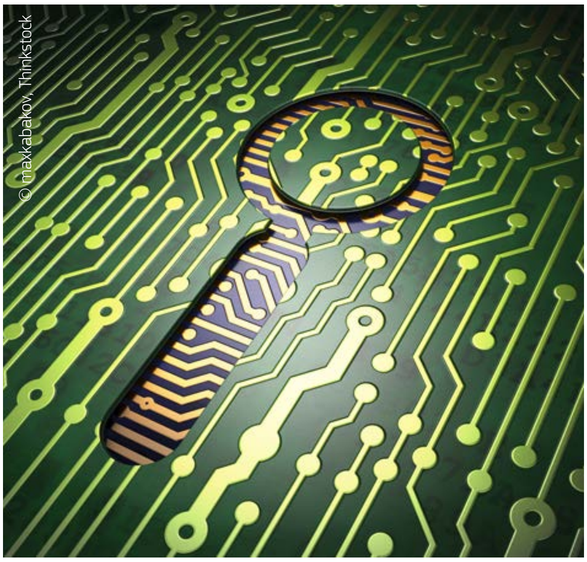
ALL-OPTICAL INFORMATION PROCESSING

EU-funded scientists have set out to develop an all-optical 'Liquid-state machine' (LSM) based on a complex network of lasers. This should allow machine-learning computations to be carried out at unprecedented speed and using low energy consumption.

Reservoir computing represents a new paradigm in information processing, based on the idea that computational power can emerge from system complexity. The central part of the setup is a vast non-linear network — the reservoir — with nodes needed for information exchange. The connections to the output layer are trained to read the state and map it to the desired output.

The EU-funded project NOVALIS (A novel architecture for a photonics liquid state machine) aimed to develop a novel photonic approach to reservoir computing based on an LSM, which is a major type of it. The idea was to replace the network by lasers, acting as nodes. These nodes were highly non-linear in order to provide the complex dynamics necessary for computations.

Implementation of these nodes was achieved by using 'semiconductor lasers' (SLs) with delayed feedback. Optical information injection with 5 Gsamples/s sample rates revealed impressive single SL information-processing capacity. Coupling and feedback were then established for a two-SL system by using polarisation-maintaining optical fibres. However, scientists could not obtain computation results because of slowly varying modulation at the output intensities.


© maxkabakov, Thinkstock

Another implementation of LSMs was a 'Vertical-cavity surface-emitting laser' (VCSEL) array that was embedded in a cavity, delay-coupling several laser diodes. Consequently, a