ISSN 1977-4028

European Commission

research*eu

RESULTS MAGAZINE

N°37
NOVEMBER 2014

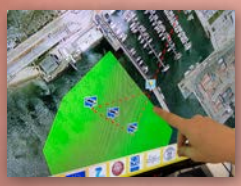
SPECIAL FEATURE

CLOSE-UP ON NANOTECHNOLOGY

SOCIAL SCIENCES AND HUMANITIES

HOW RESEARCH CAN HELP PLURALISM ACROSS EUROPE

» PAGE 21



ENVIRONMENT AND SOCIETY

USING ROBOTS FOR A BETTER UNDERSTANDING OF THE UNDERWATER WORLD

» PAGE 29

IT AND TELECOMMUNICATIONS

FLYING ROBOTS WILL GO WHERE HUMANS CAN'T

» PAGE 35

© ARCAS

"ARCAS is pioneering in that the flying robots are being equipped with arms to perform increasingly complicated manipulation tasks autonomously."

IT AND TELECOMMUNICATIONS

FLYING ROBOTS WILL GO WHERE HUMANS CAN'T

There are many situations where it's impossible, complicated or too time-consuming for humans to enter and carry out operations. Think of contaminated areas following a nuclear accident, or the need to erect structures such as antennae on mountain tops. These are examples of where flying robots could be used.

The EU's ARCAS (Aerial Robotics Cooperative Assembly System) project has designed a range of different flying robots with multi-joint manipulator arms to work together to grasp, transport and deposit parts safely and efficiently. The autonomy and skills of the robots are being developed to build or dismantle structures for a host of future applications, from rescue missions to inspection and maintenance in the energy and space sectors.

'The idea is that the robots should be able to fly in anywhere where it is impossible or impractical for piloted aircraft or ground robots to operate,' explained ARCAS project manager Professor Aníbal Ollero, from the University of Seville. 'We have helicopters, and multi-rotor systems with eight rotors to give more hovering control, increase the payload and carry arms with greater degrees of freedom.'

Up to 10 mini-prototypes have been demonstrated working together on an indoor test bed at CATEC, the Advanced Aerospace Technologies Centre in Seville, Spain. Larger outdoor demonstrations using adapted helicopters and bigger multi-rotors have been performed at the facilities of DLR, the German national aerospace research centre, near Munich, and the University of Seville, to show how they grasp bars and transport them over distances before depositing them.

The idea of flying robots is not new, of course. A large range of unmanned aerial vehicles is already in use, notably to take photographs and collect other sensor data. But ARCAS is pioneering in that the flying robots are being equipped with arms to perform increasingly complicated manipulation tasks autonomously. They are programmed with briefing information and 3D maps to orient them, equipped with sensors to adapt if a mistake is made (such as dropping a part) or circumstances change (like weather conditions), and even taught how to land safely in an emergency or fly home

automatically when they lose contact with base.

'The robots work very well,' said Professor Ollero. 'We still need to improve accuracy and repetitiveness in different conditions, but the results are very promising. We have demonstrated aerial manipulation with six- and seven-joint arms, and perception and planning functionalities, and this is a first worldwide.' Now the aim is to improve the robots' robustness and reactivity, working them together in bigger numbers and increasing the complexity of tasks they perform.

From pipeline inspection to space junk

ARCAS is paving the way for the flying robots to be used in applications, as soon as national safety laws allow. At first, this is likely to be for inspection and maintenance purposes: oil and gas pipelines and electricity networks stretching over thousands of kilometres, for example. In the medium term, the team believes the robots could cooperate in the rapid building of structures, such as antennae stations in remote areas or platforms between buildings, say, to rescue people from fires. In the long term, post-2020, they will be able to dismantle satellites, service space stations or even help remove space junk.

ARCAS

- Coordinated by FADA in Spain.
- Funded under FP7-ICT.
- http://cordis.europa.eu/result/rcn/148256_en.html
- Project website: http://www.arcas-project.eu
- http://bit.ly/1s1xlnO

HIGH-SPEED OPTICAL INTERNET

Barely anyone in Europe has premium-speed Internet, and providing it via underground cabling is impractical. A new EU solution promises an affordable alternative: super-fast optical connection between buildings.

© TCmake_photo, Thinkstock

For many Europeans, the internet has become vital for work and study. However, to meet these needs, the growing bandwidth demand often exceeds the capacity. Only 2 % of Europeans have 100 MB/s connections; providing this to the rest of the population would be cost prohibitive, mainly because of the trench-digging involved.

Europe requires a solution that does not involve such trenches or the laying of cable. Working on this is the EU-funded CONNECTTOO (Development of a wireless high capacity broadband product, based on Free Space Optics, providing a new opportunity for low cost connection of houses to the fibre-based digital highway) project. The aim was to develop a low-cost 'Free space optical' (FSO) device capable of high-rate data transmission, suitable for any short-range wireless application. To this end, work first required matching user needs with available technologies, leading to a functional product. The seven-member partnership ran from October 2010 to September 2014.