MEMO/10/140

Brussels, 20 April 2010

ICT research: EU invests €500 million in Future and Emerging Technologies (FET) to improve people's lives

Developing intelligent artificial hands for hand amputees, neural devices to help people suffering from vertigo, dizziness and other vestibular disorders and the possibility to see how your brain responds while learning are a few examples of European research carried out in the area of future and emerging information and communication technologies (FET) that are being presented in the European Parliament in Strasbourg today. Twelve outstanding science projects funded under the European Commission's Future and Emerging Technologies programme will be showcased at the exhibition on "Science beyond Fiction: an Excursion into Future and Emerging Technologies". Europe is taking the lead in FET by proposing to invest around €500 million in exploratory research into high risk future Information and Communication Technologies (ICTs).

EU Digital Agenda Commissioner Neelie Kroes said: "In these days of economic uncertainty, Europe must boldly invest in its future. The European Commission wants to double the budget for FET research by 2015 and I urge Member States to match this effort with their own investments."

What is FET?

Future and Emerging Technologies (FET) is part of the ICT programme of the European Commission. FET aims at promoting long-term research, laying the scientific foundations of radically new next generation technologies. FET helps identify and develop future research in ICT and into uncharted areas such as the interdisciplinary field of quantum information science (quantum physics and computer science combined), often inspired by and in close collaboration with other scientific disciplines.

How is FET financed?

FET receives research funding under the EU's Seventh Framework Programme (FP7). The European Commission is increasing the FP7 budget for FET research by 20% per year up from €100 million today, and Member States are invited to match this effort with similar increases. The Commission intends to fund FET research with a total budget of around €500 million for 2010-2013.

What are the projects financed by the FET programme?

Biologists, neuroscientists, specialists in nanotechnologies and computer scientists are all paving the way to the most advanced research in FET. Here are just some of the projects that will be exhibited at the European Parliament:

CyberHand and SmartHand have developed an artificial hand that is capable of behaving and feeling like a real hand. It can be used for hand amputees. **eMorph** and **Brain-i-Nets** explore the way in which a brain processes information by recording the changes that take place during the learning process. The goal is to gain new understanding of how the brain works. **Megaframe** has developed a high speed digital camera which is fast enough to capture impulses travelling between brain cells and broadcast them in high resolution video.

Other FET projects can pioneer solutions for global challenges such as climate change, social problems, energy consumption and spread of diseases (**GSD**) and design of epidemic forecast infrastructures **(EPIWORK)**.

What is the future of FET?

The European Commission will continue to support ambitious, science-driven flagship initiatives to tackle the scientific challenges of the 21st century. These projects will reduce fragmentation and increase the effectiveness of the European research efforts. They also have the potential to meet some of the society's big needs if they receive political support and backing from the stakeholders involved.

FET will encourage young researchers by empowering them to jointly explore their boldest visions for future technologies.

A targeted initiative will be launched to engage more closely high-tech research intensive small and medium-size enterprises in FET research. In this way, research results will turn more quickly into a true innovation potential for the future.

In all its activities, FET will promote collaboration of European researchers with the best research teams worldwide.

Neelie Kroes' speech at FET exhibition will be available: SPEECH/10/168.

More on FET:

FET website: http://cordis.europa.eu/fp7/ict/programme/fet_en.html

European Commission Communication to the European Parliament and Council: "Moving the ICT frontiers - a strategy for research on future and emerging technologies in Europe" (http://ec.europa.eu/information_society/events/fet/2009/documents/fetcom.pdf)

Annex: Summary of projects on show at the exhibition on "Science beyond Fiction - **An excursion into Future and Emerging Technologies.**

Theme: better living

CLONS battles vestibular disorders by developing neural prosthetic devices that are directly connected to the inner ear. Vestibular disorders are very stressful with symptoms such as disorientation, dizziness, jerky movements and seeing illusory movements. CLONS aims to radically improve the quality of life for the many people affected. The implantable neural prostheses foreseen are to restore and control vestibular function digitally. Will fixing vestibular disorders become standard practice in the near future? CLONS gives us good reasons for thinking that the answer could well be in the affirmative. Moreover, the new models of the human vestibular system that are developed in this project are inspiring completely new types of sensors.

http://www.clons-project.eu/

The objective of the **CyberHand** and **SmartHand** projects is to develop an intelligent artificial hand that looks and feels like a real hand. This is a challenging and visionary goal. However, recent development in the field and several converging scientific areas makes it possible to state that the perfect artificial hand is no longer a fantasy. SmartHand aims to integrate recent advances in nanobioscience, cognitive neuroscience and information technologies in order to develop such an intelligent artificial prosthetic hand with all basic features displayed by a real one. While making a prosthesis that can directly be used by hand amputees, it also works towards a highly advanced neural interface, aiming to achieve a better knowledge in cognitive neuroscience, and thus also contribute to the field of nerve injuries in general.

http://www-arts.sssup.it/newCyberhand/smarthand/index.htm

Theme: Brain Inspired Technologies

Brain-i-Nets seeks to understand how the brain modifies itself during learning. What are the rules for synaptic change and neural network reorganisation that describe the adaptive processes of a learning brain? New experimental techniques in neurobiology (such as 2-photon laser-scanning microscopy, optogenetic cell activation and dynamic clamp techniques) are now making it possible to record the changes that take place in the brain during learning, even *'in vivo'*. The goal is to use such tools to gain new understanding of how the brain works. This understanding can then help us to engineer so called neuromorphic hardware that mimics the brain, such as developed by the **FACETS** project. Traditional work in the field has focused on studies of isolated samples of neural tissue taken entirely out of context. The amazing fact about Brain-i-Nets is that it builds on analysis of actual living brains. This holistic thinking with the deepest respect for biology could revolutionise neuromorphic engineering.

http://brain-i-nets.kip.uni-heidelberg.de/

Biological neural systems vastly outperform conventional digital machines in almost all aspects of visual perception tasks. Despite its dramatic progress, information technology has not yet been able to deliver artificial systems that can compare with biology. The **eMorph** project is designing novel, data-driven, biologically inspired, analog visual sensing devices, based on technology developed in the **Caviar** project as well as developing new computational paradigms for them. The system will adapt to the dynamics of the real world in order to develop a new way to process sensory signals. This will be tested in on the advanced iCub humanoid robotic platform.

http://www.emorph.eu/

Theme: Observing and Learning from Nature

Closing your eyes and exploring your surroundings with your fingertips provides an experience that is rich and immediate. While vision supplies information about distant objects, touch is invaluable in sensing the nearby environment. However, in designing intelligent, life-like machines, such as robots, the touch modality has been largely overlooked. Biology, by contrast, reveals an abundant use of tactile sensing in the animal kingdom. Indeed, in nocturnal creatures, or those that inhabit poorly-lit places, touch is widely preferred to vision as a primary means of discovering the world.

The **BIOTACT** project aims to build new technologies inspired by the whisker morphology and neural processing systems of two such tactile specialists: the Norwegian rat and the Etruscan shrew. The project is developing two biomimetic artefacts: a novel active tactile sensing array with many whisker-like sensing elements; and an autonomous whiskered robot that can seek-out, identify, and track fast-moving target objects.

http://www.biotact.org/

Megaframe gives a new meaning to the term slow motion video. The project team develops a camera fast enough to capture impulses traveling between brain cells in high resolution video. It might seem that it would be impossible to capture these signals in neuronal networks, traveling at 180 kilometers and lasting only for a millisecond or two. But this is no match for the Megaframe camera. It captures one million frames per second. This is forty thousand times faster than standard digital video. As if this was not enough, the camera is also sensitive enough to detect single photons of light. To get a sense of what this means think of yourself as looking at a normal candle one hundred meters away. The light sensitive areas of your eyes would be receiving millions of photons per second from this weak source of light. With extremely high frame rate, terrific resolution and single photon sensitivity we will be able to see new worlds of biological and other scientific phenomena on video for the first time. There is no doubt that Megaframe is making Europe a world leader in high speed digital video.

http://www.megaframe.eu

Theme: Human Computer Confluence

IMMERSENCE aims to enable people to freely act and interact in highly realistic virtual environments with their eyes, ears and hands. Human senses are integrated into a single experience allowing comprehensive immersion. While most of today's systems receive the user merely as a passive observer, IMMERSENCE enables users of Virtual Environments to manipulate items of various shapes, sizes and textures as well as to interact with other users including physical contact and joint operations on virtual objects. The development of new techniques of signal processing creates a synthesis of all sensory modalities to provide a feeling of "being there", allowing full multi-modal feedback.

http://www.immersence.info/

The **PRESENCCIA** project has as its major goal the delivery of presence in wide area distributed mixed reality environments. This environment includes an installation that understands and learns from its interaction with people, either physically or virtually present, or with virtual beings with their own goals and capabilities for interacting with one another and with embodiments of real people. Key elements studied are the cerebral mechanisms for presence in conjunction with advances in the underlying technology for mixed reality display and interaction, with special

attention to the interaction between people, and also between people and virtual people.

http://www.presenccia.org/

Theme: Understanding Global Systems

EPIWORK aims to develop the appropriate framework needed for the design of epidemic forecast infrastructures. This should seize the opportunity offered by the huge flow of social, demographic and behavioural data becoming available nowadays, and use it to improve traditional disease-surveillance systems. For the first time, ICT and computation enable the study of epidemic in a comprehensive fashion addressing the complexity inherent to the biological, social and behavioural aspects of health related problems. This includes for example mathematical and computational methods to predict the disease spreading in complex social systems and the design and implementation of original data-collection schemes through innovative Web and ICT applications.

http://www.epiwork.eu/

GSD stands for 'Global System Dynamics'. This project takes on critical global challenges – climate change, sustainable cities, social problems, energy consumption and spread of diseases. These challenges involve dynamics which no single group in society controls, but that affect everybody. Our global systems are changing rapidly and issues such as the prediction of climate change and the appearance and wide-spread diffusion of HIV are pressing. There is a need for establishing an efficient and accessible cooperation network for scientists and policymakers. GSD takes important steps in this direction and explores how complex systems analysis can support policy making by providing new insights into global systems dynamics.

http://www.globalsystemdynamics.eu

Theme: Data Deluge and Privacy

GeoPKDD maps and analyzes human activity in our mobile world. We live in times of wasted opportunities for collecting, storing and analyzing data on human activities. These opportunities come from location aware devices such as mobile phones, GPS devices and devices connected to the mobile internet. To take advantage of them GeoPKDD explores how to discover facts and knowledge within mobility data through automated data mining. This research also calls for reflection on how technologies are changing our social lives. The shift towards human knowledge discovery comes with unprecedented opportunities but also risks. Mobility analysis could be of societal benefit and help tremendously with anything from controlling traffic flow to urban planning, but it could also endanger our privacy. To put us on the right track GeoPKDD takes preservation of privacy as a key issue and stimulates discussion of the topic.

http://www.geopkdd.eu/

Vismaster tackles a fundamental challenge of our digital age: to effectively use information for planning and decision making. On the one hand, the appropriate use of available information offers large potential to realise progress and innovation in society. On the other hand, there is the problem of information overload. Vismaster captures the opportunities and avoids information overload by stimulating research in visual analytics. Visual analytics is an emerging research discipline for making the best possible use of large information loads in a wide variety of settings. The approach combines the strengths of intelligent automatic data analysis with the capability of human vision for directly seeing and understanding complex information.

http://www.vismaster.eu/