What about a European Robotics Area?

Science fiction has provided various snapshots of the present and future of robotics. While the image of a robot as a moving steel bin with eyes, colourful lights and a metallic voice is now obsolete, we are still a long way from seeing robots as advanced as the anthropomorphic "Terminator" in James Cameron's famous film of the 80's.

Lionel Boillot, Project Officer (P4) and Christos Ampatzis, Project Officer (S2)

One thing is for sure, the future of robotics looks bright and thousands of little (or not so little) agents are invading our lives, our homes, our countries, our planet and our solar system. These robots are more than ever assisting us to accomplish repetitive and tiring, or hard and daunting tasks, such as vacuum-cleaning or gardening on a Saturday morning!

So where does robotics stand today in terms of applications, capabilities, and ultimately intelligence?

Previous generations of robots were stiff and rigid robotic manipulators (arms) mostly found in manufacturing industry (the car industry above all) replacing workers in repetitive tasks with a significant gain in quality and efficiency.

In the last decade, the capabilities and applications of robots have increased significantly. Robots are becoming more intelligent, autonomous and adaptable. They are now capable of beating human chess masters, interacting with humans, taking decisions, and even learning, demonstrating the first elements of (artificial) intelligence! Also steering the metro in Copenhagen, exploring the planet Mars and helping surgeons with keyhole surgery are just some of the examples of what robots can do nowadays.

With a global market foreseen to reach € 65-100 billion by 2020, robotics is becoming a booming industry and a source of many innovations. If Japan is the undisputed leader in humanoid robotics, the USA is the champion in robotics applications for space, defence and agriculture, Europe is at the forefront for mobility in structured environments (urban transportation), care of the elderly and home service robotics.

In parallel to these application-oriented trends, there is enormous research worldwide on how to augment the cognitive capacities and intelligence of robotic agents, with the ultimate goal of having them pass the famous "Turing test"! After all, endowing robots with intelligence can help humans better understand animal as well as human behaviour, as the fast growing area of bio-inspired and humanoid robots shows.

Let's take a closer look at some of these projects!

The "Turing test"

Photo © European Union 2012 PE-EP

The Turing test is a test of a machine's ability to exhibit intelligent behaviour. A human judge engages in a natural language conversation with a human and a machine, all participants are kept separate from one another. If the judge cannot reliably tell the machine from the human, the machine is said to have passed the test. The test does not check the ability to give the correct answer it checks how closely the answer resembles typical human answers.

Marie Curie project ROBOT-DOC at the European Parliament

Photo: Ioannis Tsoukalas

On 28 March, MEP Ioannis Tsoukalas hosted a lunch debate and exhibition at the European Parliament on "European Research Leadership in Robotics". This event sought to raise awareness of the latest progress made in the field of robotics by European research. The event successfully gathered the European academic and industry robotics community as well as high level officials from the EU institutions (MEP Tsoukalas, Robert-Jan Smits - Director-General of DG RTD, Libor Kral - Head of Unit, Cognitive systems and Robotics at DG INFSO). Alessandra Luchetti - Head of Unit, Marie Curie Actions at DG EAC was a speaker along with Dr Angelo Cangelosi, who is the coordinator of the Marie Curie project ROBOT-DOC.

Marie Curie Actions - Training tomorrow's "roboticists"!

Within FP7, the Marie Curie actions fund around 100 fellows to the tune of €20M in 36 different individual and collaborative projects. Experts in human sciences, electronic and mechanical engineers and young PhD students are looking at a wide range of subjects, from mathematics for topographic modelling, ethics of robotic weapons, robotic gripping of sensitive objects to human-robot interactions.

Space Research

Robotic exploration is of the utmost importance for all Space Agencies and all space-faring nations, as robots are able to set foot on planets where conditions are very challenging or impossible for humans.

Therefore, the Space Unit manages several projects which address robotic exploration, performing research mainly on planetary rovers and robotic spacecraft.

PRoVisG & PRoViScout: Planetary Robotic Vision for Exploration

Photo: PRoVisG, PRoViScout

While, for humans, vision and recognition of targets is a trivial task, the same is not true for robotic agents. These two projects contribute to providing planetary rovers with "eyes" (vision) that capture images and a "brain" (cognition) that can decode the meaning of these images, and that transforms them into decisions and actions.

In particular, **PRoVisG** is taking care of the "eyes" by building a unified European framework for Robotic Vision Ground Processing in order to better exploit the image data which will be gathered during future robotic space missions to the Moon and the planets. This will lead to a significant enhancement of the scientific, technological and educational outcome of such missions.

On the other hand, **ProViScout** is focusing on the "brain" by demonstrating the combination of vision-based autonomous sample identification & sample selection with terrain hazard analysis for a long range scouting/exploration mission on a terrestrial planet.

We invite you to take a look at the projects' websites:
http://www.proviscout.eu/
http://www.provisg.eu/

ROBOT-DOC: cognitive and artificial intelligence

Photo: iCub

Within the project ROBOT-DOC, a cohort of 13 PhD students and 3 Postdocs are looking at the capacity of humanoid robots (iCub, Nao, ECCE, etc.) to analyse and learn from their actions based on children's learning mechanisms. iCub looks like a 3-year old child, can keep eye contact with people, fire a bow and arrow or pour cereal in a bowl. However, iCub was not programmed to do that - it learns it! iCub understands action words (e.g. "keep", "give", "receive") and reacts accordingly, it has also acquired some abstract concepts like "accept" and one of the ROBOT-DOC objectives is to make it understand more elaborate concepts such as "freedom" or "friendship". Have a look at www.robotdoc.org

Research for the benefit of SMEs

PV-Servitor – the cleaning robot!

Photo: PV-Servit

The **PV-Servitor** project focuses on concepts for a fully autonomous cleaning robot for ground mounted large scale photovoltaic power plants. Its application will increase the electricity output of the PV plant by 8% at a service cost of only 3%, thus resulting in a 5% user-benefit by cost reduction of the electricity yield.
The project has created a semi-autonomous prototype that cleans glass surfaces of solar modules of up to 2,500 square meters.
Who knows – maybe one day a robot on Mars will be cleaning up another robot's solar panels after a Martian dust storm!
www.pv-servitor.eu

Security Research

TALOS - When robots patrol the borders

Photo: www.pisp.eu

TALOS is developing a mobile, autonomous system for border surveillance and patrol based on Unmanned Ground Vehicles - UGV robots. The modularity and flexibility of the UGVs ensure their fast adaptation to specific tasks and local area conditions, such as the length of the border segment, lie of the land or tree cover.

The TALOS system is able to detect, locate, track and trace individuals and vehicles crossing a border, and even to engage the intruder using unmanned vehicles.
www.talos-border.eu