



ROBOTICS

GETTING EMOTIONAL ABOUT ROBOTS

Whether we are science fiction fanatics or factory workers, robots never fail to fascinate and spark our imaginations. There is something about their autonomy and apparent intelligence that endears them to us. A long heritage of European robotics projects reveals how coordinated research is pushing automation technologies. It may not be long before they become walking, talking and compassionate companions that today we only ever meet in the movies.

The first robot, called Unimate, was installed in the General Motors production plant in New Jersey, USA, in 1961. It was programmed for manual handling and welding jobs, working efficiently and in environments too dangerous for humans.

Today more than one million robots make light work of many industrial tasks, especially in the automotive sector. They are fast and efficient at what they do; the most advanced have complex sensory and cognitive capabilities. But they are still little more than industrial slaves, keeping the manufacturing sector competitive and freeing employees from repetitive tasks for safer, more rewarding activities.

The economic benefits of robotics in industry are already clear. But they also have the potential to improve other aspects of European society. In the healthcare sector, for example, the use of robots is helping to improve surgery. At home, meanwhile, robots capable of domestic chores could dramatically improve the quality of life for elderly people and enable them to retain greater independence.

SERVICE WITH A METAL SMILE?

Whilst recognising the importance of robots in the manufacturing sector, over the past two decades European research in the areas of robotics, automation and cognition has strived to release robots from their so-called cage, getting them out of factories and into our homes and on to our streets.

According to the European Robotics Technology Platform (EUROP), robotics is a key technology for tackling societal challenges: our ageing population, climate change, sustainability, safety and security.

EUROP calls for robots to be transformed from industrial workhorses to human assistants. As assistants, robots will be co-workers in the workplace, companions at home, servants and playmates delivering professional services and acting as agents for security.

Although the EU has always funded robotics research, this area has generally been regarded as a means to an end — robotics was a tool, one possible solution for a particular problem. But since the Union's Sixth Framework Programme (FP6) for research the field has been given more attention; before reliable domestic and service robots can be built we need to really get to grips with many of the basics — cognition, artificial intelligence, motion control and mechanics, and the elements of human interactivity.





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Smart robotics is very much a nascent discipline, but Europe is investing heavily in its growth, funding almost 30 robotics projects with some EUR 200 million in just the first two years of FP7. The European Robotics Research Network (EURON) brings together all European robotics groups and resources in research, industry and education. It helps harness and coordinate the EU-wide research effort, have input into this area of research policy and provide opportunities for scientists to share their knowledge and exchange ideas.

Between 2006 and 2010, the EU has funded nearly 90 robotics projects. They strike a balance between research into some of the basic underlying mechanisms of machine cognition, intelligent decision-making and contextual response, and cutting-edge applications. Today across Europe robots are being trialled by fire rescue teams, waste collectors, hospitals and even in the homes of elderly citizens.

But would you trust one? Perhaps not completely today, but European scientists are passionate about their robots; research projects are looking at how robots may be able to express and respond to emotions and show more human-like behaviours. It is still early days, but perhaps within the next quarter of a century we will learn to like our domestic machines, and see them as the helpful friends that today are just the stuff of science fiction. ■

PROJECTS IN FOCUS

I, ROBOT, AT YOUR SERVICE

Europe is investing in an automated future as it is recognising the potential of robotics to tackle some of our biggest societal challenges. But first robots much learn to think, move and communicate more like us.

As small children, we learn by doing and we understand the actions of others by comparing their actions to our previous experience.

The developers of the iCub robot wanted to mimic this process. So the **Robotcub** project designed iCub with just a few innate abilities, just like a new born baby. For example, it can reach out and close its fingers around an object just like a baby. The robot uses information about what it sees and feels to develop more complex behaviours as it learns that particular objects are best manipulated in certain ways.

Eccerobot meanwhile is mimicking structure and will build the world's first 'anthropomimetic' robot. Instead of just copying the outward form of a human, it replicates inner structures and mechanisms — bones, joints, muscles, and tendons — giving the robots greater potential for human-like action and interaction in the world. This interaction is enhanced with technologies that help robots that learn to 'understand' human emotions. **Feelix Growing** has demonstrated that machines can interact with their users, and express happiness and sadness, depending on the situation.





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Humanised robots could take on the increasing societal load of care for the elderly or infirmed, especially if they use technology being developed by **Companionable**. This project is developing systems for robots that will interact with residents, deliver therapy and be stimulating companions for people with dementia or depression.

Service robots like these will also have to incorporate technologies which guarantee human safety. The **Phriends** project has found ways to keep us safe even if a robot suffers programming bugs, sensor glitches or internal failures.

Not all robots look like people. The **Dustbot** project's DustCart looks like a bin on wheels, but it is bristling with state-of-the-art sense and control technologies so it can provide an 'on demand' waste collection service. The robot is mounted with cameras and other sensors so it can 'see' where it is going. It scans the path ahead and avoids stationary objects. It also picks out moving objects — pedestrians, bicycles, even stray dogs. To navigate its way to a resident's home, Dustcart uses a clever triangulation system, interacting with a wireless network set up across the robot's area of operation. There could be a market for at least 100 000 of these robots across Europe and they would cost no more to run than conventional door-to-door waste services.

The **µDrones** project has built a 50 cm wide unmanned helicopter device. It is highly manoeuvrable, capable of sensing and can avoid objects in its flight path. The new drone would be capable of carrying out missions autonomously in places with obstacles, such as in an urban area or inside a building. It is being tested by several fire crews and may soon offer the ultimate service to society: saving human lives. ■

