

Appendix to:

“Robotic Visions to 2020 and beyond – The Strategic Research Agenda for robotics in Europe, 07/2009”

Speech of Dr. Horst Kayser

At the press conference

Date: 07-07-2009

“Robotic Visions to 2020 and beyond – The Strategic Research Agenda for robotics in Europe, 07/2009” can be obtained from:

EUROP Secretariat
c/o EUnited Robotics
Diamant Building, Bd. A. Reyers 80
1030 Brussels, Belgium

Phone: +32 2706-8222
Fax: +32 2706-8223
Email: info@robotics-platform.eu
Internet: www.robotics-platform.eu

*Supported by the “Coordination Action for
Robotics in Europe”, FP6-IST-045058*

Slide 1 – Title: Leading European Robotics

Ladies and gentlemen of the press,

Welcome to the presentation of the *Strategic Research Agenda, SRA for short, for robotics in Europe*. I am very pleased today to present the results of almost three years' work and the strategic research agenda "Robotic Visions to 2020 and beyond", which you also have in printed form. Even if brochures like this [HJK holds up a copy of the SRA] are more often downloaded as PDFs today, this printed brochure is something quite special. You will find a copy in your press pack.

You might well ask why we chose this building, the Solvay library, for presenting the SRA.

Slide 2: bios [bible] – a robot writes the bible (→ a video is running on this slide)

We believe that thousands of books and the knowledge amassed in them dating back over centuries lend us exactly the right atmosphere to acclaim robotics today and discuss its future. In former times, these books were copied by monks. Today, robots can also fulfil such tasks as this. Even if in this case Gutenberg's original does have certain advantages, it nevertheless goes to show that robotics is at the threshold of a new era. The SRA not only provides a glance at the many facets of robotics...

Slide 3: Mission statement

... it also contains fundamental statements specifically about robotics in Europe and its future. This SRA was developed with the following mission statement in mind:

This Strategic Research Agenda
aims to promote robotics development
and business activity in Europe.

The 40 pages are a record of intensive consultation and coordination between all robotics stakeholders in Europe - altogether 130 organisations.

Allow me to explain how we arrived at this document and which conclusions we have drawn from our work.

Slide 4: Why use robots? - Industrial robots

Why use robots at all?

As you most certainly know, industrial robots are essentially the backbone of Europe's manufacturing industry. Robots make cost-effective, high-quality production possible in Europe.

At the same time, robots enhance flexibility in production, expand the variety of products and increase production volumes - all requirements an individualised society like ours demands daily of very many products. Excellent examples here are the automotive and the entertainment electronics sectors.

Using industrial robots, we can lower the overall costs of the global economy. They also improve working conditions, e.g. for welding or the deburring of castings, and in the production of food in abattoirs and refrigerated warehouses.

The miniaturisation of robotic technologies and newly developed sensing capabilities mean that these benefits are becoming applicable to an even wider range of manufacturing industries, including those with small and varying lot sizes, materials and product geometries.

Robots can also be effective in areas where there are skill shortages. As an example, a McKinsey study in Germany predicts a shortage of 6 million skilled labourers by 2020, and highlights a pressing requirement for an increase of productivity.

Apart from industrial robots ...

Slide 5: Why use robots? - Service robots

... service robots are playing an increasingly greater role in providing services for people and institutions.

You can find robots of this type in all sorts of different fields of application. Generally, we make the difference between service robots in professional environments, for example the medical sector, and in private environments, for example domestic cleaning robots. Furthermore, service robots are also employed as security robots, assistants to astronauts or as autonomous systems in space.

We have now reached a time when robots are penetrating a wide range of market sectors - continuously and at an extremely high rate of development. This will accelerate over the next few years. Today, about 7 million robots are at work, by 2011 there will be about 18 million. But let me sketch out a few developments:

The population will grow increasingly older in the years to come. The ageing of society and in parallel the increasing improvements in medical care are going to be a challenge to the young generation.

Who will support old people in their day-to-day life? How will it all be financed? Robots can assist old people in their everyday lives, remind to take medication and help look for the mislaid spectacles. These are but a few of their possible applications in the care sector.

In step with the ageing of society, there is also a growing desire for security. Today, the palette of security applications is already enormous when you think of mass events like public viewing and high-level state and official visits. In future robots will help to make the world around us safer in public places, on public transport, at airports and railway stations.

In future, people will no longer need to be exposed to every risk. Robots will replace people in conflict areas or for bomb disposal. Robots, with and without human control, will patrol national borders and large building complexes.

Robots will precede space and deep-sea missions to prepare for later expeditions.

These visions of the future that I have merely outlined here are full of previously untapped market potential. It was of utmost importance to us not to pass up this potential today and in the future. It must be consolidated within Europe so that we can maintain and even increase our leading position. This is the only way to secure our industry and hence the people and economy in Europe.

Slide 6: European Robotics Technology Platform (EUROP)

This is why EUROP was established as a platform for the robotics industry.

Its aim is to help us all maintain the global leadership in robotics that we have already attained, but also to expand wherever the market presents opportunities.

Furthermore, we want to increase security - public and private - for Europe. All in all, robotics is to help safeguard the quality of life of each individual.

How can we do this?

We must unite, bundle our strengths. In Europe, we have a wide variety and high quality all along the line: we have strong scientists, powerful suppliers and a robust robotics industry ourselves. No other region in the world has these locational advantages. We will safeguard them by forging a common supply chain.

Towards these visions and goals, EUROP's first and primary aim was to draft a strategic research roadmap. Great efforts have already been made during the past three years. Industry and science have grown closer and a Robotics Community has emerged.

Slide 7: EUROP membership

Today, EUROP comprises 105 members and 6 cooperation partners from 23 countries - these include companies, federations, scientific institutes and universities.

EUROP is a so-called European Technology Platform – an ETP. ETPs are mechanisms that bring together the main stakeholders in a research and development field. They have to be accepted by the European Commission, thereby already recognising the importance of a particular area. Their task is to identify common research and development goals of industrial relevance and develop a roadmap to achieve these goals. EUROP constituted as an ETP in October 2005.

Unlike its academic sibling EURON, EUROP is an industry-driven platform. On the one hand, it enables communication between the industrial members from all branches of robotics, on the other hand, its goal is to improve communication between the robotics industry and the increasing number of academic organisations welcome as members under the umbrella of EUROP.

With the help of the European Commission, we have found a way to finance the activities of EUROP. A so-called Coordination Action provided financial support to the main driving forces behind EUROP in drafting the research roadmap. In the end, this was the only way to fulfil the high demands and expectations towards this roadmap.

Slide 8: CARE: Coordination Action for Robotics in Europe

Fifteen partners have joined forces in this Coordination Action for Robotics in Europe – CARE – and, under the leadership of KUKA Roboter as coordinator, they have managed to mobilise the robotics community to produce the SRA presented here.

Five sectorial working groups were set up according to the market forces: industrial robotics led by KUKA and COMAU, professional service robotics led by CEA LIST, domestic service robotics led by iTechnic, security robotics led by Alenia Aeronautica and space robotics led by Selex Galileo.

Special advisers were appointed to establish contact to the scientific side of the robotics community and to handle the so-called ELS issues.

Scientific adviser was project partner SSSA. ELS stands for Ethical, Legal and Societal issues, which I will briefly discuss later. ELS adviser was project partner Scuola di Robotica.

Having discussed EUROP and CARE, the drivers behind this SRA, I would like to introduce you to the content of the SRA.

Slide 9: The eight SRA commandments

Our strategic research agenda draws 8 conclusions formulated as commandments which contain the essence of the SRA. If these are followed, European robotics will be at a great advantage:

1. Take advantage of robotics technology in all aspects of life
2. Master the challenge of system integration
3. Create a European robotics supply chain
4. Focus on the right research and technologies
5. Create new markets through SME support and technology transfer
6. Support cross-fertilisation to maximise the impact of R&D
7. Enhance robotics training and education
8. Avoid ethical, legal, and societal issues becoming barriers

These commandments have sprung from exhaustive discussions not only between the 15 CARE partners, but also with numerous external experts. You may naturally ask: How do you achieve a consensus of all these different opinions?

Slide 10: Setting up a joint Research Agenda for robotics in Europe

The most important point was to collect and fuse the information from all the stakeholders. The challenge here is that they see robotics from very different viewpoints. Rather than trying to force them to discuss on some common level, the CARE partners tried to merge the most important findings from both worlds into a common vision.

The industry observes markets and tries to determine how to best make money in the future. For this reason here the discussions focused on visions of future products.

I would like to mention some examples:

- the human-like assembly robot from the industrial robotics working group
- the surgical robot from the professional service robotics working group
- the robot assistant for the physically challenged from the domestic service robotics working group
- the border surveillance robot from the security robotics working group
- and the planetary robot explorer from the space robotics working group

One interesting finding here was that the level of performance, that needs to be achieved to make these products successful, could be expressed in 12 terms. These Application Requirements are described in the SRA.

The academic world, on the other hand, is motivated by finding new ways of solving problems. They look at fundamental science and develop new technologies. It is these technologies, which will fulfil the requirements of the industry in order for them to be able to launch new products.

CARE took on the role of collecting the Product Visions and their Application Requirements from the industry. In total 39 such Product Visions were identified by the 5 sectorial working groups. Based on the information gathered from industrial researchers and developers and from academics, the technologies, which could fulfil the resulting Application Requirements, were identified. This merged view was then discussed, first within the sectorial working groups, then with individual experts from both sides, and finally at consensus meetings. The result of these discussions lies in front of you today. We are sure that it has the potential to lead to industrial innovation in robotics in Europe.

Slide 11: Product Visions grouped by Application Scenarios

While analysing the Product Visions and their Application Requirements it was noted that they could be grouped into six cross-sector Application Scenarios:

- Robotic workers: robots performing tasks autonomously

Such robots will carry out tasks autonomously, for example in shipbuilding and agriculture.

- Robotic co-workers: robots working directly with & for humans

These robots will support people as if they were colleagues. That is why we call them co-workers.

- Logistics robots: robots moving goods and people

Today, in the logistics sector we already see public transport systems moving people from A to B without a driver. In future, this will increase with the implementation of robotic technologies.

- Robots for surveillance and intervention: robots protecting citizens against security threats

Robots will protect people against threats and will be employed instead of people for tasks in uncertain and unknown situations.

- Robots for exploration and inspection: robots in unknown or dangerous environments

Submarine robots will be employed to inspect pipelines, crawler robots, as shown in the accompanying exhibition, explore areas that are inaccessible to humans.

- Edutainment robots: robots educating and entertaining humans

Last but not least, robots with new capabilities will be implemented in education and entertainment.

It should be noted that the borders between Application Scenarios can be subtle and are not that important in such cases. The Application Scenarios are described in detail in the SRA.

Slide 12: Application Scenarios cover all market sectors

The far-reaching significance of this is that we have very easily proven that here is a great potential for cross-fertilisation between the different robotic sectors. This means that the individual sectors can learn from each other and enrich each other with their technological developments.

Here, as an example, we see the outstanding significance of the Application Scenario "Logistics". All the robotic sectors have product visions here. The same applies for robotic co-workers. You also see that product visions of service robots can be found in all Application Scenarios.

Grouping product visions into application scenarios was a fruitful exercise. Looking back from the Application Scenarios, further Product Visions and market opportunities were identified, for instance in the security sector with the product vision of robots which make security checks of goods and people.

All Application Scenarios are described in detail in the appendix of the SRA.

Slide 13: 18 technologies are needed to realise the Product Visions

But as I mentioned earlier, these Product Visions can only be realised with adequate technology progress.

In the research agenda, we have identified 18 technology groups as relevant to robotics, which we can see on this slide. Some technology groups contain several technologies or aspects, for example, the "end effectors" technology group includes grippers, dexterous hands and process tools.

All technologies essential to robotics have aspects that are almost exclusively relevant in the context of robotics and aspects that are relevant not only to robotics, but also to other domains. Good examples of the first, robotics-driven group are "end effectors", "navigation" and "perception". Battery technology is an aspect of power management which provides a good example of the second group where advances will benefit robotics, but where, for now, robotics will not be a driving force.

However, most technologies are driven by several domains, for instance in the area of real-time communication, which is not only pushed by robotics, but by the consumer goods industry and automation in general.

Competitive advantages in high-technology areas such as the ones listed here are hard won. Europe must not only retain leadership where this has been achieved, but also take the lead in first-wave technologies. For Europe's success, it will be vital to capitalise on its existing strong academic base through well-managed technology transfer.

However, Europe cannot afford to concentrate only on areas of strength; it will also need to foster technologies that could become critical barriers to market. In areas of relative weakness, an informed decision has to be made whether dependence on others is acceptable. To aid these choices, an estimate of the time when technologies will be found in products is given, European strengths are highlighted and the drivers of the technologies are identified.

Slide 14: Ethical, legal and societal issues

Having discussed the markets and the technical sides, another important set of topics needs to be taken into account: only if the ethical, legal and societal considerations and consequences are taken into account, will robotics eventually help us overcome some of our problems, which are developing, both at a societal and economic level.

Injustice can arise through robots - either from the robots themselves or from the application of robots. When is it justifiable to use specific types of robots? How should robots be employed so as not to violate people's rights? Direct legal questions follow on fast. Who is responsible for mistakes made by robots and who is liable?

Finally, we must also consider the societal aspects. A more widespread use of robots will lead to labour displacement. How many jobs can be retained in comparison and how can this be compensated and transmitted? And what about the digital divide?

The ethical, legal and societal considerations play just as an important role as the go-to-market aspects of robotic technologies: both are decisive for whether a product can be realised and be successful. It is therefore of enormous importance to integrate experts on these topics from the very outset of the development process.

Slide 15: Summary and Conclusions

Summing up I would like to impart these thoughts to accompany you on your way. We, the European robotics community, are on an outstanding road – which I hope I have been able convey to you.

In Europe, we have the optimum premises for taking the leadership in robotics. And - together - we have taken the first step into the future: With our common European robotics SRA.

It will serve as our mission statement. It provides the framework for astute investment and keeps our sight keen for profitable technologies of the future. We know that technologies must first be developed or extended on the basis of the current state of the art in order to meet the requirements of our product visions. Research institutes and universities are first in line here, but also industry and companies that pick up technology trends and transpose them into marketable products. Close cooperation at all levels will help to transfer knowledge and expertise across sectors and also between science and industry. The research agenda will help us to identify potential for robotics both in and beyond the familiar tracks. With unified strengths and our sights set on clear aims, we will better see our chances and opportunities.

Permit me to remark at this point that we do not claim to possess ultimate wisdom, but with this project, we have pooled the knowledge and experience of so many experts. Eventually, this SRA will not be judged on the detailed accuracy of its visions, but on its ability to stimulate collaboration and investment in the technology and infrastructure required to achieve a viable robotics industry in Europe in 2020. The development of the research agenda has made it clear to me that close collaboration along the entire European production chain, from research to complete product development and marketing, is of paramount importance for implementing the strategic research agenda.

With the mission statement in our hands, [HJK once again picks up the SRA brochure] the time has come to stride on forwards. We want to reinforce our market share of industrial robotics and penetrate new markets. For this, we will employ the results of our agenda and work with unified forces - with industry and science and with private and public investors.

Slide 16: EUROP

We are ready to drive robotics forward.

We are ready to lead the world in robotics.

EUROP, the European Robotics Technology Platform, is ready to facilitate this process!

Thank you.