

**euCognition**

*The European Network for the Advancement of  
Artificial Cognitive Systems*

euCognition Roadmap

# Value of Roadmaps

“Roadmaps help to coordinate the thinking and activity of key stakeholders including governments, corporations, research institutions, policy professionals, investors, educators and the media.

They provide a framework for articulating the pathways and steps which must be taken to progress from the present state of development to a desired future goal.

They illuminate what we should be focusing on today and provide an important basis for defining current research and commercialization agendas.”

Foresight Nanotech Institute: [www.foresight.org](http://www.foresight.org)

# Who wants roadmaps and why?

## ■ Funders:

- So that they know what/why to fund, and have a clear argument for spending tax-payers money on this and not that...
- See industry becoming involved and creating new value adding activity
- See research money flowing through to economic benefit...
- **Central to what they do**

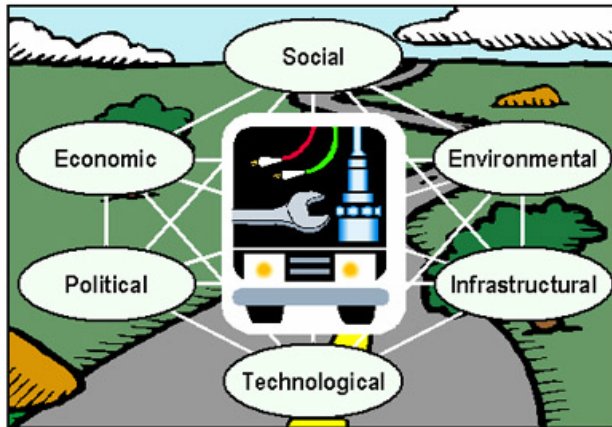
## ■ Industry:

- Result oriented – any cat as long as it catches mice
- Steer research and get the research they want funded with the people they want to work with,
- Take/explore options on emerging strategic technology
- Build better stuff – support their industry – create consortia and virtual centres of excellence
- **Fits with the logic of industrial R&D**

## ■ Researchers:

- So that they can get funded for what they want to do
- Research manifesto
- **But it's not the natural dynamic of research and competes with research demands**

# Examples



## Foresight Vehicle

“The Foresight Vehicle Technology Roadmap has been developed to identify technology and research themes for road transport, aiming to support UK industry in the globally competitive market for transport products and to provide sustainable mobility for UK citizens.”



## Agentlink

EU FP6 Coordination Action



# Foresight Vehicle Technology Roadmap

Automatic parking

Full automation in e.g.  
heavy congestion  
urban driving

Intelligent speed  
adaptation

“Auto pilots”  
emerge

Voice technologies

Adaptive  
systems for  
older drivers

Compensation for  
human error

Pedestrian sensors

Minimum cost routing

50% reduction in  
fatigue related  
accidents

Electronic vehicle  
identification

360° vehicle sensing

Infrastructure/vehicle  
co-operative systems

5

10

15

20 years

 euCognition  
www.euCognition.org

# Cognitive Systems challenge



Artificial Cognitive Systems in FP7

“..positioning of artificial cognition as an **enabling technology** in many areas of applied systems engineering.”

*Extreme breadth of applications and impact – anything that you can build might want to be “smart”*

*Extreme breadth of intellectual and engineering relationships*

*Not a well-formed domain*

*In pre-paradigmatic scientific stage*

# euCognition Roadmap Purpose



Develop a dialogue between cognitive systems research and industry applications that promotes the emergence of a shared systems engineering research agenda with industry impact

Outbound:

- Foster the engagement of the cognitive systems engineering discipline with a range of industry sectors to define *sector application scenarios and roadmaps*

Inbound:

- Develop a *requirements lead roadmap* for future cognitive systems capabilities that are common across domains and that motivates research

# Approach



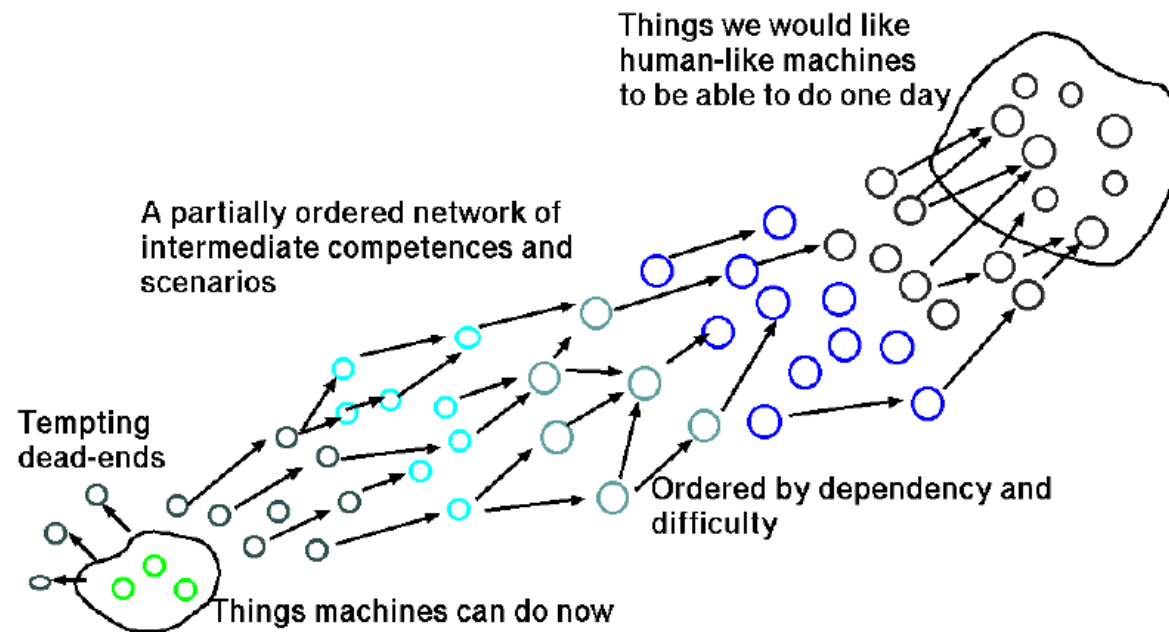
- **Application:** Harness industry energy and interest in specific problem domains
  - Centre around industry/academic research groups with particular domain connections
  - Place the development of a requirements led description at the centre: "these are the sorts of things we want to build, and this is why we can't build them now"
  - Highly themed workshops (e.g. Vehicle foresight, environmental robotics, adaptive networks)
  - **Link to their 'natural agenda' and help them develop it**
  
- **Research:** Create cross domain understanding of core research agenda
  - Focus on the scientific coherence of cognitive systems as a cross domain systems engineering discipline
  - Work back from longer term scenarios to short and medium term intermediate goals
  - **Create map of goals, requirements and capabilities grounded in application scenarios**
  
- **Foresight:** Work in partnership with EU Cognition research planning and industry outreach
  - Help create links to relevant industry groups
  - **Maintain alignment with ongoing research planning in Cog Sys and related programmes**



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## Picture of a Research Roadmap

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**Forward chaining research** asks: how can we improve what we have already done?

**Backward chaining research** asks: what is needed to achieve our long term goals?

## Step 1: Collection of scenarios

### TreppenhausRobot

- Background
- Day in the life
- Challenges
- Cognitive capabilities needed to cope

### Scenario 1

- Background
- Day in the life
- Challenges
- Cognitive capabilities needed to cope

### Scenario 2

- Background
- Day in the life
- Challenges
- Cognitive capabilities needed to cope

### Scenario 3

- Background
- Day in the life
- Challenges
- Cognitive capabilities needed to cope

□ □ N~20

Collect via  
webtools

## Step 2: Analyse Scenarios, distill commonalities

### TreppenhausRobot / Stairwell Robot

#### Background:

The key capability is learning how to navigate and clean in a domestic type space. A form of this capability already exists in the iRobot 'Roomba' robotic vacuum cleaner, albeit for large American-sized living spaces. This application extends this to the next step to take it into a different environments. The task is thus extended to be more challenging, more European but still useful to millions of people.

#### Day in the life:

It's 8am on Saturday morning, and the low profile robot wakes up. It navigates out of it's resting pod and checks the power levels and levels of cleaning solution. All seems ok. It moves to the first landing and proceeds to clean the tiled surfaces between flats 11 and 12 by applying cleaning solution, scrubbing, rinsing and drying. It manoeuvres around the plant pot holder in the corner. It moves to the edge of the first step in the staircase, moves its cleaning mechanism and repeats for the step....

#### Challenges:

different surfaces (carpet, wood, mixed), temporary obstacles like prams, doormats, changing conditions (sunlight, mud), people or pets appear and interfere, ...

#### Cognitive capabilities needed to cope:

navigation in a controlled indoor space, spatial perception, adaptation to changing circumstances, planning & goal satisfaction, 2D spatial learning, embodied system with multiple degrees of freedom.



## Step 3: Identify research issues, problems, challenges



Input for milestone definition in road map

# Outcomes



- A set of application scenarios, and sector roadmaps, defined in collaboration with representatives of industry sectors
- A research roadmap linking all the applications to a common scientific language of requirements and capabilities, built by the research community for the research community
- New dialogues and collaborations between industry and research

# Process



- January 2007: Kick off at Network Meeting
  - Invited industry attendees
  - Identify people willing to participate
  - Identify a small number of sectors to start process
  
- Mar – May 2007
  - First round of sector workshops to identify landmark applications
  - First scientific workshop to create first cut language for requirements and produce roadmap skeleton
  
- June 2007: First Roadmap Plenary Workshop
  - Bring together first round application and scientific work and organise next round of work
  
- July 2007 onwards - tbd

Sector	Roadmap value 1 = lo 5 = hi	Personal interest 1 = lo 5 = hi	Best Landmark Applications
Industrial Robotics			
Industrial Services			
Humanoid Robotics			
Intelligent Transport			
Military			
Life Sciences			
	5	5	

“My first euCog roadmap”

