IROS 2011 Workshop

Assessment of Scientific and Application Topics in Robotics: the ECHORD initiative

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Introduction

- Objectives of the delphi query:
  - Selecting the best **technologies, application scenarios** and **product visions** for the future of robotics.

- Agenda:
  - Introduce briefly the SRA classification structure.
  - Present the ECHORD experiments classified according to SRA
  - 1st delphi query

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Introduction

- How do we reach this classification:
    - Started with several frameworks: Strategic Research Agenda SRA, IFR, Robotics Handbook, WTEC our own (ECHORD's).
    - Classified the ECHORD expperiments according to these classifications.
    - Choose SRA:
        - Live effort.
        - Representative.
    - Extended the SRA classification according to the missing parts (identified in the ECHORD workshop in Vasteras 2011)

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Strategic research agenda

- Introduction
- Product vision and application scenarios
- Application requirements
- Technologies
- Conclusions

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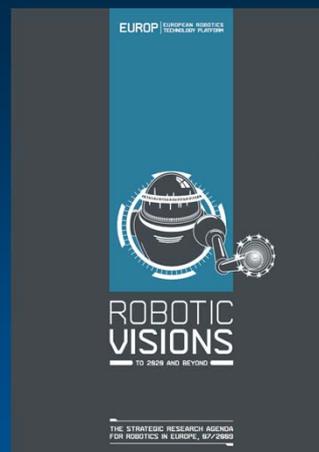
Strategic research agenda – Application Scenarios

APPLICATION SCENARIOS / SECTORS	ROBOTIC WORKERS	ROBOTIC CO-WORKERS	LOGISTICS ROBOTS	ROBOTS FOR SURVEILLANCE & INTERVENTION	ROBOTS FOR EXPLORATION & INSPECTION	EDUTAINMENT ROBOTS
INDUSTRIAL	■	■	■			
PROFESSIONAL SERVICE	■	■	■	■	■	■
DOMESTIC SERVICE		■	■	■		■
SECURITY		■	■	■	■	
SPACE	■	■	■		■	

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ECHORD according to SRA

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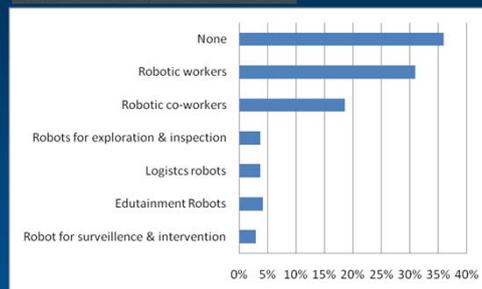
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Strategic research agenda

ROBOTIC WORKERS

- Robots producing tasks autonomously
  - More flexible
  - Dangerous, dull and dirty jobs
  - Larger structures
  - But also micro and nano scale
- Must be:
  - Easier to program
  - Complex tasks: multipart assembly
  - Multiple robots

PRODUCT VISIONS

LARGE STRUCTURE MANUFACTURING (INCL. CIVIL ENG.)	ROBOT WITH INTEGRATED PROC-ESS CONTROL
RAPIDLY ADAPTABLE MANUFACTURING CELL	COORDINATED MOBILE MANIPULATORS
HUMAN-LIKE ASSEMBLY ROBOT	ROBOT AUTOMATION FOR SMALL SCALE MANUFACTURING
POSTPRODUCTION AUTOMATION (RECYCLING, RE-MANUFACTURING)	MICRO-MANUFACTURING ROBOT
MAINTENANCE ROBOT	FORESTRY AND AGRICULTURE ROBOT
MINING ROBOT	PROFESSIONAL CLEANING ROBOT
ORBITAL ROBOT AGENT	PLANETARY ROBOT AGENT

ECHORD according to SRA

ROBOTIC WORKERS
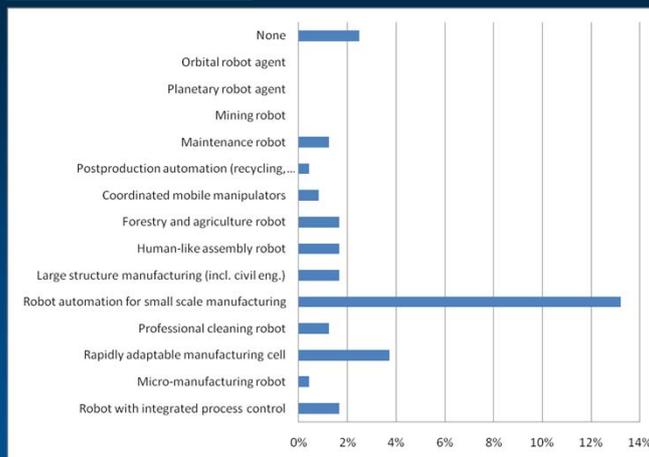
Strategic research agenda

ROBOTIC CO-WORKERS

- Robots working directly with and for humans
  - At Work, in public, at home or in space
  - Tele-operated or autonomously
- Must be:
  - Must be safe and compatible with humans

PRODUCT VISIONS

ROBOT ASSISTANT IN INDUSTRIAL ENVIRONMENTS	ROBOT ASSISTANT FOR PROFESSIONALS	SURGICAL ROBOT
REHABILITATION ROBOT	PERSONAL ROBOT	ROBOT ASSISTANT FOR PHYSICALLY CHALLENGED
ROBOT ASSISTANT IN SECURITY CONTEXTS	ORBITAL ROBOT ASSISTANT	PLANETARY ROBOT ASSISTANT

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ECHORD according to SRA

ROBOTIC CO-WORKERS

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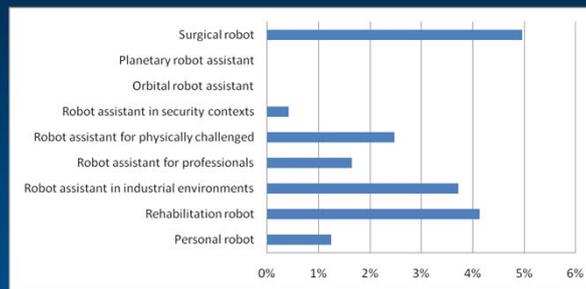
Strategic research agenda

LOGISTICS ROBOTS

- Robots moving goods and people:
  - Factory warehouses
  - Hospitals
  - Our transportation networks

- Will need
  - Fleet management systems
  - Advanced sensing

PRODUCT VISIONS

AUTONOMOUS TRANSPORT OF GOODS

AUTONOMOUS TRANSPORT OF PEOPLE

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ECHORD according to SRA

LOGISTICS ROBOTS

Autonomous transport of goods

Autonomous transport of persons

0,0%   0,5%   1,0%   1,5%   2,0%   2,5%   3,0%   3,5%

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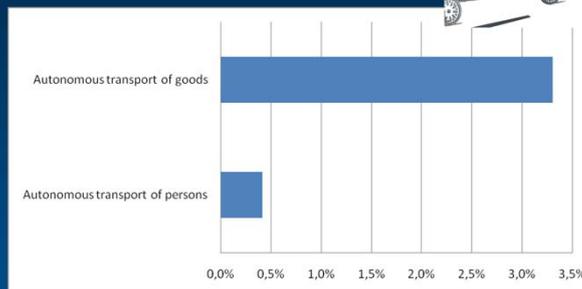
Strategic research agenda

ROBOTS FOR
SURVEILLANCE & INTERVENTION

- Robots protecting citizens against security threats:
    - Homes
    - Public buildings
    - Industrial sites
    - Country borders
- Will need
    - Cognitive capabilities
    - Decision making
    - Planning
    - Situation awareness
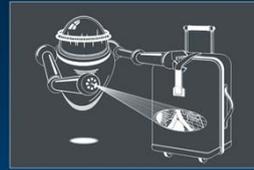
PRODUCT VISIONS

BORDER SURVEILLANCE	SITE PROTECTION (DOMESTIC AND PROFESSIONAL)	SECURITY CHECKS OF GOODS AND PEOPLE

ECHORD according to SRA

ROBOTS FOR
SURVEILLANCE & INTERVENTION

Border surveillance

Site protection (domestic and professional)

Security checks of goods and people

0,0% 0,5% 1,0% 1,5% 2,0% 2,5% 3,0% 3,5%
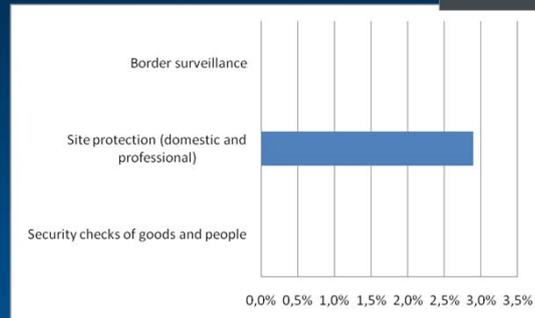
Strategic research agenda

ROBOTS FOR EXPLORATION & INSPECTION

- Robots operating in:
  - Inaccessible.
  - Dangerous scenarios.
- Will need
  - Higher levels of autonomy.
  - Reliable levels of operation.

PRODUCT VISIONS

| INSPECTION IN ENVIRONMENTS INACCESSIBLE TO HUMANS | UNDERWATER ROBOT | DISASTER MANAGEMENT |
| ORBITAL ROBOT EXPLORER | PLANETARY ROBOT EXPLORER | |
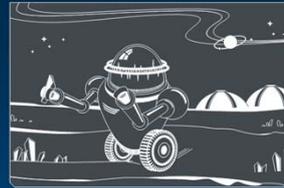
ECHORD according to SRA

ROBOTS FOR EXPLORATION & INSPECTION

Robots for exploration & inspection
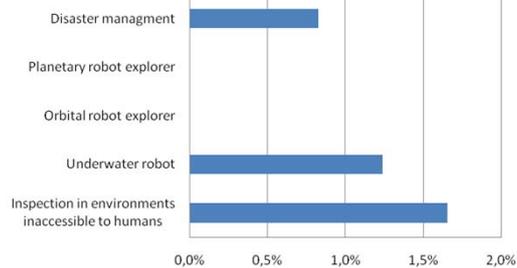
Strategic research agenda

EDUTAINMENT ROBOTS

- Robots educating and entertaining humans:
  - Educate children
  - Provide social companion to elderly
- Will need
  - Cognitive capabilities
  - Multi-modal communication
- Must have
  - Sufficient functionality to generate novelty and fascination

PRODUCT VISIONS

MOTION SIMULATOR	ROBOT GUIDE	ROBOT TEACHER
ROBOT TRAINER	ROBOT COMPANION	ROBOT TOY

ECHORD according to SRA

EDUTAINMENT ROBOTS
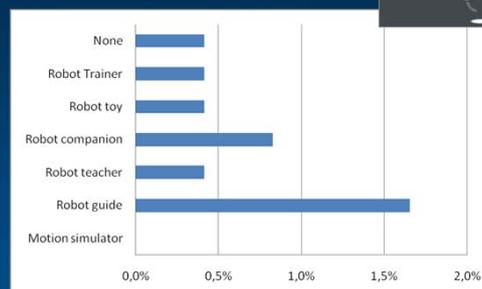
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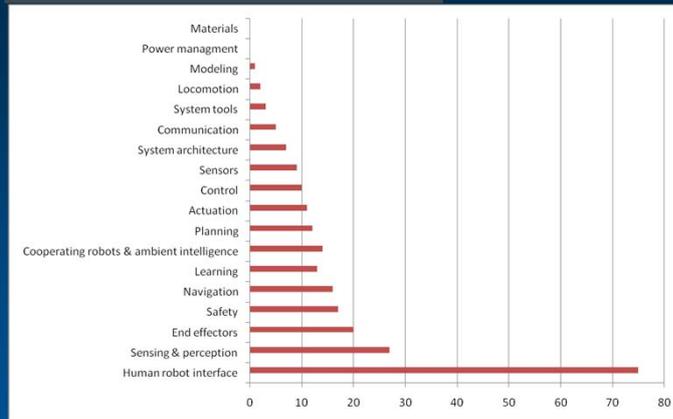
The Delphi Query

- Experts (you!) will classify:
  - Impact of basic **technologies** in the future of robotics.
  - Social and economic impact of the **product visions** and **application scenarios**.

- Reaching consensus
  - Two rounds.
  - First round – classification only
  - In the second round (in the afternoon) experts will have access to the results of the first questionnaire.

The Delphi Query

- Second questionnaire
  - Preferably on paper.
  - We will be in this room all day.

2.6.2 Edutainment Robots product visions
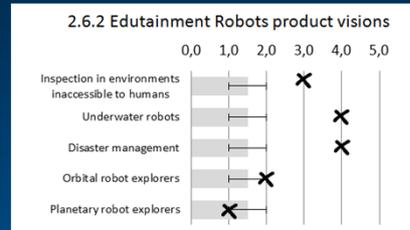
- Links
  - http://robotics.dem.uc.pt/echord/iros_2011/application.htm
  - http://robotics.dem.uc.pt/echord/iros_2011/Technology.htm

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