

“Service Robotics”

or: How Bring Robotics Research Results to Market?

Joachim Hertzberg

Osnabrück University
and DFKI Robotics Innovation Center

Overview

1. **Robotics Research Be Applied! (EC)**
2. **Are there Applications of Robotics Research Results?**
3. **Are we Good at Predicting New Technology Applications?**

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Research the EC Wants to See ...

[Horizon 2020, Work Programme 2014-15, ICT/Robotics, Part 5i, p.50]

The **importance of robotics** lies in its wide-ranging impact on **Europe's capacity to maintain and grow a competitive manufacturing sector** with millions of related jobs. But at least equally important, robotics also offers **new solutions to societal challenges** from ageing to health, security, energy and environment. ...

Service robots for professional or domestic use represent an **emerging market with strong growth** perspectives as **robots become mainstream appliances and systems** in many walks of life (work, home appliances, security, leisure, assistive technologies for physically disabled, medical equipment, etc). ...

To **conquer new markets and enable large scale deployment of robots**, it is essential to advance the current robot capabilities in terms of **robustness, flexibility and autonomy** to make them achieving **useful tasks in an efficient manner** while operating in real-world environments.

Definitions (Attempts), IFR

[International Federation of Robotics, <http://www.ifr.org/service-robots/>]

- A **robot** is an actuated mechanism programmable in two or more axes with a degree of autonomy, moving within its environment, to perform intended tasks. **Autonomy** ... means the ability to perform intended tasks based on current state and sensing, without human intervention.
- A **service robot** is a robot that performs useful tasks for humans or equipment excluding industrial automation application. **Note**: The classification of a robot into industrial robot or service robot is done according to its intended application.
- A ... **service robot for personal use** is a service robot used for a non-commercial task, usually by lay persons. **Examples** are domestic servant robot, automated wheelchair, personal mobility assist robot, and pet exercising robot.
- A ... **service robot for professional use** is a service robot used for a commercial task, usually operated by a properly trained operator. **Examples** are cleaning robot for public places, delivery robot in offices or hospitals, fire-fighting robot, rehabilitation robot and surgery robot in hospitals. ...

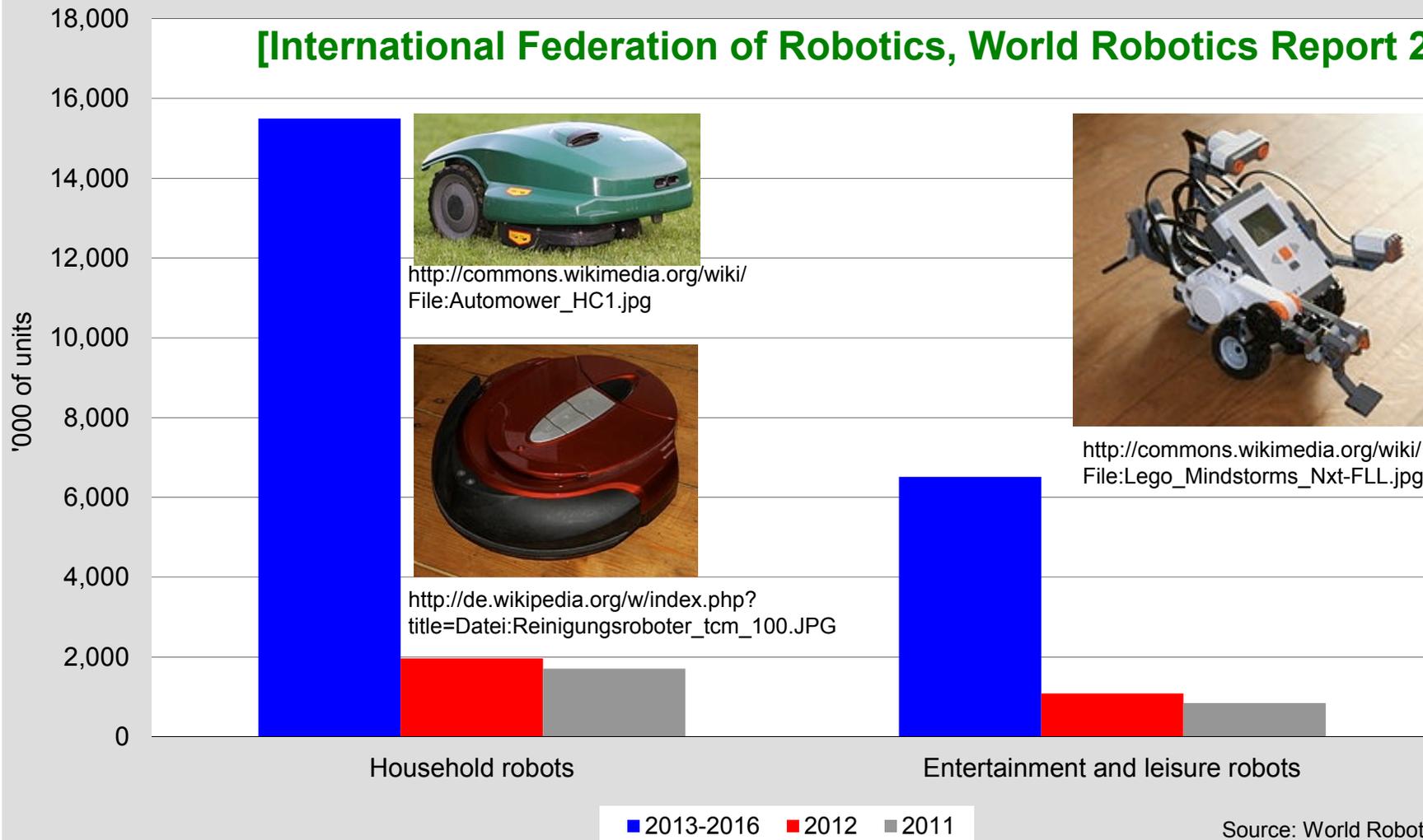
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“Service Robots”, Domestic Use

Service robots for personnel/domestic use.
Units sales Forecast 2013-2016, 2012 and 2011

[International Federation of Robotics, World Robotics Report 2013]



http://commons.wikimedia.org/wiki/File:Automower_HC1.jpg



http://de.wikipedia.org/w/index.php?title=Datei:Reinigungsroboter_tcm_100.JPG

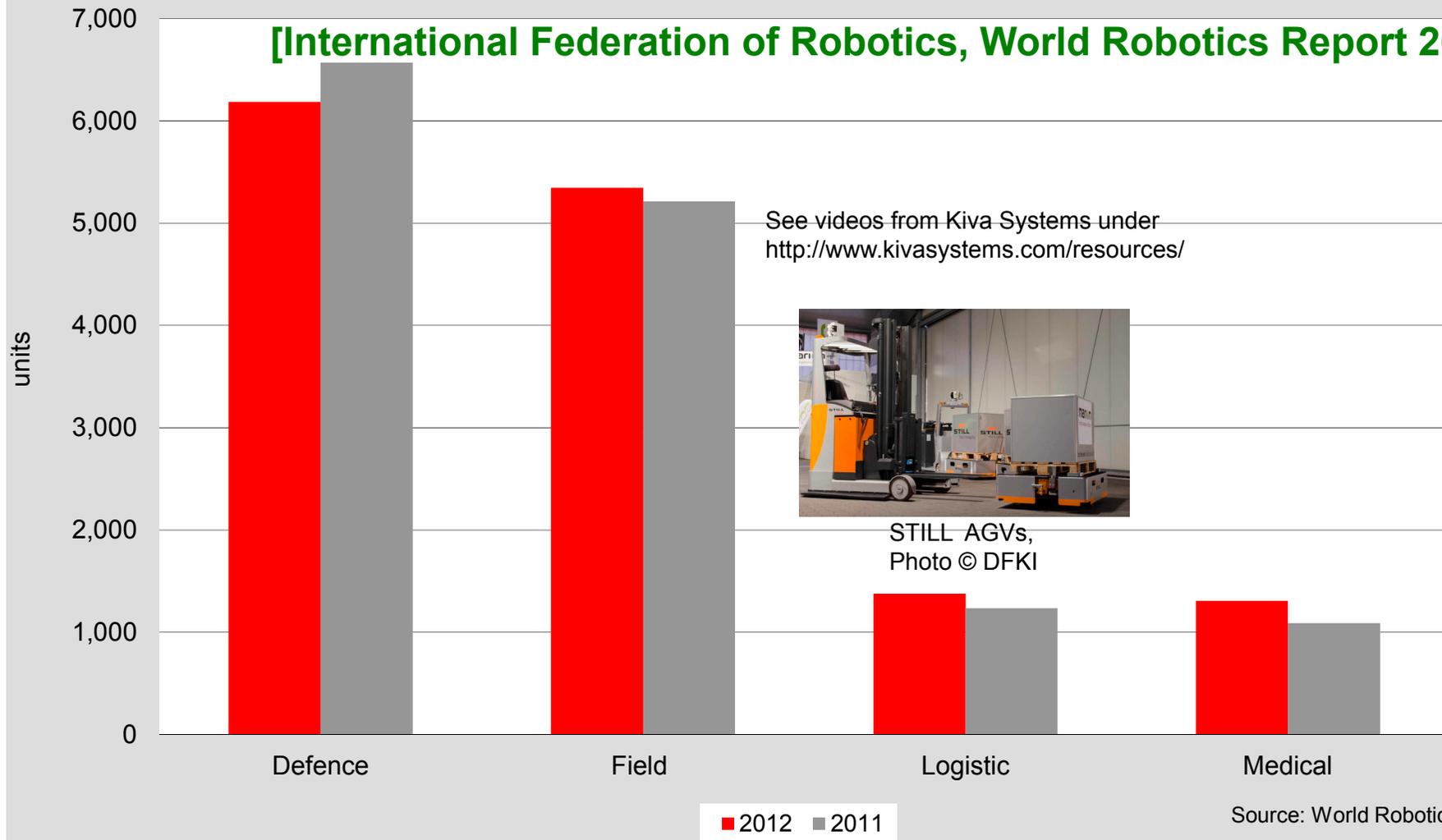


http://commons.wikimedia.org/wiki/File:Lego_Mindstorms_Nxt-FLL.jpg

“Service Robots”, Professional Use

Service robots for professional use.
Sold units 2012 and 2011 (main applications)

[International Federation of Robotics, World Robotics Report 2013]



The Most-Sold Field Robots acc. to IFR WRR ...

... are milking robots

... which are stationary, hence no robots acc. to IFR ☹



<http://commons.wikimedia.org/wiki/File:Melkrobot2.JPG>

Such Machines are not Counted by IFR ...

Seminar #1, Slide #52

Example Projects: SmartBot, marion

**Sugar Beet Harvester MAXTRON,
Grimme**



Robotic Solutions for Agriculture, Ship Building, and SME Production
Funding: EU Interreg
Partners (some): Amazone, DFKI, Grimme, HS OS

**Combine Harvester LEXION,
Tractor XERION, CLAAS**



Mobile, autonomous, co-operative robots in complex value creation chains
Funding: Fed. Min. Economy (BMWi)
Partner: CLAAS, DFKI, STILL, ATOS (ended 12/2013)



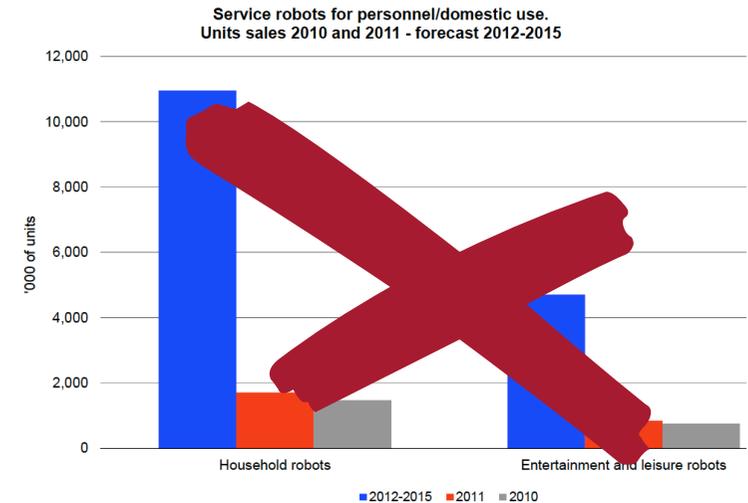
3.1 What is DFKI?
 3.2 Robots Gone Farming



... but Maybe they Should?

Everyday Appearances of AI Results

- Some AI/Robotics technologies are in widespread use:
 - Vacuuming-/lawn mowing robots, car driver assistance, speech dialog systems (call centers, SIRI), Data Mining, *recommender* systems, chess computers/programs, computer algebra systems (Maple, Mathematica)...
- They are normally not identified as such by their users
- AI/robotics would be a “key” technology, if
 - it would be used in mass products/services, and
 - society would not accept its suspension



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It is Hard to Predict ...

There is no reason for any individual to have a computer in his home.

– Ken Olson (Co-founder of DEC) (1977)

But what is this [microchip] good for?

– IBM engineer (1968)

We don't think we'd do well in the cell phone business.

– Steve Jobs (2003)

Some Future Scenarios from AI/Robotics Researchers

Technology: Semantic Web of Things and Services

- “All” “things” have IP numbers and connection
 - Computer, milk pack, car, shirt, house, book, washing machine, ...
- ... exchange data and use services
 - “Don’t wash me over 40°!”, „I’m outside, and it’s going to rain!”

Application: *Ambient Assisted Living (AAL)*

- Supervision(!) in their households for (old?) persons
 - “Stove is on!“, “Think of your medication!“, “Mrs X is lying on the floor!”
- Physical support (e.g., for handicapped people)
 - “Fridge service” for immobile people, bed control, wheel chair, ...

But what is this [microchip] good for?

Can we Predict Key Technologies?

Comp.Sci./IT 1965, technology

- IBM 360
- ARPANet first attempts
- No micro processors yet
- “Data bases” just starting

Comp.Sci./IT 1965, society

- No access to computers – neither physically, nor intellectually
- Computers do jobs that were done before without computers

- In 1965, computers could have been “dis-invented”, no harm!
- Key technology shapes society by something radically new
 - Mobile phones, satellite navigation, WWW, Facebook, Wikipedia, ...
- AI/Robotics has potential of being a key technology
- What’s the radically new? – Let’s discuss in 50 years!

Thank you for your time!

