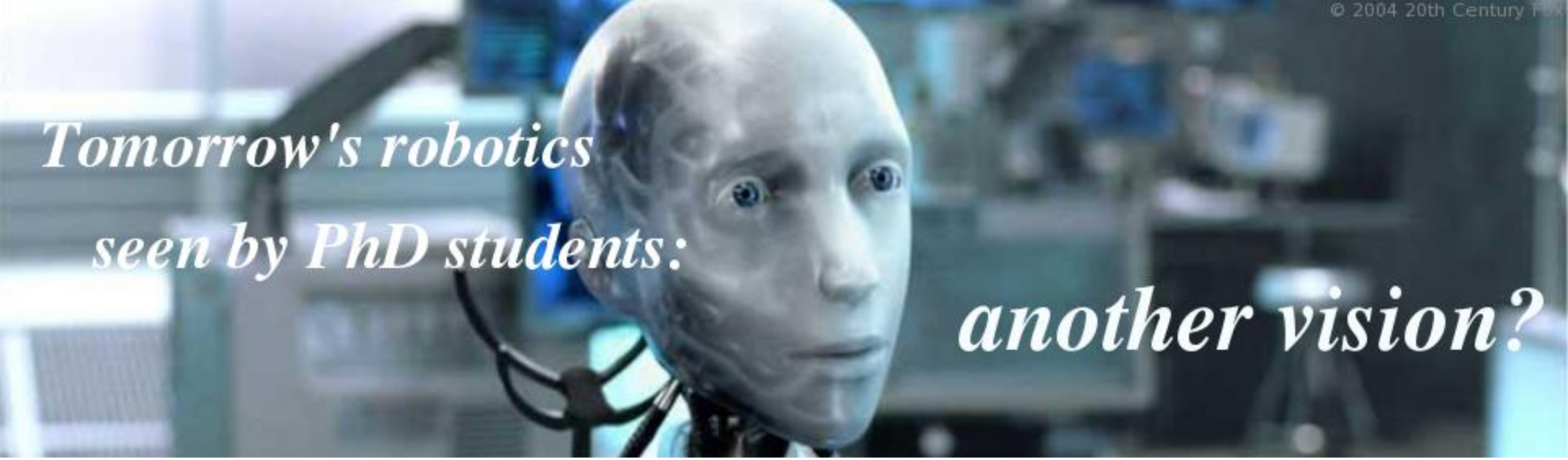


Workshop at European Robotics Forum 2013

Thibault Gayral Coralie Germain

Context

- Robotics is changing
- ERF: "Building the future of European robotics"
- Today's PhD students are tomorrow's researchers

Objectives

- Give the possibility to young researchers to give their opinion on the future of robotics
- Give the possibility to the audience to have the opinion of young researchers
- Extract the common visions, if possible
- Discuss with the audience

Agenda

13:40 – 14:30

5 to 10 minutes-long targeted presentations

14:30 – 15:30

Open round-table discussion

Developed Topics

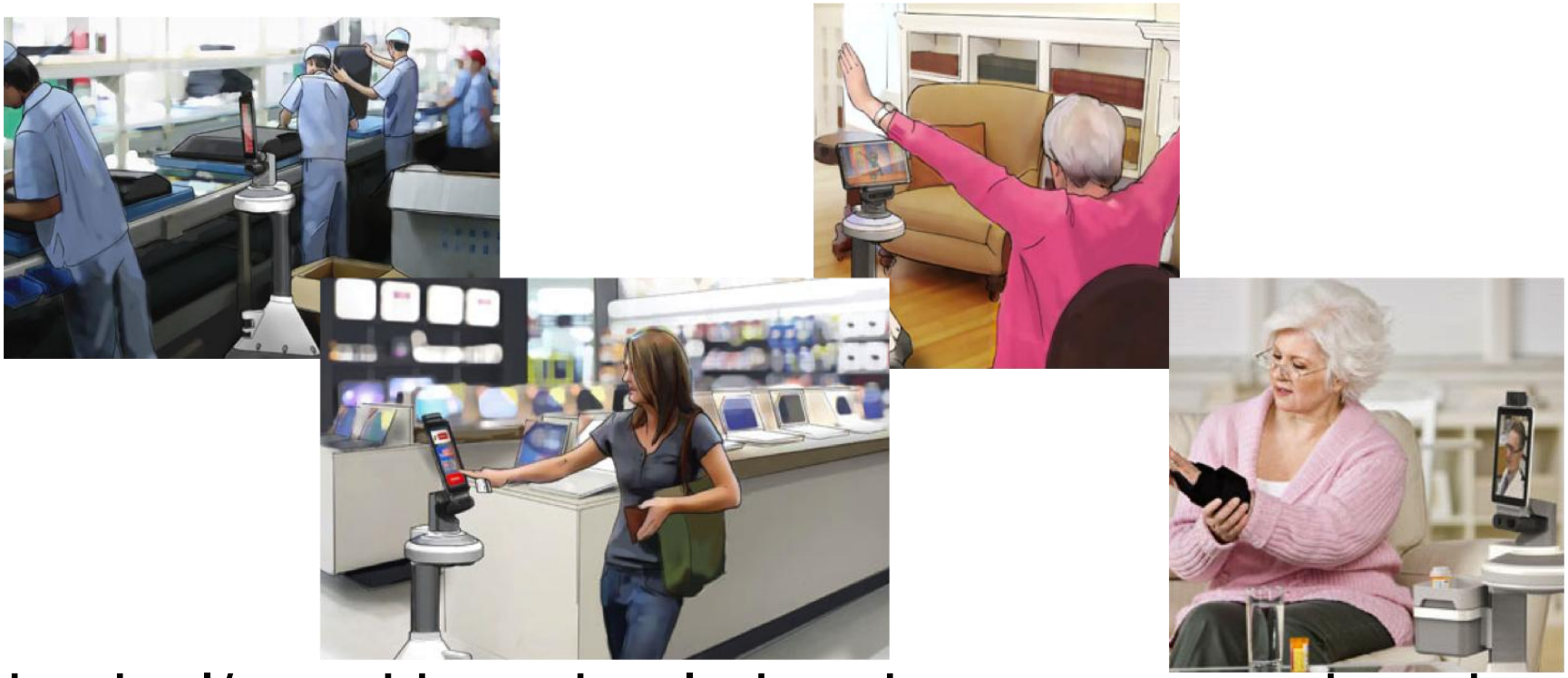
- Assistive personal robotics
- Societal impact of robotics
- Compensation and Enhancement
- Underwater multi-robots technics for exploration
- From research to industrial applications
- Trends in surgical robotics

Assistive personal robotics

Consuelo Granata

- Bachelor: Computer-Science and Control (Italy)
- Master I: Control (Italy)
- Master II: Robotics and Artificial Intelligence (France)
- PhD: personal robotics (France)
- Post Doc: personal robotics (France-Uk)

Personal robots… for what?

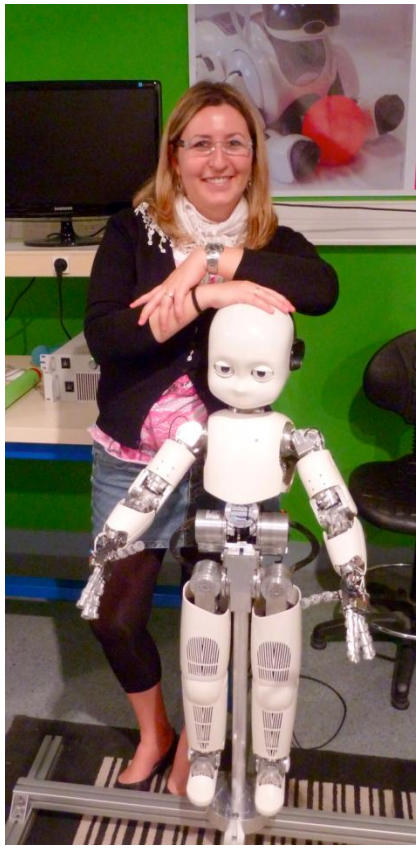


Physical/cognitive stimulation, home-care and work assistance.

Challenges

- Human and environment perception (localization, recognition, activity analysis)
- Robot autonomy (autonomous movement and decision making)
- Sensors embedded (compromise between accuracy, space and cost)
- User acceptance

Societal impact of robotics



Bio:

- Postdoc in Institute of Intelligent Systems and Robotics (ISIR - UPMC, Paris)

- PhD in Humanoid Technologies in IIT, Italy - working with iCub developing team

Research interests:

–whole-body dynamics and control

–humanoids interacting with humans

–humanoids interacting with an unpredictable environment

–cognitive development of the humanoid

http://chronos.isir.upmc.fr/~ivaldi

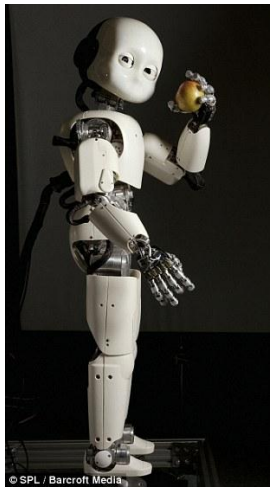
Tomorrow's robotics seen by PhD students: another vision?

One robot in every home .. now!

Tomorrow's robotics seen by PhD students: another vision?

One robot in every home .. in 10/20 years?

Tomorrow's robotics seen by PhD students: another vision?



How do we fill this gap?

How do we fill this gap?

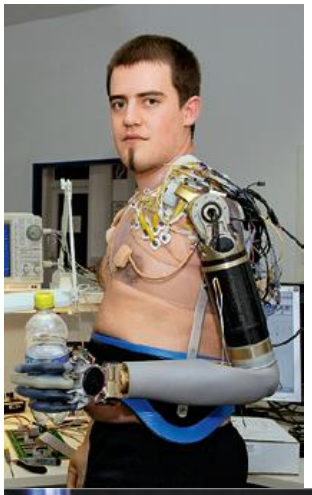
- autonomy -> biggest challenge!
- lightweight and friendly design -> also cheaper won't hurt..
- naturalness of their movements and behaviors -> make them easy to understand, predictable
- safety of physical interaction -> not only industrial environment
- human-robot symbiosis -> not only language
- adaptation to rapidly changing environment -> imagine the evolution of your apartment during the day
- stop simulations, go real -> less publications but bigger impact
- invest on people -> bigger teams, hire know-how..

Compensation or enhancement through robots

how will be perceived humans of tomorrow?

- **François Touvet** ran his PhD in a Neurosciences lab while working on robots. His research domain is the **hand** and its **control** (may it be biological or artificial) and more generally **bio-inspiration** for robotics.

Compensation



Christian Kandlbauer with an Ottobock « feeling hand » prosthesis

Robotic arm controlled by cortical signals (Hochberg et al. 2012)

- A way to normality

  ->« necessary »

- Complexity = heavy learning phase
- Mostly motor

Enhancement

Steve Mann wearing an EyeTap augmented reality eye

Moon Ribas wearing a 360° sensory extension

- Harder, better, faster, stronger!

  ->« optional »

- Mostly sensory

Or both?

Aimee Mullins

Hugh Herr

Underwater multi-robots technics for exploration

Mohamed Saad IBN SEDDIK

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mohamed_saad.ibn_seddik@ensta-bretagne.fr
@msibnseddik

- Born 14 Nov. 1989 in Rabat, Morocco
- Moved to France in 2009 for engineering studies @ENSTABretagne
- Graduated from **ENSTA Bretagne** in 2012 (**Engineer** in Computer Science and Automation for Embedded Systems)
- Graduated from **Université d'Angers** in the same year (**Master of Scicence** in Dynamic Systems and Signal Processing)
- Joined **CGG** as an **robotics engineer** in September 2012
- Started a **PhD** in **Robotics** between **ENSTA Bretagne** and **CGG** in January 2013

What am I working on?

What I would like to share with you today?

- Simulators
- Quick ready-to-use toolchain to test my work
- A shared realiable middleware (ready-to-embed) that we can share and master

Thank you!

Questions?

From research to industrial applications

Dr.-Ing. Sven R. Schmidt-Rohr

2013 euRobotics
Entrepreneurship workshop

2nd Prize

- 1st year postdoctoral researcher at the Humanoids and Intelligence Systems Lab, Karlsruhe Institute of Technology
- Expertise:
  - Programming by Demonstration
  - Robot manipulation
  - Service robots
  - Probabilistic decision making
  - EU FP6 and FP7 Integrated Projects (several)
- Now involved in innovation transfer

Entrepreneurship Workshop

- Impressions of the workshop
  - 15 teams involved in transfer of research innovation into a startup company product
  - First round of all 15: mostly service robotics
  - Best three placements dominated by industrial robotics
  - Service robotics still a very difficult commercial market
  - Hardware much more difficult than software
  - Personally having a service robotics background, but aiming for industrial robotics now, because it is a much more mature market

Innovation Transfer Award

- Impressions of the finalist talks
  - A lot of hardware or complete solutions
  - A long, rough road to success
  - Talked with some of the guys: some really struggled towards their successful product
  - Hardware is *really* difficult
  - Finding totally new applications for robotics can be a winning move

Obstacles for commercialization

- Bridging the gap between the paper and the product is hard!
- At the universities we mostly have scientific networks and mentors
- Need to become close to entrepreneurial mentors, investors and a large customer base
- Moving out of the safety of the ivory tower is uncomfortable

- Advice: do not stick to your pet project, but move and adapt your technology towards the market, e.g. from service robotics to industrial robotics!
- Focus on algorithms and software, not hardware

Benefits of commercialization

- As states are moving towards bankrupcy, public funding will dry up
- At the same time private fortunes and market opportunities expand rapidly: money is lying on the street
- There is the opportunity to convince with a product and your performance, not just powerful friends in the right places
- You can grow beyond certain bounds and rules in contrast to academia
- If you are adventurous, it is the right path for you
- But utter failure can wait behind every crossroads
- Always work in a complementary team

Requests to the EU Commission

- EU projects are great to build a network of international friends, also including industry
- The emphasis on impact these days really pushes to think practical and towards tangible innovation
- But how about including explicit processes in STREP/IP formal rules to facilitate or even demand in Horizon 2020 the founding of startups within the scope of the project?
- So a project may start with 7 partners and end with 9 ☺
- This could increase the impact substantially
- This gives young researchers a perspective and thus motivation

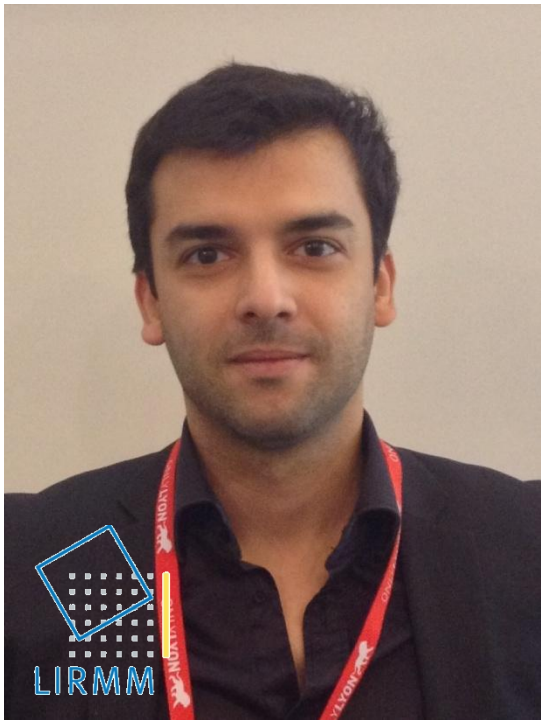
Requests to the EU Commission

- State funding is very important for the initial seed phase
- In Germany there are very good instruments like e.g.
  - «EXIST founders stipend »: easy to get for high-tech, 1 year funding of 3 people without obligations as e.g. giving away shares
  - Semi-public VC « High-Tech Founders Fund »: 500k€ for just 15% of the shares
  - Many more such opportunities
- Some countries lack good instruments, but they are crucial to (re)vitalise an economy
- EC could integrate them into the ICT framework funding schemes

Requests to the EU Commission

- Events like the Entrepreneurship Workshop are really great to get an impression about the level of the competition
- It serves as a critical feedback « where do I stand in international comparison », even considering totally different products
- Personal impression: very different attitude about what is sufficient to be (re)presented publicly in different countries
- Having more such international events can help to avoid disappointments when facing international competitors
- @EC: please support events like this in the future and encourage participation

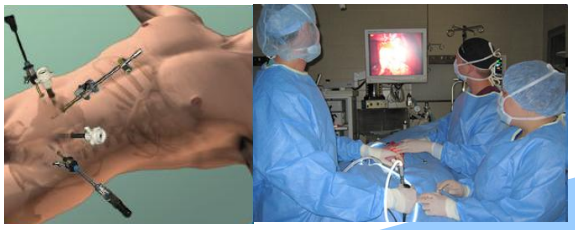
Trends in surgical robotics



- Alonso SANCHEZ, PhD Candidate at LIRMM
- Subject of interest: Design and control of mesorobots for endoluminal surgery
- Background: Microelectronics, (Surgical) Robotics and 3D vision
- Contacts: sanchezsec@lirmm.fr, poignet@lirmm.fr

Technology trends

MINIMALLY INVASIVE SURGERY (MIS)

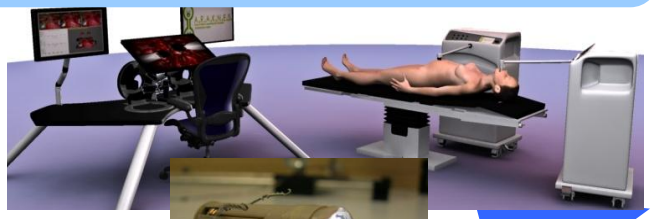


2000

ROBOTIC ASSISTED MIS

2010

ENDOLUMINAL or INTRAVASCULAR TELEOPERATED ROBOTIC SURGERY



2020

Some questions?... and opinions!

- Is it possible to create an universal robot? [Dombre et al., 2012; Taylor et al., 2003]
- Will micro-robots replace meso- and larger robots?
- Are surgical robots really better? [Barry et al., 2012; Cooperberg et al., 2012; Tomaszewski et al., 2012; HTA, 2011; Lin et al., 2011; Barnett et al., 2010; Kolata, 2010]
- And are they safe? After being certified?
- When should certification start during research? [Sanchez et al., 2012; Sanchez, 2013]
- Which of the main actors (i.e. patient, surgeon, developers, indsutrials and medical institutions) care about ethics?
- What shall be done to create « win-win » relationships?

References

- E. Dombre, P. Poignet, and F. Pierrot. Design of Medical Robots, pages 141–176. J. Troccaz (ed) Medical Robotics.Wiley, 1 edition, January 2012.
- R.H. Taylor and D. Stoianovici. Medical robotics in computer-integrated surgery. IEEE Transactions on Robotics and Automation, 19(5):122–130, 2003.
- M.J. Barry, P.M.Gallagher, J.S. Skinner, and F.J. Fowler. Adverse effects of robotic-assisted laparoscopic versus open retropubic radical prostatectomy among a nationwide random sample of medicare-age men. Clinical Oncology, 30(5):513–518, February 2012.
- M.R. Cooperberg, A.Y. Odisho, and P.R. Carroll. Outcomes for radical prostatectomy: Is it the singer, the song, or both? Clinical Oncology, 30(5):476–478, February 2012.
- J. Tomaszewski, B. Davies, S. Jackman, R. Hrebinko, and J. Nelson. One year updated comparative cost–analysis of open and robotic–assisted radical prostatectomy. Urology, 187 (4):153, 2012.
- Health, Information and Quality Authority (HTA). Health technology assessment of robot assisted surgery in selected surgical procedures. Technical report, Dublin, Ireland, September 2011.

References

- S. Lin, H.G. Jiang, Z.H. Chen, S.Y. Zhou, X.S. Liu, and J.R. Yu. Meta-analysis of robotic and laparoscopic surgery for treatment of rectal cancer. World Journal of Gastroenterology, 17(47):5214–5220, December 2011.
- J.C. Barnett, J.P. Judd, J.M.Wu, C.D. Scales, E.R.Myers, and L.J.Havrilesky. Cost comparison among robotic, laparoscopic, and open hysterectomy for endometrial cancer. Obstetrics and Gynecology, 116(3):685–693, September 2010.
- G. Kolata. Results unproven, robotic surgery wins converts. Website, 2 2010. URL http://www.nytimes.com/2010/02/14/health/14robot.html. Last visited: March 15, 2013.
- L.A. Sanchez, M.Q. Le, K. Rabenorosoa, C. Liu, N. Zemiti, P. Poignet, E. Dombre, A. Menciassi, and P. Dario. A case study of safety in the design of surgical robots: The ARAKNES platform. In S. Lee, H. Cho, K.J. Yoon, and J. Lee, editors, Proceedings of the International Conference on Intelligent Autonomous Systems IAS'12, volume 194 of Advances in Intelligent Systems and Computing. Springer-Verlag, 2012.
- L.A. Sánchez. Control of mesorobots for endoluminal surgery. PhD thesis, Université Montpellier II, To be published

Developed Topics

- Assistive personal robotics (Consuelo Granata)
- Societal impact of robotics (Serena Ivaldi)
- Compensation and Enhancement (François Touvet)
- Underwater multi-robots technics for exploration (Mohamed Saad)
- From research to industrial applications (Sven Schmidt-Rohr)
- Trends in surgical robotics (Alonzo Sanchez)

http://www-sop.inria/coprin/ERF2013/Workshop_Students/