Report on Session 1

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Session 1 – Global Overview and On-Going Initiatives

- ***"Smart Production in Future Aircraft Factory: Designing a CPS Platform Approach for Manufacturing Processes"***
  Sébastien Boria, R&D Mechatronics Technology, Airbus.

- ***"New Robotics for Factories of the Future"***
  Raja Chatila, ISIR - CNRS & UPMC *Sorbonne Universités*,

Conventional Wisdom

"Comparatively easy to make computers exhibit adult-level performance on intelligence tests or playing checkers, and ***difficult or impossible to give them the skills of a one-year-old*** *when it comes to perception and mobility."*

-- Hans Moravec, 1988

- Computers are good at following rules but bad at pattern recognition.
- Low-level sensorimotor skills require enormous computational resources.
- Most difficult human skills to reverse engineer are the ones that are unconscious.

Examples of skills that have been evolving for millions of years:

- Recognizing objects, moving around in space, judging people's motivations, catching a ball, recognizing a voice, setting appropriate goals, paying attention to things that are interesting; anything to do with perception, attention, visualization, motor skills, social skills and so on.

What we heard yesterday …

- "Production tasks and factory floor operations are manual."
- Smart factory of the future is coming – convergence of scientific and technological advances
- Human-machine fully collaborating in the same physical environment and process execution.
- Airbus is adding intelligence into its shopfloor systems from smart handheld tools, co-robots, integrated IS, process supervision software.
- **Dependable operation** with high assurance of reliability, safety, security and usability.

What we heard yesterday …

- CPS is a system of collaborating computational elements controlling physical entities
- Need for integrated and secure shopfloor distributed information system
- Need for a robust communication and information system platform to integrate smart devices in a “cohesive system of intelligent systems.”

From Automated to Cooperative Manufacturing … [from Raja's Presentation]

- Today's industrial robots: precise; repeatable tasks; operate in structured environments; not adaptable; installation not flexible; operate in large; fixed manufacturing plants; potentially unsafe.

- Factory of the future: more complex operations; small product series with customization; responsive to evolving market demand; lighter and more flexible manufacturing environment; low cost infrastructure.

- Advances in sensing, perception and control, new materials, machine learning and AI will enable robots to achieve higher levels of "adaptability and resiliency."

Robotics and Automation

- “Factories of the future will be based on interconnected units embedding more intelligence and task adaption capabilities.”
- Increasingly capable robots with **enhanced senses, dexterity and intelligence** used to automate tasks, augment human capabilities or work beside and cooperatively with people
- Applications extend beyond industrial automation to **services**, **personal safety**, **surgery**, **emergency response** and even **human augmentation**

Increaing levels of complexity …

- Human-robot cohabitation
- Human-robot co-operation
- Human-aware motion control and dexterity
- Motion planning and control for humanoid robots
- Collaborative robots with cognitive abilities for human-robot interaction such space sharing, perspective taking, …

- Many ethical, legal and social issues w/ deploying robots in factories