euCognition Roadmap Meeting, Munich 12th January 2007

Participant Feedback

Industrial Robotics (3.6, 2.8)

(5, 3) Cooperative assembly, exploration and repair in hazardous environment (eg. robots in oil and gas industry – underwater), robot surgery, home assistance systems for the partially mobile.

(4, 2)

(5, 2)

(3, 3)

(4, 3) Using sensors adding learning and creative scenario that includes intelligent assembly task.

(4, 4) Robots capable of working along/together with humans.

(3, 3) Collaborative construction (human – robot).

(3, 1) Collaborative construction.

(2, 2) Safe joint assembly with human and robots.

(3, 3)

(3, 1) Industrial robots navigating and collaborating with each other and with humans in complex real environments.

(5, 3) No humans working in bad conditions.

(4, 2) Medical, work space sharing.

(4, 1) Safe robots, robot-robot interaction.

(4, 4) Development of action understanding capacities in joint action tasks (human-robot, robot-robot) replacing the “cognitive button”.

(5, 5)

(5, 4) Learning by demonstration.

(3, 5) Flexible manipulation of objects (far more manipulators).

(2, 2) Trainable robots.

(4, 3)

(5, 4) Universal manufacturing robot produced in large series equipped with flexible control system suitable for “arbitrary” task.

(5, 4) Small, adaptive robots for SMEs.

(3, 1) Micro-robots.

(2*, 2) Better sensors than no sensors! *(* may be powerful drivers economically, but best solutions may be very different to cognition)*.

(2, 1) Robots capable to understand changes on its working environment.

(4, 3)

(2, 3) Safe robot technology for service robotics. Process integration.

(5, 4) Robot with high degree of integration between its network of sensor, its body and its motors and with high level of autonomy in performing different tasks (low degree of a prior knowledge, mainly unsupervised learning).

(5, 5) Kitchen-machine “intelligent hand” – for domestic use of small companies – for stirring, mixing, scrubbing, washing, etc.

(3, 4) Intelligent grasping of non-rigid objects. Human-machine collaboration.

(3, 4) Cooperation between human and robot in the production line.

(5, 5) Several robots handling a piece and doing more operations on it. Includes sending. Handling fragile, soft objects (eg. tomatoes).

(-, 1)

(4, 2)

(3, 4) Teaching by learning, HM interactions.

(1, 1)

(2, 1) Not a car factory wielding robot. Robot-robot coordination in open-flexible manufacturing (learning by demonstration is a very good cog sys area).

(4, 3)

(2, 1) Robot that is used in a not very structured environment for different tasks

(4, 4) One or two trail programming by demonstrator that can be tuned by spoken language

(4, 5) Take object from box, robot programmed by technical person using language

Industrial Services (2.8, 2.2)

(3, 2)

(4, 2)

(3, 4)

(4, 2)

(3, 3)

(3, 2)

(4, 2) Human-robot collaboration.

(3, 1)

(5, 3)

(3, 1)

(1, 4)

(2, 1) Work flow.

(1, 1)

(3, 2)

(*, 5)

(?, 1)

(3/4, 3) Multiple reactive behaviours, co-operative behaviours.

(2, 1)

(2, 1) Internet and shopperless shopping using multi modal interface customer-machine.

(3, 2)

(4, 4) Intelligent data-mining, innovation engine.

(2*, 2) Deconstruction/waste management and recycling. *(* may be powerful drivers economically, but best solutions may be very different to cognition).*

(2, 1)

(3, 2)

(2, 2) Automated “emotional products”.

(3, 2)

(4, 3) Knowledge-sharing system for our best engineers that copes with languages/industries/descriptions.

(2, 4) Quality control with different modalities.

(1, 1)

(-, 3)

(4, 2)

(2, 2) Running out of “augmenting engineers”.

(3, 2)

(3, 2) Not clear what applications in this area (similar to industrial problems).
(personalisation/customisation, adoption = important principles)

(2, 2)

(4, 1) open ended learning, such as trial programming by demonstrator that can be tuned by language

(1, 1)

(3, 4) Cleaning X, support tools for engineers

(-,-) I'm unclear from the talk as to what this really means for cognitive systems.

Humanoid Robotics (4.3, 3.7)

(5, 5) Entertainment robotics, semi-humanoid robots in office, or personal assistant in home.

(5, 5)

(5, 2)

(4, 5)

(3, 3)

(4, 5)

(4, 5) Entertainment and companions, multi model conversation.

(4, 4) Robocup humanoid league.

(4, 4) “Correspondence problem”. Self-organising vision-based action imitation learning based on primitives (visio/motor) and explorative mechanisms.

(5, 5) Get reasonable vision module. Get convincing interpretation method.

(5, 5) Build sociable robots and toys. Study human communication better.

(3, 5) Companions for humans (children, elderly people).

(3, 2)

(5, 4) System level properties (no application though).

(5, 5) Close interaction with humans in rich, dynamic environments (home). Robots need human-like motion (arm, body) and human-like reasoning and decision capacity to be accepted as partners.

(5, 1) Already challenge, but with large potential to be a business disaster – need to be done very professionally, no technology push

(3, 1)

(5, 3) Domestic cleaning robot.

(5, 5) Tool use, imitation, general (non-task specific), pet companion, augmentation.

(5, 5)

(4, 4) Humanoid robot which is able to acquire such skills as walking on two legs, mimic hand manipulation with objects, learning word meaning in interaction with humans.

(3, 2)

(2, 2) Healthcare.

(5, 3) Co-development of embodiment and intelligence.

(5, 5) A humanoid robot capable of free movement through a house, office or even the street.

(4, 3)

(4, 3) Sensor motor co-ordination. Body and ‘brain’ integration.

(4, 2)

(5, 5) Service robots for impaired people/elderly.

(5, 2) Interaction between robots and humans.

(5, 4) Build a platform for scientific research and cooperation in humanoid robotics.

(4, 3)

(-, 1)

(5, 4) Care robot for person with dementia.

(5, 5) Embodiment of a system which is able to learn and develop as one unit, not independently.

(4, 3)

(5, 5) Developmental robots (~or baby robot that grows with lessons). Flexible/growing morphology robots (not necessarily humanoid).

(4, 3)

(5, 5) Humaniod that can “pick up” intuitively on a cooperative task, and “jump in” to the task to cooperate with the human, shaped by language and observation.

(4, 3)

(4, 5) Clean table -> dishwasher, “natural” interfaces, learn room layouts of apartments, find all tables/sofas/cupboards

Intelligent Transport (3.9, 3.1)

(4, 2) Flow control and congestion control.

(3, 2)

(5, 2)

(3, 4)

(5, 4) Situation awareness, reactions, behaviour patterns using sensing – good constrained environment – from virtual to real mid setup.

(4, 4) Co-operative vehicle highways.

(3, 2)

(4, 3) Intelligent vehicles (Darpa Grand Challenge).

(4, 5) Driver/assist functions. Safe cars. Pedestrian detection and activity/observer's behaviour dependent risk/scene evaluation.

(5, 4)

(4, 4) Attentive information and navigation. Forward-looking real-time image feed and its use.

(5, 1) Safer transport organisation.

(2, 3) Organising of traffic lights in a city.

(4, 2) Traffic management/route selection. Communicated so autonomous.

(4, 2)

(5, 1)

(5, 5) Life-long learning.

(4, 3) Autonomous navigator/pilot: ie a "car" programmed by the short and long term task (task level programming) rather than joint/actuator level programmes.

(3, 2) Fully autonomous vehicles.

(4, 3)

(5, 5) Camera-based semaphores, unmanned vehicle, warning systems in vehicle (pedestrian, out of road, sleeping driver)

(4, 2) Assisting systems for highway driving.

(4, 3) Car, traffic/control, prediction

(3, 3) Autonomous control.

(4, 3) A car capable of controlling itself on present day roads (with no mods in the road).

(3, 2)

(3, 3) Monitoring and self-regulated traffic.

(5, 5) Communication between cognitive vehicles and smart infrastructure. Platooning on motorways for increasing efficiency and driving comfort.

(4, 3/4) Intelligent vehicle able to interact with the condition of the road and with other vehicles to make driving the car easier, more relaxing and safer for the driver.

(5, 4) Autonomous logistic networks in urban environments.

(2, 2) Intelligent collision avoidance.

(4, 5) An autonomous intelligent communication system between vehicles in order to prevent accidents, and inform drivers.

(-, 5)

(5, 3) Car convoys.

(3, 5) Multi-agent collaboration and decision-making.

(4, 3) Cognitive car, intelligent highways.

(4, 5) A landmark application for autonomous platforms for mobility of people in cities or natural parks (like cybercars [www.cybercars.org]) are applications scenarios that promote these technologies in daily life. Typical scenarios are amusement parks, park-and-ride for cities without cars, etc.

(3*, 2) Car “cooperating/communicating” with roads and other cars (or +other cars + road = 1 environment). (*overlaps with other FP7 areas beyond ICT – co-funding needed?)

(5, 4)

(3, 1) Automatic pilot with inter-vehicle coordinator

(4, 3) Intelligent driver assistance systems

(1, 2) Driverless individual A->B transport

Military (3.2, 2.2)

(5, 0)

(5, 3)

(5, 2)

(2, 2)

(3, 3)

(3, 4) Anomaly detection.

(2, 1)

(2, 2) Furture combat systems.

(0, 0)

(2, 1)

(3, 5) Multi-source, multi-sensor information fusion. Visual data mining and pattern/trend recognition.

(3, 3)

(2, 2) Suspicious behaviour recognition.

(4, 2) Anomaly detection.

(3, 1)

(5, 1)

(3, 3)

(3, 1)

(5, 1)

(5, 5)

(3, 1) Border watch, detection of suspicious individuals in crowd of people.

(4, 2) Detection of abnormal behaviour/situations.

(5, 1)

(4, 2) Threat analysis – could closely connect to exactly same problem in biological systems.

(3, 3) Robots that can autonomously approach a target and attack it, or deactivate a mine.

(4, 3)

(1, 1) Recycling weapons.

(2, 2)

(4, 2)

(1, 1) Intelligent de-mining.

(2, 3) Build cognitive systems that can identify friendly or enemy targets.

(-, 3)

(4, 2) Terrorist interception.

(4, 4) Dealing with large amounts of data, anomaly deviation.

(4, 3) Surveillance systems, “battlefield transparence”.

(3*, 3) Situation awareness and decision-making in distributed multi-agents/users scenarios. *(*overlaps with other FP7 areas beyond ICT – co-funding needed?)*

(0, 0)

(2, 1) Situation and threat analysis

(5, 4) Interpretation and analysis of situation information

(1, 1)

Life Sciences (3.3, 2.7)

(-, -) Robot Scientist.

(4, 2)

(5, 3)

(4, 5)

(1, 3)

(4, 4) Prosthetic devices for cognitively impaired.

(4, 3) Assistance systems for disabled persons

(2, 4)

(5, 5)

(2, 1)

(2, 2)

(2, 1)

(3, 3)

(3, 2)

(3, 3)

(4, 2) Good understanding of multi-sensory (human) for fusion. Visual data mining and pattern/trend recognition. Real-time interactive massive data exploration.

(3, 4)

(1, 1) System level modelling of cells for all major cell families.

(5, 4) Artificial autopoetic systems, rule extraction, domain general mapping.

(3, 4) Modelling of animal and human behaviour (from insects to men).

(4, 4) Body sensor network, ambient intelligence.

(5, 2)

(2*, 1) Robot scientist. ** May be powerful drivers economically, but best solutions may be very different to cognition*

(2, 1)

(2, 1)

(5, 1)

(4, 4)

(-, 5)

(3, 2) An explanation of consciousness from life sciences perspective.

(3, 2) Nature-based cognition theories.

(4, 3) Study of living systems' behaviour under certain circumstances.

(3, 2) Cognitive systems for identification of cancer cells that can learn from the experiences of expert humans.

(5, 5) I am interested in network of cameras, sensors, observing sick, elderly people (I am not sure, it is best).

(3, 2) Classifications of problems with extremely variable scenarios.

(5, 5) Robot-human interaction and studies on learning and imitation process on cognitive level are important for the improvement of robotics technology and its spread on the community.

(3, 1)

(4, 2)

(1**, 2)This looks more closely related to other areas or ICT/AI (e.g. data-mining to build better-than-human systems.) Cog sys – build human-like systems to support (substitute) humans. **related to e-helath and related to F.E.T within ICT e.g. build physiological model of cell/organ/brain tissues

(4, 2)

(5, 5)

(2, 1)

(3, 2)

(2, 3) Cell counting of growing organisms. Human machine registration

Other

Security

- Predicting the intention of a suicide bomber in a public space.

Personal Robotics

- Robot companions.

Organisation

- Define interfaces for existing algorithms. Collect Open Source repository. Fund research on flexible combination of these. Especially collect hardware interfaces.

Language Specs – Production & Perception

- Acquisition, communication.

Computer Games

- *no application given.*

Software Architectures for Complex Systems

- Generalised agent-oriented programming.

Human-Robot Integration

- Increase of human performance, “added value”.

Socially Assistive Robotics

- A system that is capable to completely understand human speech under normal conditions (not in laboratory).
- Social human machine interaction.
- Gesture and ‘human language’ understanding.

Applications Featuring Models of Cognitive Systems used for Cog.Sci. Education

- A computational model of a brain circuit (eg a retina, LGN, V1, V2…), well visualised, interactive, which can be used for demonstrating basic principles of this circuit to undergraduate students of cog. sci. (Generally, I wouldn’t underestimate the educational site…)

No Sub-Heading

- Intelligent system able to support doctors in the diagnosis and robot (fairly autonomous and driven by doctors) able to make simple complex surgical operations.

- Learning issues, concept building from scratch in real-life scenarios, what should be innate and what learned.

Service Robotics

- Rescuing and bomb disposal robots.

Neuro-Sciences

- Inverse engineering of brain, particularly the correction patterns of brain regions and neurons.

Intelligent Surveillance and Monitoring

- Multi-modal activity recognition from networks of sensors for safety and security: in transport, at home for elderly.
- Cognitive home, monitoring elderly, security systems.

Service/Household Robotics

- Linguistic communication with household robots (beyond 'simple' navigation mobile tasks) eg. robot manipulating objects, using tools, make up of tea, assemble parts of a tool/site/act.

Human-robot interaction in home and healthcare environments

- The robot acts as a a "nanny" and "personal assistant" capable of interacting in an open-ended way, and taking responsibility for people's safety

Psychology/Neuroscience

- Neural computational principles that enable animals and humans to act/behave successfully (e.g. high fitness, realise personal goals) in a a noisy, ambiguous, dynamic world with a noisy and also dynamic body