PROJECT FINAL REPORT

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Project acronym: *EUCogIII*

Project title: *3rd European Network for the Advancement of Artificial Cognitive Systems, Interaction and Robotics*

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1. Publishable summary

EUCogIII - "3rd European Network for the Advancement of Artificial Cognitive Systems, Interaction and Robotics" (FP7-ICT- 269981), Nov. 2011 - Dec. 2014

http://www.eucognition.org/

EUCogIII has decisively contributed to building a research community in artificial cognitive systems in Europe: It has provided the grease for the gears of successful research. Europe is big on cognitive systems: we are at the forefront of current research and development in information technology; linking the web to the real world, building autonomous robots or cars, providing cognitive assistance to humans – all these require integrating cognition with perception and action. The network of now 1000 members has promoted a scientific culture in which understanding human cognition and designing artificial systems remain intimately linked. This network will continue beyond funding in the newly established *«European Society for Cognitive Systems»*. EUCogIII has (1) articulated a shared vision of cognitive systems; (2) enabled research-level training and community-building; (3) established bridges to relevant application areas and research fields; (4) helped shape the research agenda; and (5) opened the field of cognitive systems to public debate.

(1) Through conferences, workshops, summer-schools and other events (73 in total, with 1150 cost reimbursements), EUCogIII has massively stimulated interchange and debate about foundational issues of how understanding cognition in natural systems informs artificial cognitive systems that are autonomous, embodied and able to learn, which makes them effective and resilient in the real world. This culture of interdisciplinary exchange is critical to the success of cognitive systems (see our maps of research centres and members).

(2) We established means of communication for the community, including web-based tools, mailing lists, social media channels. We achieved continuous growth of the network to about 1000 researchers – and our members want the network to continue (we see 95% satisfaction in our feedback channels). EUCogIII has provided training opportunities (Summer schools, hands-on workshops, lab visits, student exchanges, etc.) for researchers that allowed them to acquire an interdisciplinary skill set and the underlying scientific culture.

(3) EUCogIII has established bridges to the most important related application areas and research fields. We specifically engaged the robotics community in dialogue about the core cognitive properties of autonomous robots, their capacity to make sense of and use their environment, including natural agents. That this has significantly influenced the robotics community where 'cognition' is now growing rapidly. Other areas to which close links were built include machine learning, grounding language and higher cognition in perception, auditory scene understanding and acoustic design.

(4) EUCogIII has played a very active role in translating its vision of cognitive systems research into contributions to the European Research agenda, e.g. through the euRobotics PPP process (MAR, SRA, SOD), elaborating syntheses and strategy papers in dedicated workshops, cooperating with the representatives of the Commission, and reports on impact.

(5) To reach a broader audience, we articulated the vision of cognitive systems research at events and through a video on our YouTube channel (https://www.youtube.com/user/EUCog). The ethics of cognitive systems is of profound societal concern and was made a topic of a member meeting and of a number of other initiatives.

2. Project Context and Objectives

The larger context for the EUCogIII coordination and support action is constituted by the European Commission's endeavour to strengthen the economy and amplify the labour market in Europe through catalysing processes that can transform the outcomes of innovative and excellent research into commercial applications. The specific contribution of EUCogIII to this strategy is to build the cognitive systems community in Europe and to provide services to this community. The main target is to broaden and strengthen the impact of research on cognitive systems by linking communities having related interests but lacking established communication forums, also outside Europe. The project provides the initiative and structure for this action, and encourages the network members to contribute. It links to the European context by facilitating the transfer of information about ideas, findings and products resulting from European cognitive systems research to three different communities: The cognitive systems (and related) research community itself, policy makers and the society.

EUCogIII draws on the achievements of the predecessor networks euCognition (FP6) and EUCogII (FP7). It continues their objectives to bridge research communities and to reach out to relevant interest groups, to determine their needs and to develop strategies addressing them, to support education and mobility of early career researchers in Europe, and to develop the societal awareness for the impact of cognitive systems technology and research and pending legal and ethical questions. In EUCogIII, particular attention was dedicated to means that can make the achievements sustainable beyond the lifetime of the action.

2.1 Project Objectives

The main objectives of EUCogIII can be summarized as follows:

1. Strengthen the cohesion of the artificial cognitive systems community in Europe
2. Improve the presentation of European cognitive systems research to related constituencies, such as IT research, industry, the wider public and the press
3. Build institutional and personal bridges from the European cognitive systems community to these related constituencies in Europe and beyond
4. Contribute to the cutting edge education of the coming generation of researchers
5. Provide services that sustain and support the cognitive systems community in Europe

2.2 The research context

Cognitive systems is an interdisciplinary field that intersects with psychology, cognitive science, neuroscience, computational neuroscience, computer science, artificial intelligence, autonomous robotics, computer vision, and other areas. Artificial cognitive systems are aimed to achieve human like cognitive competences such as making sense of the world through perception, organizing thought, and acting in the world in meaningful ways. There is a long history of trying to design artificial cognitive systems. The emphasis of the EUCogII and EUCogIII networks on embodied cognitive systems reflected the insight of the last two decades of research that the cognitive component of such systems cannot be designed and studied in isolation, but is strongly constrained by its real or potential linkage to sensory-motor systems, by the existence of loops of coupling through the environment, and by the adaptation of cognitive systems to particular physical and task environments in which cognition is acted out. This emphasis gives particular prominence to the "systems" aspect of artificial cognition and is one reason why cognitive systems is not another new sub-field that

is essentially defined by its own, original methods. In that sense, cognitive systems is quite different from related areas such as machine learning or classical artificial intelligence, that are essentially defined by their innovative methods.

This characterization of cognitive systems gives particular prominence to the task of community building, to which this project was dedicated. In terms of the methods they use, researchers in cognitive systems are at home in one or multiple of the related disciplines. They need, however, to acquire the skill of interdisciplinary exchange and, specifically, need to understand the scientific language and culture of the interfacing disciplines. The network was thus aimed at establishing an interdisciplinary culture that promoted two kinds of influences: First, because artificial cognitive systems must connect to human users, designers of artificial cognitive systems need to understand the nature of human cognition and the constraints that arise from how human cognition works. This requires understanding the scientific culture that has emerged at various levels of description around the question of how the human mind works. Second, because artificial cognitive systems are confronted with problems that are difficult to solve with current technology, but that humans solve even as children, designers of artificial cognitive systems need to be inspired by how human cognition works. This requires understanding the scientific culture that surrounds mechanistic accounts of human cognition.

The network was organized to systematically link an interdisciplinary community so that these kinds of influences become possible. This task is harder and its outcomes are less tangible than exporting a particular set of methodological skills to a new field or even developing a particular new method. It also requires a longer view, and thus asks for building a sustainable web of connections among the different fields.

In the previous phase of the coordination action, EUCogII, we largely succeeded in establishing links among the interdisciplinary research fields, enabling the community to develop mutual understanding and the culture to interact across the disciplinary boundaries. In the current phase of the coordination action, EUCogIII, we more strongly emphasized linking to areas in which artificial cognitive systems may become deployed or from which problems arise that artificial cognitive systems may solve. Bridging toward application areas is possible where relevant needs and opportunities exist, but requires that the area of application or research is open to new influences and can currently make use of new interdisciplinary stimulus.

Currently, artificial cognitive systems are considered key to major technological developments worldwide. Market leaders in information technology like IBM and HP have identified artificial cognitive systems as the new frontier. Three examples, illustrate, however, the hurdles faced when inducing the interdisciplinary exchange that is needed to achieve breakthroughs.

Autonomous robotics has, in the past, made strong demands on artificial intelligence to deliver the cognitive component of their systems. Currently, this field is making great strides through new methods. Probabilistic methods are perhaps most rapidly impacting on the field with machine learning starting to have a strong influence as well. Both drives are, in part, fueled by progress in computational hardware that brings methods into the realm of real-time performance that were previously not feasible for robots. As the field is busy exploring what can be achieved with these methods, it is currently not as open as it has been in the past to the broader, interdisciplinary exchange that artificial cognitive systems research offers. Visual

SLAM (self-localization and map formation) for instance, has just become feasible in real-time and is being deployed, although it is clearly something the human mind is not doing at all. Openness and strong interest in cognitive systems work exist, however, where autonomous robots try to make sense of their environment to understand human users and their intentions, or to connect to knowledge about tasks and goals. This is where there is a need to ground concepts in perception and action and to address on-line updating and time-varying environmental demands. The network used both its member meetings and targeted workshops and summer schools to link to this part of the autonomous robotics and computer vision field.

Artificial cognitive systems are central to much current work in *data-mining* that is aimed to link the internet or other large statistical text or image data bases to the real world. There is an enormous need to understand how human cognition links to perception and action in that application area. Unfortunately, the information technology industry in these areas is particularly, even legendarily, closed due to fears about intellectual property. This is a field where ideas travel easily, so companies tend shut down communication even at a very early stage of their explorations. The interdisciplinary interchange is, on the one hand, highly successful, in that many talented young people educated in the open, interdisciplinary research fields connected to cognitive systems are hired by this industry and there impact on the direction technology takes. On the other hand, not so much comes back into the research community, so this is somewhat of a one-way street. Even so, the network has linked to these application areas through member meetings and educational events.

Related field are *driver assistance and autonomous driving*. These are, in some sense, special cases of autonomous robotics, with a strong need to include human actors as both users of cognitive technology as well as objects of cognition (such when pedestrian or driver intentions are estimated). This area is similarly plagued by much closedness on account of intellectual property concerns. But again, exchange happens and is advanced by network activity through individuals who either collaborate in individual projects or who move to the companies that pursue these applications. The trend toward cars become platforms of information technology (literally, with wheels) moves this application area ever closer to cognitive systems. Again, by instilling researchers who contribute to this application area with the culture of interdisciplinary exchange in the relevant domains of cognitive systems, the network is contributing to this application area as well.

Summary

Artificial cognitive systems are at the forefront of current research in information technology, but are not driven by a single innovate method or new technology. Instead, the research field of artificial cognitive systems lives off interdisciplinary exchange, in which the understanding of how human cognition is closely tied to perception, action, and context constrains and organizes approaches to artificial cognition. EUCogIII was aimed to strengthen cognitive systems research in Europe by promoting conceptual clarity, transmitting a culture of interdisciplinary exchange, connecting researchers embedded in different relevant disciplines, and training a new generation of researchers in this interdisciplinary culture. Reaching out to relevant application areas, EUCogIII was to contribute to shaping the research agenda in information technology, promote the interchange of people and ideas, and enable stakeholders and the general public to engage in critical dialogue with the research community.

3. Use and dissemination of foreground/results

As a coordination action, the foreground and results of EUCogIII consist primarily of intangibles in a community: the scientific culture instilled in members of the research and user communities of artificial cognitive systems; the network of personal scientific connections that enable new collaborative efforts; the ensemble of scientific and technology outcomes that have emerged from such connections (we know that 58% of our members have entered formal collaborations); and, finally, the new ideas and new level of understanding that has impacted on the research agendas of many of the members of our network. The table below lists some of the measures taken toward these outcomes. We discuss briefly discuss the main results by stepping through the five categories of actions employed by EUCogIII.

Research and Application areas: Bridges across scientific disciplines and application and research areas were promoted by members conferences. 1) Autonomous Robotics was the main focus of two members meetings (Vienna and Odense 2012), but was also a topic in the 2013 Palma de Mallorca and Brighton meetings, as well as the final meeting in Genoa, 2014. Clearly, robotics has received the strongest attention as it is the area in which cognitive systems thinking is critical to enabling robots to make sense of their environments and to interact with humans about that environment. It is also a field largely open to interact in the interdisciplinary form cognitive systems requires. The links to robotics were further promoted by the activity of coordination council members at various instalment of the European Robotics Forum and at other professional events of that area (see also below). 2) Grounding higher cognition and communication in perception and action was the topic of the 2014 Bochum meeting but was also covered by the 2014 Genoa and the 2014 Palma de Mallorca meetings. This is an overlapping area in which there is tremendous demand for cognitive systems thinking, although less open to scientific interchange.

Research community: The primary use of the foreground of EU Cognition III by the research community was to make use of educational events in which interdisciplinary training was provided to young researchers. This is, no doubt, the centerpiece of EU Cognition III's achievement. The network ran its own summer schools, and supported a large number of summer schools that were closely aligned with the research agenda of cognitive systems. The coordination action also supported workshops, many of which "hands-on", stand-alone or at scientific conferences, to advance cognitive systems thinking within the relevant communities. The coordination action also funded the generation and dissemination of tutorial materials.

Scientific communication within the distributed research community was further advanced by providing supporting numerous special sessions, satellite meetings, workshops, and conferences at which aspects of cognitive systems research were presented.

At a more technical level, the management tools developed in EUCogIII, including "TalkNVote" and financial management tools have been made available to researchers.

Policy makers, decision makers: The coordination action provided results to policy makers, decision makers and the broader general public through multiple means. One members meeting was dedicated to the theme of the ethics of cognitive systems (Brighton, 2013),

which also appeared in Genoa (2014). This solicited considerable public interested and media demand and is a key area that needs to be addressed for cognitive systems to remain acceptable at the decision level of politics and businesses.

EUCogIII also acted on supporting the further development of research policy in its central area through coordination workshops in Munich (2013) and Rapperswill (2014), through its coordination council meetings, and through its active engagement in the PPP for cognitive robotics (ERF Odense, 2012, Lyon, 2013, and Rovereto, 2014).

Critically, EUCogIII enabled feedback from the research community that support the process of defining research strategies. The member questionnaire generated a detailed picture of the needs and concerns of the community, that is now shaping how cognitive systems is positioned in the research agenda at the European level.

General public: EU Cognition III developed a strong dissemination program that included its powerful video message about the meaning and significance of cognitive systems research, its new media presence supported by a coordinated drive to generate messages, and its participation in dissemination programs such as “robots on tour” and the “Shanghai lectures”.

We provide an overview of the 73 events we had in the project period to illustrate this aspect of our activity, which involved ca. 1000 cost reimbursements.

	Events in EUCogIII		
No	**Event ID & Title**	**Organiser**	**Dates**
1	CC-004 2011 Coordination Council Meeting Zurich	Vincent C. Müller	28.11.2011
2	CC3-004 2012 Coordination Council Meeting Oxford	Vincent C. Müller	22.10.2012
3	CC3-005 2013 Coordination Council Meeting Palma	Vincent C. Müller	10.04.2013
4	CC3-006 One-day workshop on July 8th at Munich airport	Vincent C. Müller	08.07.2013
5	CC3-007 EUCog & Robotics Unit meeting in Luxembourg	Olivier da Costa, Vincent C. Müller	15.11.2013
6	CC3-008 2014 Coordination Council Meeting Thessaloniki	Vincent C. Müller	16.05.2014
7	NE3-001 2012 First EUCogIII Members' Conference Vienna	Markus Vincze, Vincent C. Müller	23-24.2.2012
8	NE3-001 2012 First EUCogIII Members' Conference Vienna	Vincent C. Müller	17.10.14
9	NE3-002 2012 Second EUCogIII Members' Conference Odense	Tom Ziemke, Vincent C. Müller	25-26.8.2012
10	NE3-002 2012 Second EUCogIII Members' Conference Odense	Vincent C. Müller	19.03.2014
11	NE3-003 2012 Postgraduate Conference on Robotics and Development of Cognition RobotDoC-PhD, Plymouth, Sept. 2012	Francesca Stramandinoli	10/09/12 - 12/09/12
12	NE3-004 2013 Third EUCogIII Members' Conference Palma de Mallorca	Toni Gomila, Vincent C. Müller	10-11.4.2013
13	NE3-004 2013 Third EUCogIII Members' Conference Palma de Mallorca	Vincent C. Müller	23.10.2013
14	NE3-005 2013 Fourth EUCogIII Members' Conference Falmer/Brighton	Ron Chrisley, Vincent C. Müller	23-24.10.2013
15	NE3-005 2013 Fourth EUCogIII Members' Conference Falmer/Brighton	Vincent C. Müller	26.08.2012
16	NE3-006 2014 Fifth EUCogIII Members' Conference Bochum	Gregor Schöner, Vincent C. Müller	19-20.3.2014
17	NE3-006 2014 Fifth EUCogIII Members' Conference Bochum	Vincent C. Müller	23.02.2012
18	NE3-007 2014 Sixth EUCogIII Members' Conference Genoa	Vincent C. Müller	17-18.10.2014
19	OT3-001 European Robotics Forum, Odense	Markus Vincze, Vincent C. Müller	05-07.03.2012
20	OT3-002 Fifth ICT Coordinators Day	Efi Frangopoulou	23.10.2013
21	OT3-003 European Robotics Forum, Lyon	Vincent C. Müller	19-21.03.2013
22	OT3-004 European Robotics Forum, Rovereto	Vincent C. Müller	12-14.03.2014
23	RV3-001 2012 Eugenia Polizzi di Sorrentino IPHC-CNRs, France	Eugenia Polizzi di Sorrentino	10/06/12 - 30/06/12
24	RV3-002-AISB-IACAP-World-Congress-2012-Alan-Turing-2012	Vincent C. Müller	2-6.07.2012
25	RV3-003 2013 Miguel Aguilera to Randall Beer's Laboratory at Indiana University	Miguel Aguilera Lizarraga	22/01/13 - 22/04/13
26	RV3-004 2013 Summer Student Visit at the Centre for Robotics and Neural Systems, Plymouth University	Georgios Pierris	19/06/13 - 19/09/13
27	RV3-005 2014 Da Rold -Tokyo: Deterministic chaos in embodied agents	Federico Da Rold	30/06/14 - 31/08/14
28	SE3-001 2012 ECAI Workshop on Machine Learning for Interactive Systems (MLIS 2012), August 2012	Heriberto Cuayáhuitl	27/08/12 - 28/08/12
29	SE3-002 2012 Auditory Cognition - Listening in the Real World, Plymouth	Susan Denham	16/07/12 - 23/07/12
30	SE3-003 2012 Interdisciplinary College 2012 (Günne)	Fred Henrik Hamker	16/03/12 - 23/03/12
31	SE3-004 2012 Embodiment, Cognition and Communication (Human Ethology Conference, Vienna)	Elisabeth Oberzaucher	12/08/12 - 17/08/12

32	SE3-005 2012 Special Session "Cognitive Architectures in Dynamic Field Theory" (Progress in Neural Field Theory, Reading)	Peter beim Graben	19/04/12 - 21/04/12
33	SE3-006 2012 13th Neural Computation and Psychology Workshop (NCPW , Basque Country)	Julien Mayor	12/07/12 - 14/07/12
34	SE3-007 2012 Neural Dynamics Approach to Cognitive Robotics III --- A Hands-on Summer School	Gregor Schöner	03/09/12 - 07/09/12
35	SE3-008 2012 ACM 3rd International Symposium on Facial Analysis and Animation	Michael Pucher	21/09/12 - 21/09/12
36	SE3-009 2012 CITEC Summer School 2012: Verbal and non-verbal communication: From experiments to implementation	Sascha Sebastian Griffiths	26/08/12 - 31/08/12
37	SE3-010 2012 Barcelona Cognition, Brain and Technology Summer School 2012	Paul Verschure	03/09/12 - 14/09/12
38	SE3-011 2012 AISB Sensorimotor Theory Workshop	John Mark Bishop	26/09/12 - 26/09/12
39	SE3-012 2012 Peters: Beyond Robot Grasping - Modern Approaches for Dynamic Manipulation	Jan Peters	12/10/12 - 12/10/12
40	SE3-013 2012 AGI Impacts	Vincent C. Müller	10/12/12 - 11/12/12
41	SE3-014 2012 VVV2012, the iCub summer school	Giorgio Metta	18/07/12 - 28/07/12
42	SE3-015 2013 HRI Pioneers Workshop 2013 - Doctoral Students Workshop	Astrid Marieke Rosenthal-von der Pütten	03/12/12 - 03/12/12
43	SE3-016 2013 Interdisciplinary College 2013: Wicked Problems, Complexity and Wisdom (Spring School)	Tarek Richard Besold	15/03/13 - 22/03/13
44	SE3-017 2012 3rd Int. Workshop on Human Behavior Understanding	Albert Ali Salah	07/10/12 - 07/10/12
45	SE3-018 2013 CogSci 2013, 35th annual meeting of the Cognitive Science Society	Ipke Wachsmuth	31/07/13 - 03/08/13
46	SE3-019 2013 The 9th International Summer Workshop on Multimodal Interfaces - eNTERFACE'13	Yves Rybarczyk	15/07/13 - 09/08/13
47	SE3-020 2013 Conceptual and Mathematical Foundations of Embodied Intelligence	Nihat Ay	27/02/13 - 01/03/13
48	SE3-021 2013 Bilingual minds, bilingual machines	Susan Denham	24/06/13 - 30/06/13
49	SE3-022 2013 Summer School on Social Human-Robot Interaction, Cambridge	Tony Belpaeme	26/08/13 - 30/08/13
50	SE3-023 2013 Robots on Tour, Zurich	Samantha O'Farrell	08/03/13 - 09/03/13
51	SE3-024 2013 Workshop on Soft Robotics and Morphological Computation, Monte Verità	Fumiya Iida	14/07/13 - 19/07/13
52	SE3-025 2013 International Conference "Aesthetics and the Embodied Mind" (conference with less than 30 participants)	Alfonsina Scarinzi	26/08/13 - 28/08/13
53	SE3-026 2013 International Summer School on Agent-based Computational Models of Creativity, Cortona	Pieter Wellens	15/09/13 - 20/09/13
54	SE3-027 2013 Workshop on "Models of Cognition in Biorobotics"	Ioannis Iossifidis	24/06/13 - 24/06/13
55	SE3-028 PT-AI 2013 - Philosophy and Theory of Artificial Intelligence	Vincent C. Müller	21/09/13 - 22/09/13
56	SE3-029 2014 Joint IEEE ICDL-Epirob 2014	Giorgio Metta	13/10/14 - 16/10/14
57	SE3-030 2013 Interdisciplinary College 2014: Cognition 3.0 -- the social mind in the connected world (Spring School)	Tarek Richard Besold	14/03/14 - 21/03/14
58	SE3-031 2013 Neural Dynamics Approach to Cognitive Robotics --- A Hands-on Summer School	Gregor Schöner	09/09/13 - 14/09/13
59	SE3-032 2013 Synthetic Modeling of Life and Cognition: Open Questions	Luisa Damiano	12/09/13 - 14/09/13
60	SE3-033 2014 HRI Pioneers Workshop 2014	Tamara Lorenz	03/03/14 - 03/03/14
61	SE3-034 2013 Learning across domains and tasks: theory meets practice	Tatiana Tommasi	10/12/13 - 10/12/13
62	SE3-035 2013 NeuroEngineering the Brain: from Neuroscience	Jörg Conradt	02/12/13 - 04/12/13

	to Robotics … and back		
63	SE3-036 2014 AISB Symposium "Machine Ethics in the Context of Medical and Care Agents"	Mark Coeckelbergh	03/03/14 - 04/03/14
64	SE3-037 2014 AISB Embodied vs. Simulated Behavior and Cognition	Nikolaos Mavridis	04/04/14 - 04/04/14
65	SE3-038 2014 ICRA Workshop Active Visual Learning and Hierarchical Visual Representations for General-Purpose Robot Vision	Ales Leonardis	01/06/14 - 01/06/14
66	SE3-039 2014 IRSS-2014: International Research-Centered Summer School in Cognitive Systems and Interactive Robotics	Nikolaos Mavridis	03/07/14 - 30/07/14
67	SE3-040 2014 CTY Workshop series on AI and Robotics for teenage students	Alexander Astaras	01/07/14 - 30/06/15
68	SE3-041 2014 NCPW14 - 14th Neural Computation and Psychology Workshop	Gert Westermann	21/08/14 - 23/08/14
69	SE3-042 2014 ICDL-Epirob 2014 Special Session: Dynamic interactions between visual experiences, actions and word learning	Beata Joanna Grzyb	13/10/14 - 13/10/14
70	SE3-043 2014 The ShanghAI Lectures 2014	Fabio Paolo Bonsignorio	09/10/14 - 11/12/14
71	SE3-044 2014 Summer School Neural Dynamics Approach to Cognitive Robotics	Gregor Schöner	25/05/14 - 30/05/14
72	SE3-045 2014 Development of body representations in humans and robots	Matej Hoffmann	13/10/14 - 13/10/14
73	SE3-046 2014 EUCognition after EUCogIII, Rapperswil	Vincent C. Müller	29/30.11.2014

4. Potential Impact

As outlined above, EUCogIII has (1) articulated a shared vision of cognitive systems; (2) enabled research-level training and collaboration toward this vision; (3) established bridges to relevant application areas and research fields; (4) developed messages and tools that help shape the research agenda; and (5) opened the field of cognitive systems to public debate.

To specifically strengthen impact, we held two meetings to determine our desiderata and make practical plans to reach them: “EUCog - Munich Message Meeting” and “EUCog & Luxembourg Unit - Outreach, outcome and impact of research in cognitive systems and EUCog”. These desiderata have now been made reality with our activities. We also the members of EUCognition about the impact of Cognitive Systems Research and interviewed researchers of EC funded projects to find out about the progress in the field. We summarized our findings in these two reports:

- Cognitive Systems Research in Europe - EUCog Report
- Cognitive Systems: Insights, Examples, Systems - Report from the EUCog 3 x 3 Questionnaire

The reports and impact material can be found on http://www.eucognition.org/index.php?page=impact-cognitive-systems-research.

The impact of these achievements and the community-building is a much stronger position of cognitive systems in the research arena and the move into products.

One result is that we have significantly influenced the robotics community; as reflected by, for example, the IEEE Robotics & Automation Society’s recent establishment of the IEEE Technical Committee on Cognitive Robotics (http://www.ieee-coro.org/). Cognitive robotics

is getting stronger, the aims of bringing robots closer to humans, human robot collaboration in industry, future service robots at home all require it. The topics group "Artificial Intelligence and Cognitive robotics" (AICoR) has made major contributions to the MAR and SOD and eventually to the call text in the robotics PPP.

Perhaps we may illustrate this impact with some quotations: "Welcome to the Era of Cognitive Systems" (2012) John E. Kelly, Director of IBM Research. "Advanced robotics and autonomous cars are major disruptive technologies" (2013) McKinsey Global Institute Report. "The future of robotics will be cognitive robotics" (2014) Herman Bruyninckx, Vice-President Research, euRobotics AISBL. Europe is strong on cognitive systems and cognitive systems are now entering the mainstream.

In terms of the community one major impact was the establishment of the European Society of Cognitive Systems, that has been legally set up, will hold its first conference in 2014 in Barcelona and has an enormous community push behind it. The Society was pushed by ordinary network members at the Rapperswil meeting in November 2014 (http://www.eucognition.org/index.php?page=2014-eucognition-after-eucogiii-gen-info) with concrete plans and responsibilities.

Impact on research community

The main impact of EUCogIII is hidden since it lies in the community, in the 'grease' that we provided to the cogs and wheels of research.

The EUCogIII network has considerably improved the potential impact of researchers by better position and better articulating the goals and vision, and by providing services for dissemination. We now have a strong community through clearer vision, clearer goals, and clearer relationship to the different fields and disciplines

One main area is by bringing researchers together that otherwise would not have met, let alone collaborate. We know from our members' questionnaire http://www.eucognition.org/index.php?page=2nd-members-questionnaire that 58% of members have entered into formal collaborations (publication, project, etc.) directly facilitated by the network. One illustrative example:

During the August 2012 meeting in Odense, speaker Maarja Kruusma (underwater robotic and fish hydrodynamics) met coordination council member Tjeerd Andringa (soundscape research and situational awareness) and they talked about Sietse van Netten's research on the fish lateral line. Half a year later this let to the idea to build macroscopic lateral sensors for oceanographic research by applying key ideas from cognitive systems research in the domain of hydrodynamic imaging: actually implementing fish spatial cognition on the scale of kilometers. After a considerable technical feasibility phase this let to the formation of the LAkHsMI (LArge scale HydrodynaMic Imaging) consortium.The consortium was awarded 3M€ in the call "Blue Growth: Unlocking the potential of Seas and Oceans" topic "BG-09-2014 - Acoustic and imaging technologies".

5. Report on societal implications

Replies to the following questions will assist the Commission to obtain statistics and indicators on societal and socio-economic issues addressed by projects. The questions are arranged in a number of key themes. As well as producing certain statistics, the replies will also help identify those projects that have shown a real engagement with wider societal issues, and thereby identify interesting approaches to these issues and best practices. The replies for individual projects will not be made public.

A General Information *(completed automatically when **Grant Agreement number** is entered.*

Grant Agreement Number: 269981	
Title of Project: EUCogIII	
Name and Title of Coordinator: Prof Vincent C.	

B Ethics

1. Did your project undergo an Ethics Review (and/or Screening)? • If Yes: have you described the progress of compliance with the relevant Ethics Review/Screening Requirements in the frame of the periodic/final project reports? Special Reminder: the progress of compliance with the Ethics Review/Screening Requirements should be described in the Period/Final Project Reports under the Section 3.2.2 *'Work Progress and Achievements'*	***No***
2. Please indicate whether your project involved any of the following issues (tick box) :	***No***
RESEARCH ON HUMANS	
• Did the project involve children?	
• Did the project involve patients?	
• Did the project involve persons not able to give consent?	
• Did the project involve adult healthy volunteers?	
• Did the project involve Human genetic material?	
• Did the project involve Human biological samples?	
• Did the project involve Human data collection?	
RESEARCH ON HUMAN EMBRYO/FOETUS	
• Did the project involve Human Embryos?	
• Did the project involve Human Foetal Tissue / Cells?	
• Did the project involve Human Embryonic Stem Cells (hESCs)?	

• Did the project on human Embryonic Stem Cells involve cells in culture?	
• Did the project on human Embryonic Stem Cells involve the derivation of cells from Embryos?	
PRIVACY	
• Did the project involve processing of genetic information or personal data (eg. health, sexual lifestyle, ethnicity, political opinion, religious or philosophical conviction)?	
• Did the project involve tracking the location or observation of people?	
RESEARCH ON ANIMALS	
• Did the project involve research on animals?	
• Were those animals transgenic small laboratory animals?	
• Were those animals transgenic farm animals?	
• Were those animals cloned farm animals?	
• Were those animals non-human primates?	
RESEARCH INVOLVING DEVELOPING COUNTRIES	
• Did the project involve the use of local resources (genetic, animal, plant etc)?	
• Was the project of benefit to local community (capacity building, access to healthcare, education etc)?	
DUAL USE	
• Research having direct military use	
• Research having the potential for terrorist abuse	

C Workforce Statistics

3. Workforce statistics for the project: Please indicate in the table below the number of people who worked on the project (on a headcount basis).

Type of Position	Number of Women	Number of Men
Scientific Coordinator		1
Work package leaders		9
Experienced researchers (i.e. PhD holders)	1	1
PhD Students	3	3
Other		

4. How many additional researchers (in companies and universities) were recruited specifically for this project?	**2**
Of which, indicate the number of men:	2

D Gender Aspects

5. Did you carry out specific Gender Equality Actions under the project?	○ x	Yes No

6. Which of the following actions did you carry out and how effective were they?

		Not at all effective				Very effective
❑	Design and implement an equal opportunity policy	○	○	○	○	○
❑	Set targets to achieve a gender balance in the workforce	○	○	○	○	○
❑	Organise conferences and workshops on gender	○	○	○	○	○
❑	Actions to improve work-life balance	○	○	○	○	○
○	Other: Invited more women speakers to events					

7. Was there a gender dimension associated with the research content – i.e. wherever people were the focus of the research as, for example, consumers, users, patients or in trials, was the issue of gender considered and addressed?

○ Yes- please specify

x No

E Synergies with Science Education

8. Did your project involve working with students and/or school pupils (e.g. open days, participation in science festivals and events, prizes/competitions or joint projects)?

x Yes- please specify

Summer schools, on-site training

○ No

9. Did the project generate any science education material (e.g. kits, websites, explanatory booklets, DVDs)?

x Yes- please specify

Online tutorials

○ No

F Interdisciplinarity

10. Which disciplines (see list below) are involved in your project?

x Main discipline[1]: 1.1

x Associated discipline[1]: 2.2	x Associated discipline[1]: 5.1

[1] Insert number from list below (Frascati Manual).

G Engaging with Civil society and policy makers

11a Did your project engage with societal actors beyond the research community? *(if 'No', go to Question 14)*	x O	Yes No

11b If yes, did you engage with citizens (citizens' panels / juries) or organised civil society (NGOs, patients' groups etc.)?

- O No
- O Yes- in determining what research should be performed
- O Yes - in implementing the research
- x Yes, in communicating /disseminating / using the results of the project

11c In doing so, did your project involve actors whose role is mainly to organise the dialogue with citizens and organised civil society (e.g. professional mediator; communication company, science museums)?	O x	Yes No

12. Did you engage with government / public bodies or policy makers (including international organisations)

- O No
- x Yes- in framing the research agenda
- O Yes - in implementing the research agenda
- x Yes, in communicating /disseminating / using the results of the project

13a Will the project generate outputs (expertise or scientific advice) which could be used by policy makers?

- O Yes – as a **primary** objective (please indicate areas below- multiple answers possible)
- x Yes – as a **secondary** objective (please indicate areas below - multiple answer possible)
- O No

13b If Yes, in which fields?

Agriculture		Energy		Human rights	
Audiovisual and Media		Enlargement		X Information Society	
Budget		Enterprise		Institutional affairs	
Competition		Environment		Internal Market	
Consumers		External Relations		Justice, freedom and security	
Culture		External Trade		Public Health	
Customs		Fisheries and Maritime Affairs		Regional Policy	
Development Economic and Monetary Affairs		Food Safety		X Research and Innovation	
		Foreign and Security Policy		Space	
Education, Training, Youth		Fraud		Taxation	
Employment and Social Affairs		Humanitarian aid		Transport	

13c If Yes, at which level?

- ○ Local / regional levels
- X National level
- X European level
- x International level

H Use and dissemination

14. How many Articles were published/accepted for publication in peer-reviewed journals?		**N.A.**
To how many of these is open access[2] provided?		
How many of these are published in open access journals?		
How many of these are published in open repositories?		
To how many of these is open access not provided?		
Please check all applicable reasons for not providing open access:		
❑ publisher's licensing agreement would not permit publishing in a repository ❑ no suitable repository available ❑ no suitable open access journal available ❑ no funds available to publish in an open access journal ❑ lack of time and resources ❑ lack of information on open access ❑ other[3]: ……		
15. How many new patent applications ('priority filings') have been made? *("Technologically unique": multiple applications for the same invention in different jurisdictions should be counted as just one application of grant).*		**N.A.**
16. Indicate how many of the following Intellectual Property Rights were applied for (give number in each box).	Trademark	**N.A.**
	Registered design	**N.A.**
	Other	**N.A.**
17. How many spin-off companies were created / are planned as a direct result of the project?		**N.A.**
Indicate the approximate number of additional jobs in these companies:		

[2] Open Access is defined as free of charge access for anyone via Internet.

[3] For instance: classification for security project.

18. Please indicate whether your project has a potential impact on employment, in comparison with the situation before your project:

❑	Increase in employment, or	❑	In small & medium-sized enterprises
❑	Safeguard employment, or	❑	In large companies
❑	Decrease in employment,	❑	None of the above / not relevant to the project
x	Difficult to estimate / not possible to quantify		

19. For your project partnership please estimate the employment effect resulting directly from your participation in Full Time Equivalent (*FTE = one person working fulltime for a year*) jobs:

Indicate figure:

x Difficult to estimate / not possible to quantify

❑

I Media and Communication to the general public

20. As part of the project, were any of the beneficiaries professionals in communication or media relations?

○ Yes x No

21. As part of the project, have any beneficiaries received professional media / communication training / advice to improve communication with the general public?

○ Yes x No

22 Which of the following have been used to communicate information about your project to the general public, or have resulted from your project?

X	Press Release	X	Coverage in specialist press
❑	Media briefing	X	Coverage in general (non-specialist) press
X	TV coverage / report	X	Coverage in national press
x	Radio coverage / report	X	Coverage in international press
❑	Brochures /posters / flyers	X	Website for the general public / internet
x	DVD /Film /Multimedia	❑	Event targeting general public (festival, conference, exhibition, science café)

23 In which languages are the information products for the general public produced?

❑	Language of the coordinator	x	English
❑	Other language(s)		

6. Contact Details

1.1. Basic Data

EUCogIII

3rd European Network for the Advancement of Artificial Cognitive Systems, Interaction and Robotics

Project no.: 269981

Coordination Action

European Commission, 7th Research Framework Programme,

Information and Communication Technologies

Funding: 1,980,000 Euros

Duration: 38 months (Nov. 2011 - Dec. 2014)

http://www.eucognition.org

1.2. Participant Details

http://www.eucognition.org/index.php?page=project

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