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INCF

Integrating and strengthening the European Research Area

Specific Support Action

6.1 Publishable final activity report

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6.1 Publishable final activity report

The objective of this Specific Support Action (SSA) is to promote the development of the International Neuroinformatics Coordinating Facility (INCF), a newly formed organization, to further a rapid advance of Neuroinformatics on a global scale. INCF was formed through the Global Science Forum (GSF) of the Organization of Economic Cooperation and Development (OECD), which initiated an analysis of the field of Neuroinformatics and concluded that a global coordinating effort was required for the benefit of basic and clinical neuroscience. To support this area is of particular importance from a health perspective, since around 35% of the total costs for the health sector are due to diseases of the nervous system and nearly all people are afflicted with a malady of the nervous system at least once in their lifetime. These diseases are often long-lasting and make not only the patients suffer but also their relatives. Furthermore, major technological advances in communication science, robotics, and machine-human interface of the 21st century are increasingly reliant on strategies of information processing that are analogous to those used by the brain. Therefore, success in Neuroinformatics, the multidisciplinary field interfacing the domains of biomedicine and information technology, will not only markedly reduce the enormous social, economic and psychological burdens caused by brain disorders but also lead to greatly enhanced competitiveness in the industrial and economic environment of a nation. Fulfillment of this promise constitutes a global megascience challenge.

With the support of all research ministers of the OECD countries, it was recommended that all OECD member states should support the advance of Neuroinformatics, and INCF be established to tackle this challenge through international coordination for global activities and infrastructures, in particular, to guide and oversee the important development of standards, guidelines, ontologies, and other unifying activities in Neuroinformatics. In August 2005, the organization was formally established with the INCF Secretariat hosted by the Karolinska Institutet and Royal Institute of Technology in Stockholm. Professor Jan Bjaalie was subsequently appointed as the first Executive Director in the autumn of 2006. During the period of this SSA, a rapid buildup of INCF has been achieved. By the end of the SSA, there are 15 member countries across Asia, Europe, and North America, among which, 12 European countries. All member countries contribute to INCF financially in relation to their national investments in R&D. The European Commission was represented on the Neuroinformatics subcommittee at GSF. European Union is not a member of INCF but has the observer status and the present SSA provides the means to support the development of INCF. INCF operates with a Secretariat and a network of distributed National Nodes in the member countries.

This SSA started in January 2007, when the INCF Secretariat was being built into full capacity. The SSA contains five different work packages, each of which is organized to facilitate a rapid development of INCF. The INCF Secretariat is responsible for Work Packages 1, 2, 3 and 5, and University of Edinburgh/Professor David Willshaw is responsible for WP4 on Neuroinformatics Training. The work performed with the support of this SSA can best be summarized by describing the accomplishments under the

different Work Packages. All resulting reports and documents cited herein are available at the INCF web-site (www.incf.org) and in *Nature Precedings*.

1. Project execution

- *WPI 'Small workshops in different INCF focus areas held at the secretariat'*

According to the original plan, INCF have arranged fifteen workshops, each in a particular focused area/topic and with around 15 participants. INCF was able to enlist leading experts in these particular areas to discuss the development of the fields and recommend implementation plans. The recommendations were then assessed and put into action by the Secretariat in interaction with the workshop participants and INCF National Nodes. This has been proven as an effective process for strategic planning in different target areas. During the second half of this SSA, INCF has capitalized the experience obtained and further formalized this step-wise process for launching and executing activities, i.e. the INCF Workshops as the basis for further actions. The following workshops have been supported by SSA:

Topical Workshops

1. Large-Scale Modeling of the Nervous system December 12-13, 2006; Report by: Mikael Djurfeldt and Anders Lansner,
2. Workshop on Mouse and Rat Brain Digital Atlasing Systems, February 13-14, 2007; Report by: Jyl Boline, Michael Hawrylycz and Robert Williams,
3. Workshop on Neuroimaging Database Integration, August 30-31, 2007; Report by: Lars Forsberg and Per Roland.
4. Workshop on Global Portal Services for Neuroscience, September 3-4, 2007, Report by: Jaap Van Pelt and Gordon Shepherd.
5. Workshop on Neuroanatomical Nomenclature and Taxonomy, September 10-11, 2007, Report by: Mihail Bota and Larry Swanson.
6. Workshop on Sustainability for Neuroscience Databases Dec 13-14 2007; Report by: Jaap Van Pelt
7. Workshop – International Neuroinformatics Coordinating Facility (INCF), December 1-2, 2007; in preparation
8. INCF Task Force on Digital Brain Atlasing – Preparatory meeting, March 5, 2008; Report by: Hui Wang
9. Workshop on Large Scale modeling, Topic: Standard Language in Neural Network Modeling, March 19-21, 2009
10. Time Series Data: Analysis and Management. December 4-5, 2008, report by Gareth Leng
11. Workshop on Digital Brain Atlasing, Infrastructure and portal services, Waxholm Space, April 25-26, 2009
12. Workshop on Neural Ontologies, Neuronal Registry, Topic: Infrastructure and portal services, October 18, 2009
13. Role of Neuroinformatics in Genetic Animal Models of Brain Diseases. December 12-13, 2009, report by Olaf Riess in preparation

Workshops of Scientific Program Planning

14. *Ontologies of Neural Structure Oversight Committee*. September 10 – 11, 2008, report by Maryann Martone and Jyl Boline
15. *Multi-scale Modeling Oversight Committee*, December 11 – 12, 2008, report by Erik De Schutter and Hui Wang

These workshops have provided invaluable help in developing the work of INCF. Based on the analysis and recommendations derived from the workshops, four Scientific Programs have been started to develop key areas of critical importance:

- Program on Digital Brain Atlasing,
- Program on Ontologies of Neural Structures,
- Program on Multi-scale Modelling,
- Program on Minimal Metadata Standards.

These programs each represent areas in which standards and infrastructure development are of critical importance and central to the INCF mission. Each such program is directed by an oversight committee of scientific leaders in the program area (10 to 15), which then define specific areas to be developed, which in turn led by a task force composed of often younger researchers. These programs rely on core funding of INCF from the member nations, but has been formed as a result of the workshops initiated through this SSA. INCF has adopted the workshop recommendation for the role of its portal in the community and established the guiding principle for INCF Neuroinformatics Portal development as “a portal of portals”

- ***WP2 ‘Analysis of available resources within the European NI community with regard to science, training and funding’***

The work within this Work Package has been extended and arranged around (1) a new major INCF Neuroinformatics portal (2) the INCF Software Center, and (3) a Community Section – Neuroinformatics Community Index. The INCF Neuroinformatics portal will serve as an entry point to all relevant Neuroinformatic resources – a ‘portal of portals’ service.

During the second half of this SSA, the INCF software centre was released at the FENS Forum in July, 2008; The first release of the overall portal was at the annual meeting of Society for Neuroscience in November, 2008; and key information on research groups, events, training programs, and funding opportunities at an international level has been provided at the portal's Community Section, with substantial entries in all categories by December 2009. All parts of the portal are expected to receive contributions from the entire global neuroscience community in 2010, with a control entry to ensure the quality of inputs.

With the completion of basic technical structure of INCF Neuroinformatics Portal, one further focus of development during the second 18 months of this SSA grant has been

content expansion and integration with resources derived from INCF Scientific Programs. The first major coordinated action is in the area of digital atlasing. In January 2009, INCF published the vision and direction necessary for sharing rapidly growing collections of multi-dimensional data. Central to fostering interoperability of databases is a new standardization in atlas mapping, proposed as Waxholm Space. INCF has assembled a task force, consisting of leading experts who have been involved in major atlasing projects worldwide, to bring data into the Waxholm Space and to establish procedures for registration and validation. By December 2009, Waxholm Space is available through INCF Neuroinformatics Portal as a key resource and has attracted significant downloads.

- ***WP3 ‘Strategic planning and interaction with National nodes’***

The aim here is to facilitate the development of a strategic plan for INCF with a definition of the main goals at different stages. During the first 18 months, a detailed “road map” was developed and is summarized in a corporation document “*INCF Strategy Overview 2008 – 2010*”, available at the INCF website (www.incf.org). During the second half of this SSA, the focus has been the implementation of the “road map” to develop INCF into an efficient organization. INCF has strengthened the strategic planning by refining the step-wise process for launching future activities and by the end of this SSA in December 2009, INCF has successfully launched 4 Programs on Digital Brain Atlasing, Ontologies of Neural Structures, Multi-scale Modeling, and Minimal Metadata Standards. These programs represent long-term strategic undertakings to address issues of importance to the neuroscience community. In addition, all 15 INCF countries have established their National Nodes respectively by the end of 2009. Therefore, furthering coordination with INCF National Nodes has been a priority during this period and a set of efforts to promote interactions has been implemented. This has led to better concerted actions within the INCF global network and as a result, INCF has begun to build up core infrastructure elements at the appropriate National Nodes since December 2009.

Analyses of the results achieved during the first three years have been carried out and the summary of achievements as well as strategic considerations for the next period are presented in the organizational document “*International Neuroinformatics Coordinating Faculty, the first 3 years*”, available both as a printed hardcopy and at www.incf.org. In May 2009, INCF was evaluated by an external review panel to analyze the efficiency of organizational structure in reaching the objectives. The outcomes of the review are summarized by the panel as:

“In conclusion, the Review Panel felt that the INCF has made remarkable progress, exhibited an exciting vision, and recommends continued support of this enterprise for the next five years.”

- ***WP4 ‘Neuroinformatics Training Program’***

The objectives of this Work Package are to develop an overview of needs, investigate good practice and facilitate sharing of training for Neuroinformatics. The actions are organized mainly as a series of discussion workshops on these three topics, respectively. All workshops took place during the second half of this SSA as follows: the 1st workshop was held in Edinburgh on July 23-25, 2008 with the report published in October 2008; the 2nd workshop was a one-day event on September 9, 2009 in Pilsen; and the 3rd workshop was organized on October 26 – 27, 2009 in Edinburgh. The reports for the later two are in preparation.

INCF has, already during the period of this SSA, implemented some of the more feasible recommendations from the above workshops, including hosting the list of major training opportunities in Neuroinformatics at INCF Portal. A more detailed plan for the roles of INCF in training during the next 5-year phase of development is being drafted. Capitalizing on the outcomes obtained through the activities in this Work Package, 4 INCF National Nodes of Sweden, India, Germany and UK have formed a consortium, EuroSPIN, for international training of PhD students in Neuroinformatics.

- ***WP5 ‘Exploration of an “INCF Neuroinformatics e-journal” with open access’***

A possible INCF own open access e-journal has been fully investigated. Shortly after the start of this SSA, a new initiative was launched to form a family of journals under the title ‘Frontiers in Neuroscience’ which has similar aim, scope and publishing practice. As a result, INCF has taken the decision and the follow-up actions of collaborating with key players in scientific publishing arena to better achieve the general objectives of this Work Package. By the end of the SSA, INCF has formed close cooperation with *Frontiers in Neuroinformatics* within the Frontiers journals, and established new collaboration with *Neuroinformatics*. Therefore, all current journals dedicated to the field have direct involvements or contributions of INCF. In addition, INCF has partnered with *the Neuroscience Peer Review Consortium*, which includes virtually all major journals in neuroscience. By implementing the WP5 through collaboration with several strategic partners in scientific publishing, developments have been achieved beyond the original plan with a broader impact on the Neuroinformatics community.

To summarize,

During the tenure of this SSA, a very fast development of INCF has occurred. All proposed objectives in every Work Package have been fulfilled. The support from the EU, in the form of the five WPs discussed above, has been critical for the rapid advance of INCF to position itself strategically and uniquely in the global Neuroinformatics community.

2. Dissemination and use

Extensive dissemination activities have taken place during the SSA, which is of critical importance for INCF to be able to promote, coordinate and facilitate the development of Neuroinformatics and ultimately also basic and clinical neuroscience. During the first 18 months while INCF was being staffed into full capacity, the dissemination action consisted mainly of the INCF Executive Director or the Coordinator of this SSA (Chair of INCF Governing Board) visiting national nodes and presenting at scientific meetings, as reported previously. During the second half of this SSA, an integrated dissemination plan has been developed and implemented as follows:

- Annual INCF Congress in Neuroinformatics – With an interdisciplinary emphasis and the only one dedicated to the field of Neuroinformatics, INCF Congress was launched in September 2008. It is a single-track event with keynote speeches, workshops and posters. The annual Congress has functioned successfully in terms of both the number of participants and the operation to date. Approximately 300 researchers from several distinct fields in neuroscience and technical development were attracted to the first two in Stockholm (2008) and Pilsen (2009), respectively. The 3rd (2010) is scheduled in Kobe, Japan, and 4th (2011) in Boston, USA.
- Regular exhibits and presentations at scientific conferences – Since 2008, INCF has exhibited at all conferences of the Federation of European Neuroscience Societies (FENS) in Europe and Society for Neuroscience in the US, the world two largest societies in Neuroscience. Presentation of the organization and own activities as well as live demonstrations from National Nodes and major Neuroinformatics projects worldwide are organized at INCF booth. In addition, INCF has attended the following specialist meetings relevant to Neuroinformatics to present the organization and activities to targeted audiences at various levels:
 - The International Summer School “Advanced Course in Computational Neuroscience”, Freiburg, Germany, August 4 – 29, 2008
 - 2nd French Conférence on Computational Neurosciences, Marseille, France, October 8 – 11, 2008
 - NeuroML Development Workshop, London, UK, March 9 – 10, 2009
 - New Horizons in Human Brain Imaging – A Pacific Rim Neuroimaging Conference, Hawaii, USA, April 13 – 15, 2009
 - Eighteenth Annual Computational Neuroscience (CNS) Meeting, Berlin, Germany. July 18 – 23, 2009
- Improved web design and publicity materials – The original INCF designs of web and printed materials have been improved by a professional and comprehensive modification. A color scheme has been established and formal instructions for presentations on web and in printed materials have been formulated. Subsequently, a large number of publicity materials have been produced including updated communication brochure, newly developed fact sheets on INCF activities and programs, annual reports, strategy overview, and flyers for INCF annual Congress. These measures have strengthened the identity of INCF.

- INCF Newsletter – The Secretariat initiated the INCF Newsletter in July 2008, both online and in print, as a major vehicle of communication within the INCF global network as well as to the neuroscience and Neuroinformatics community in general. Published quarterly, INCF Newsletter disseminates the latest developments and activities of the INCF and related international Neuroinformatics initiatives. Regular contributions and updates from INCF National Nodes are another feature of the series. By the end of this SSA, over 700 copies of each issue are distributed in print and/or online.

In addition, the coordinator of this SSA and the Executive Director continued the frequent visits to National Nodes in European and other potential countries for INCF membership including Canada, Australia, China, and South Korea to disseminate the developments of INCF and promote the field of Neuroinformatics.

In conclusion,

The support from EU in the form of this SSA has been of major importance for the development of INCF at an early stage of its existence, and for implementing the mission of INCF, which is:

- *To foster scientific interaction for discovery and innovation and facilitate the flow of information and knowledge between researchers in both academia and industry*
- *To serve as a credible and sustainable global network for developing, maintaining, and evaluating internationally coordinated neuroinformatics activities and infrastructures for standards, guidelines and references*
- *To facilitate training for producing highly skilled neuroinformatics researchers worldwide*

And to promote INCF values which include:

- *Openness – INCF activities are open to all researchers who can contribute to neuroinformatics at the international level*
- *Neutrality – INCF priorities and directions are based solely on the collective benefit of science and research, with global brokerage being an important function of INCF*
- *Stability and Lasting Accountability – INCF-participating countries value and directly invest in sustainable products, services, and programs*
- *Result Orientation – INCF criteria for action are results and deliverables to fulfill the mission*
- *Global Excellence – INCF benchmarks for all activities are state-of-the-art and best-practice in both academia and industry*

- *Leadership and Innovation – INCF innovative approaches help to gain and maintain international leadership in supporting neuroscience research.*