Kick-off Meeting Minutes

ICT-2011.9.7: Dynamics of Multi-Level Complex Systems (DyM-CS)
Topology Driven Methods for Complex Systems
Acronym: TOPDRIM
GA Number: 318121
Date: 3 and 4 October 2012
Location: ISI Foundation, Torino, Italy

The lead scientists representing each partner of the TOPDRIM consortium met the 3rd and the 4th of October 2012 at the ISI Foundation to discuss the following **agenda:**

1. Welcome and official opening of TOPDRIM
2. Consortium Agreement (CA), financial guides and duties
3. Scientist participants and WPs presentation
4. New ideas and future perspectives
5. Next coordination meeting

The **lead scientists**, representing each partner of the project consortium were present and constituted a quorum of the Assembly of Representative as specified in the CA (see point 2 of the agenda):

alphabetic list

Johnson Jeffrey	Open University – Unite Kingdom
Merelli Emanuela (project coordinator)	University of Camerino – Italy
Pettini Marco	University of Marseille – France
Rasetti Mario	ISI Foundation – Italy
Reidys Christian	University of Southern Denmark – Denmark
Sloot Peter	University of Amsterdam – Netherlands

Other scientists, technicians and officers, affiliated to project partners, present at the meeting:

Simona De Simone	University of Camerino – Italy
Hoekstra Alfons	University of Amsterdam – Netherlands
Mancini Stefano	University of Camerino – Italy
Rodrigues David	Open University – Unite Kingdom
Vaccarino Francesco	ISI Foundation – Italy

At 02.30 p.m. the chairman Emanuela Merelli (Coordinator of the project) opened the meeting and Prof. Mario Rasetti, President of the ISI Foundation, hosting institution, welcomed the participants. The chairman asked the attending partners to briefly introduce themselves and their institution.

The details concerning the individual points listed below can be found in the slides of the individual presentations which will be made available in the web site.

1. Welcome and official opening of TOPDRIM

Presentation by the Coordinator (Emanuela Merelli

After a brief remind of the rationale, of the main objectives and of the target outcomes of the ICT-2011.9.7: Dynamics of Multi-Level Complex Systems (DyM-CS) call, the chairman recalled the TOPDRIM objectives and listed the other eight funded projects. Analogies and potential connections among all projects should be discussed by the project coordinators with the hope to build a coordination action. In particular, TOPDRIM has connections with TOPOSYS and Heratic for what concerns the use of topological concepts and with Sophocles for sharing competences of the Computational Science research group of University of Amsterdam. The participation of Alfons Hoekstra, coordinator of Sophocles, in the TOPDRIM kickoff meeting aims to allowing to establish a synergy between the two projects.

Mario Rasetti, who was one of the godfathers of the proposal, presented to the attendants an historical account of TOPDRIM's genesis (that will be recorded and published in the web site) and the milestones that constitute the background knowledge over which TOPDRIM has been designed. He described how the concept of topology-based approach to data space concept, which is at the core of TOPDRIM, aims to allowing us to analyse big data situations by methods taking global features into account. The new theory, inspired by many-body physics, should enable us to find emerging patterns in societal interaction phenomena, such those of social networks. The awareness that complexity network theory, at present strongest candidate as possible basis for a theory of complex systems, is fully local opens a promising door to those topology-based approaches where topology implies global.

The chairman communicated then to the Assembly of Representatives the key points required by the European Commission for this project:

- the official start date of the project was announced to be 01 October 2012 with a duration of 36 months;
- after 12 months from the start, the Commission will monitor the advancement of the project and, depending on the outcome of this scientific review, will take action for delivering the last tranche of financing;
- the Consortium should focus on the deliverables and in the short, medium and long term should specifically concentrate its work on measurable objectives. To fulfill these targets and monitor their development each partner should describe in details their contribution in terms of man/moths and scientific work; a"task description table" distributed during the meeting and available from the web site will help to integrate competences of each scientific group w.r.t. WPs objectives. The GA decided that the **"task description table" must be completely filled in within the next three months**.

The chairman proposed to the Assembly of Representatives to insert the following sentence of acknowledgement in any paper, oral presentation, poster that will concern the project TOPDRIM:

"We acknowledge the financial support of the Future and Emerging Technologies (FET) programme within the Seventh Framework Programme for Research of the European Commission, under the FET-Open grant agreement TOPDRIM, number FP7-ICT-318121"

The chairman invited Alfons Hoekstra to present the FET-Proactive STREP "Sophocles: Self-Organised information PrOcessing, CriticaLity and Emergence in multilevel Systems" of which he is coordinator.

2. Consortium Agreement (CA), financial guides and duties, and web site.

Presentation by the Simona De Simone (UNICAM - Italy)

The following points were presented:

- **TOPDRIM CA** has been described in details and some CA issues were focused, such as:
  - The management structure of the project is given by: The Coordinator; WP leaders; The AoR - Assembly of Representatives (the Project Coordinator is the Chair, the co-Chair is nominated by the Chair).

    The chairs and the WP leaders will be in close contact at all stages of the project and will take care of monitoring constantly the detailed progress of the WPs and will promptly initiate corrective actions if needed. Decisions will be taken during meetings (face-to-face or via conference call). The AoR will meet when needed at least once every year (ordinary). The rule to take decision is one person one vote. In case of parity the Coordinator gives the casting vote.
  - Foreground Protection (FLOSS or Patent protection)

    In case the project foreground will be a software, the AoR will decide whether to adopt the FLOSS for sw transfer to users or to protect by patent filing the sw code in case it is patentable (for sw patentability see http://www.epo.org/news-issues/issues/computers/software.htmlandhttp://documents.epo.org/projects/babylon/eponet.nsf/0/a0be115260b5ff71c125746d004c51a5/$FILE/patents_for_software_en.pdf) FLOSS means Software which is licensed under a FLOSS License (FLOSS being an acronym for Free, Libre Open Source Software).
  - Background Included (CA Attachment 1) - The partner 2 SDU likely will grant access to the use of software that is under sw patent filing. It could be useful for projects aims.
- **Financial aspects** Pre-financial arrangements are described as ruled by the CA:

Beneficiary	Total EU Contribution	Retention 0,5 %	Prefinancing	I Tranche (now)	II Tranche (Apr 2013)
Unicam	413.400,00	20.670,00	227.370,00	227.370,00	-
SDU	299.480,00	14.974,00	164.714,00	82.357,00	82.357,00
UvA	299.480,00	14.974,00	164.714,00	82.357,00	82.357,00
OU	297.000,00	14.850,00	163.350,00	81.675,00	81.675,00
ISI	320.440,00	16.022,00	176.242,00	88.121,00	88.121,00
AMU	290.200,00	14.510,00	159.610,00	79.805,00	79.805,00
	1.920.000,00	96.000,00	1.056.000,00	641.685,00	414.315,00

The second payment will be made to the partners after six months from projects start date, and against receipt by the Coordinator of the cost statement and work description for the purpose of checking the Project implementation progress (as ruled by CA art. 7.1.3. Method of payment of the Communitys financial contribution)

  - 1st reporting period : Sept 30th 2013 After the EU approval, the 1st Interim Payment will be paid as ruled by CA art. 7.1.3. In case of approval, the interim payment will be given on the base of eligible costs up to 90% of the total contribution
  - 2nd and final reporting period : Sept 30th 2015 The final payments after reports EU approval

- **Access ECAS Participant Portal for TOPDRIM project management**

  The list of Participant contacts has been showed. Some details about the FR module are explained.

- **Remind about Eligible Costs**

  - actually incurred by the beneficiary
  - real and not estimated, budgeted or imputed
  - supported by valid financial evidence (e.g invoices, time sheets and payslips, etc.)
  - incurred during the duration of the project
  - determined according to the applicable accounting rules of the country where the beneficiary is established and "according to the usual accounting and management principles and practices of the beneficiary
  - essential for the performance of the project and would not be incurred if the project did not take place
  - recorded in the accounts of the beneficiary
  - have been indicated in the estimated overall budget in Annex I (DoW)

Presentation by David Rodrigez (OP - Unite Kingdom)

The following points were presented and discussed:

- Organization of the web site;
- Talk about the LOGO;
- Newsletter;
- Services videos, data, programmes, dissemination;
- Wiki, Internal project services
- Relationship with DYM-CS sites
- Need for a stronger server for website & services
- Joint Events, . Benchmark problems & data sets, algorithms and methods
- Strategy and roadmap

- International cooperation
- Facilitate mobility

The presentation opened a discussion on how to organize the web site for being more effective in sharing results and ideas. Everyone agreed on recording of a small video on questions regarding the objectives of TOPDRIM;

3. Scientist participants and WPs presentation

Presentation by Francesco Vaccarino (ISI - Italy) – Deputy Leader of Workpackage 1

The following points were presented:

- Description of WP1. Topology of data;
- Networks and cycles: emergence and evolution of "topology";
- Persistent homology in networks;
- Metrical and weighted clique filtration;
- Comparison between topological and standard methods.

The presentation stimulated a wide discussion and several questions were posed, among which 1. is there any possibility to mathematically characterize the results obtained from the homology and homotopy equivalence? 2. how to characterize the barcodes that encode the persistent homology of data? 3. do we have appropriate tools to deal with multidimensional persistent homology?

Presentation by Christian Reidys (SDU - Denmark) – Leader of Workpackage 4

The following points were presented:

- Description of WP4. Bio-oriented methods;
- Topological RNA structures and their folding;
- Fatgraphs in the computer;
- Poincaré Dual;
- Bijection;
- The exploitation of a patent.

This presentation provided a lot of hints for further collaborations within the consortium; it has been underlined the possibility to use formal languages, especially those context free in the Chomsky hierarchy, and multiple context free, for reformulating the proposed approach – that analyses and characterizes irreducible shapes starting from a collection of interactions – in a formal language setting, identifying loops, charactering energy functions and boundary components. To this purpose, Peter Sloot suggested to consider the Lindenmayer system, that is a parallel rewriting system, a variant of a formal grammar, used to generate fractals.

Presentation by Marco Pettini (AMU - France) – Deputy Leader of Workpackage 4

The following points were presented:

- Configuration energy landscapes: from their Riemannian geometry underlying dynamics to the topology underlying phase transitions;
- Differential Topology;
- From statistical mechanics of phase transition to high dimensional objects for N-body system;
- Hamiltonian flow and geodesic flow;
- A very promising approach for applications to proteins: the energy landscape paradigm.

The discussion and the main questions arose around the concepts of entropy and energy associated to a given configuration, that during its evolution (changes) can give rise to different topologies. Question: how can we correlate the entropy measure with persistent homology characteristic of the corresponding topology?

Day 1 of the kick-off meeting was adjourned at 7:30 pm.

Second Day of the Meeting – 4 October 2012

At 09.15 a.m. the chairman Emanuela Merelli (Coordinator of the project) convened the meeting.

Presentation by Peter Sloot (UvA - Netherlands) – Leader of Workpackage 2

The following points were presented:

- Description of WP2. Probabilistic methods;
- Information dissipation approach to Complexity networks;
- Stochastic resonance in Complexity networks;
- Topology and Stochastic resonance;
- A wide range of applications for efficient benchmarking;

Most of the proposed approaches, based on information theory in complex systems, and the wide range of application results, opened a general discussion on the possibility to define a benchmark for the methods that will be developed during its 3-year lifetime TOPDRIM project. Jeffrey Johnson proposed to share a repository of problems, that could be collected within TOPDRIM, in the frame of the coordination action that should be organized by the European Commission.

Presentation by Stefano Mancini (UNICAM - Italy) – Deputy Leader of Workpackage 2

The following points were presented:

- Statistical manifolds and information geometry;

- Maximum Entropy principle;
- Entropic dynamics;
- Equations of motion and complexity of motion;
- Connections among geodesic spread, curvature and topology of underlying manifold.

The theory and concepts introduced in the presentation stimulated new collaboration items, among which is the possibility of applying the information geometry approach to network models showing how their topological features will be reflected on dynamical complexity.

Presentation by Emanuela Merelli (UNICAM - Italy) – Leader of Workpackage 3

The following points were presented:

- Description of WP3. Formal methods;
- Models, Languages and Tools for specification, analysis and verification: equivalences and pre-orders;
- S[B] model - S for shape and B for Behaviour - for multi-level complex systems;
- Shape calculus: Rich language to spatially describe biological (but not only) phenomena through geometric shapes, that via a 3D process can bind and split;
- Semantics of 3D processes, functional and temporal behaviour.

A very stimulating discussion was made during and after the presentation. The shape calculus and its S[B] model, being so general, were appreciated also because it allows the modeling of some problems presented by other participants. Peter Sloot proposed to model the "coral organism" based on the "grow and form" principle and he made available all the information that UvA collected for this application. Christian Reidys suggested to apply the shape calculus to one of his results, concerning abstract shapes of k-non-crossing, σ-canonical RNA pseudoknot structures. Mario Rasetti recommended to take into account the work available on "α-shape" for its relevance in using the computational topology approach. Marco Pettini suggested to integrate the shape calculus with long-distance selective interactions, so as to release the randomness of the behavior of each shaped process ad validate the approach in a biological setting.

Presentation by Jeffrey Johnson (OP - UK) – Deputy Leader of Workpackage 3

The following points were presented:

- Beyond simplicial complexes: hypernetworks for multilevel multiscale systems;
- Relational simplices
- From networks to hypernetworks
- Multilevel aggregations
- Blackcloth dynamic

The proposed approach stimulated a new collaboration which is the possibility of applying the multilevel aggregation approach to the shape calculus showing how the topological/relational features will effect the S[B] methods.

Presentation by Jeffrey Johnson (OP - Unite Kingdom) – Leader of Workpackage 5

The following points were presented:

- Description of WP5. Dissemination, joint collaborative tasks, joint actions plan, mobility plan;
- Series of tutorial lectures for TOPDRIM postdocs and young researchers;
- Workshop proposals.

Due to the interdisciplinary aspects of TOPDRIM, the Assembly of Representatives decided to organize a tutorial school where each young researcher involved in TOPDRIM will participate during the first year of the project. Each WP leader gave his/her availability for one-week (about 10 hours) lectures on their research area, among which algebraic and combinatorial topology, formal language theory, complex system science (networks, multi-agent, chaos), field theory, differential geometry, and so on.

A Doodle consultation will be set up for deciding the best period to organize the tutorial school.

4. Next coordination meeting

It has been decided to organize an on-line meeting in the case in which the tasks listed in the table will not be completely described.

A Doodle consultation will be set up for deciding the next meeting date.

The meeting is adjourned at 13:30. Minutes prepared by: [Emanuela Merelli and Simona De Simone]