

**Evaluation Report for Theme
 “Knowledge and Data Representation and Management”
 Held in Rungis, October 11th-13th, 2011**

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~~excellent contacts and preliminary studies with ABES and INA; (5) very good student co-supervision by members of a highly motivated team; (6) excellent international co-operations, e.g. with Sebastian Rudolph.~~

~~**Weaknesses:** (1) The project is almost too ambitious, given the existing resources; (2) there could be a better co-operation, or at least an idea exchange with other INRIA groups or projects, such as, for example, LEO, DAHU, and WEBDAM.~~

~~2.7.7. Plan for the next period (4 years)~~

~~The evaluators fully agree with the plans for the next 4 years: putting emphasis on scalability, use preferences, implement and validate systems, enlarge the collaboration with European groups, develop collaborations with groups in the database and description logic areas.~~

~~2.7.8. Opportunities and risks/difficulties faced by the project~~

~~There are good opportunities to collaborate with other INRIA groups in the near future. There is a chance to convince ABES to effectively use the new algorithms developed by GraphIK for their data integration problems. There is a chance that the methods developed by GraphIK may lead to a faster algorithm for reasoning with the EL description logic. There is also a chance that preference-based methods could innovatively be used for real-world data integration problems. A possible risk of this project is that the theoretical results might not suffice to cope with the difficulty of data integration at ABES. But even in this case (which we deem unlikely) the project will surely make a huge progress towards that goal.~~

~~2.7.9. Recommended actions and suggested measures of success~~

~~(1) Given that the project is very ambitious, but already very successful and promising, it is recommended that INRIA allocates one more full-time researcher to GraphIK. This researcher should not be in the current core area of the project, but in a "kissing" area, such as databases or description logics, to which the project results could be fruitfully transferred. A researcher in the database area could, moreover, help the team to better understand data storage techniques, and exploit such techniques for scalability.~~

~~(2) The work on Axis 3 should not just lead to prototypes, but also to a new methodology for data integration/cleaning that could be published in its own right. Additionally, the data integration and data cleaning methods should be carefully compared to competing approaches.~~

2.8. GRAVITÉ - Graph visualization and interactive exploration

Evaluating experts: Franz Baader, Jean Delahousse, Pascale Kuntz (chair)

2.8.1. Primary Topics and Objectives

The GRAVITE project research belongs to the recent field of visual analytics which is at the crossroads of information visualization and knowledge extraction. Its expertise concentrates on data modeled by graphs. The team both explores how to capture the main structural properties of very large networks, and how to visualize them, often interactively, by taking into account different intelligibility requirements.

2.8.2. International Standing and Reputation in the Field

The GRAVITE team has a very good scientific reputation in visualization and graph drawing. Their members publish in major journals (e.g. IEEE Trans. on Visualization and Computer Graphics) and well-known conferences. The team is strongly involved in the community activity: several members – not only the leader- participate to the scientific committees of the major visualization conferences, and the team organized the major European conference on visualization (EuroVis) in 2010.

Also, the team leader, G. Melançon, is becoming recognized in the KDD (Knowledge Discovery in Databases) community.

2.8.3. Major Achievements and Impact (Theory, Research Software, etc.)

In the last period the GRAVITE project mainly addressed one of the major issues common to the Infoviz and KDD communities: scalability. The team produced high impact contributions for multi-level graphs: it notably obtained significant new results for the multi-level structure characterization in large graphs, as well as for the visualization of these structures at different scales, and for their algorithmic manipulation.

During that period, a great deal of energy was expended developing the Tulip software which is today one of the most complete framework of the “market” for graph analysis and visualization. Tulip strongly contributes to the GRAVITE team’s fame.

2.8.4. Industry Transfer and Partnership

Industrial applications exist through collaborative projects such as ANR grants, but they are not central to GRAVITE which prefers to focus on cooperations with scientists from other areas. Close links have been woven with social scientists, in particular quantitative geographers, through participation to common consortium and co-publications.

Faced with many requests in graph visualization, both academic and industrial, the team is thinking of creating a spin-off following a Software-as-a-Service strategy. But, this project is still in its infancy and its viability is an open question.

2.8.5. Training of Personnel

In the past four years, the team has grown from 6 to 16 members and it is now well balanced between junior and senior researchers. The recruitment of PhD students is very homogeneous in time (1 per year) and we expect the team to continue to foster young researchers regularly. The team visibility is also shown by the positions reached by the junior researchers once they conclude their experience in the project.

2.8.6. Principal Strengths and Weaknesses of the Project

Strengths

- GRAVITE members have complementary recognized skills on combinatorics and visualization which allow them to confidently tackle difficult challenging issues (scalability and now dynamics);
- Beyond their common interest in graphs, the members share the same technological resources (Tulip framework) for their analyses and their validation tasks. This certainly contributes to the team unity ;
- The amount of external resources is excellent and finding fundings in the next future does not seem to be a problem.

Weaknesses

Their current publication record –compared to the top international teams- does not exactly reflect the strengths of the GRAVITE project. The publication strategy is not clearly defined which may be largely explained by the domain of research covered.

2.8.7. Plan for the next period (4 years)

The GRAVITE future agenda proposes 8 workpackages which span a large number of research issues ranging from user-centered assistance in the data exploration process to the analysis of evolutive complex networks and the investigation of other representations more adapted to interaction than common node-link layouts.

The team plans to carry on its software development strategy focused on the Tulip graph visualization framework.

2.8.8. Opportunities and risks/difficulties faced by the project

Interest in data visualization keeps increasing in several scientific domains, which opens new paths for fruitful collaboration opportunities.

Yet, in spite of claimed requirements from both national and international authorities, interdisciplinarity still remains a risky challenge today. GRAVITE members are aware of the risks they take when trying to publish beyond the frontiers of their community of origin.

2.8.9. Recommended actions and suggested measures of success

We recommend the team to beware of dispersion by favoring future research directions in line with the present team's strengths. While advising the team to increase its publishing efforts in the best journals and conferences of the Infoviz community to maintain its visibility, we encourage it to pursue its dissemination efforts towards the KDD community where its research finds applications. The GRAVITE team could play a major role in the future positioning of visual analytics.

To make the technological transfer of their results wider, we suggest the GRAVITE team to investigate a direction complementary to a unique complex framework : the adaptation to a machine-to-machine dialog of their functionalities for knowledge extraction which may be used independently from visualization. Needs are increasing with the semantic Web expansion. Reinforcement of relationships with other INRIA projects of the "Knowledge and Data Representation and Management" theme could help towards a better understanding of the stakes.

2.9. MAIA - Autonomous intelligent machine

~~Evaluating experts: Franz Baader, Christophe Dousson (chair), Catherine Garbay~~

2.9.1. Primary Topics and Objectives

~~The main research topic of the MAIA project is to develop dynamical systems composed of one or more agents that can execute complex tasks in an uncertain environment. To address the scientific challenge posed by this topic, the MAIA team intends to use both methods from Artificial Intelligence (e.g., statistical learning, decision theory) and the area of complex system analysis (e.g., bio-inspiration, swarm-intelligence). In particular, to realize a single (rational) agent, methods from AI planning such as the use of Markov Decision Processes (MDPs) have been used, whereas on the multi-agent level the team concentrates on bio-inspired reactive multi-agent systems.~~

~~On a more fine-grained level, the following concrete challenges have been addressed:~~

- ~~- the scalability to large problem instances;~~
- ~~- the achievement of robustness and self-organization for complex systems;~~
- ~~- the merging of different approaches (mastered in the team) in order to improve some models against real problem and/or systems.~~

2.9.2. International Standing and Reputation in the Field

~~The team members are recognized in their respective communities, and they have published their results in good to very good conferences and journal. In particular, the research on AI planning and learning done within the team is world-class and was published at the best venues in the field. To be noticed is the wining of the Tetris track of the international ICML' 2008 Reinforcement Learning competition.~~

~~The team has strong contacts to other well-known research groups in their respective area, which demonstrates their acceptance in the community. To be underlined is a long term collaboration with a group from Umass University in the framework of an INRIA associated~~