



Université Libanaise



Université Libanaise

Ecole Doctorale
Sciences et Technologie



Laboratory of Mathematics and Its Applications

LaMA-Lebanon

EDST – Lebanese University

Scientific Report

www.lamalb.net

September 2008 – September 2010

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A. Members of LaMA-Lebanon

A.1 Members of the Lebanese University

A. Assoum, B. Barakeh, F. Chakik, B. El Hassan, W. Falou, R. Hoblos, M. Jazar, M. Khalil, N. Moukaddem, H. Naja, A. Shahin, H. Ibrahim

A.2 Associate Members

A. El Soufi (Tours-France),

R. Monneau (ENPC-France),

S. Tohmé (Versailles-France),

H. Skaff-Molli (Nancy-France).

R. Naja

A.3 Thesards

P. Abi Char, N. Ali, S. Chantaf, N. Chendeb, M. Barakat, S. El Haddad, L. El Khansa, C. El Mir, J. El Sayah, A. Fino, S. Issa, B. Mouslem, D. El Kass, A. El Doussouki, N. Akkari, I. Abdul Rahman.

B. Research Areas of LaMA-Lebanon

B.1 Mathematical Analysis and EDP

Study of Asymptotic behavior of Evolutionary EDP.

Reduced Measures associated to parabolic EDP.

Separable Solutions of an elliptic EDP with source term.

Dynamic of Dislocations.

Spectral Geometry.

Mathematical Modeling of the Expansion of the Universe.

B.2 Image and Information Treatment

Tattooing and Compression of the numerical images.

Camera Calibration in Image and Video.

Medical Imaging.

Management of methods of collaborative editions.

Allocation of resources in networks of fourth generation.

C. Collaborations and Supervisions

C.1 International Collaborations

Hala Naja-Jazzar

1. With H. Skaf-Molli and P. Molli: We are the co-supervisors of the thesis of Charbel Rahhal.
2. With N. Boudjlida: We are actually working on the mounting of a project CEDRE for the year 2010, this project is about distributed databases. In this context, Professor BOUDJLIDA will arrive to Lebanon during December 2010 to perform a Seminar and a Reunion for the development of the project.
3. With F. Charoy: We are collaborating to organize a Workshop during 2010; this workshop is based on different aspects such as Object Oriented Programming, Components Oriented Programming and the new technologies in Software Engineering. In this context, Professor CHAROY will arrive to Lebanon during 2011 for the development of this project.

Rola Naja

4. Rola Naja was elected unanimously by the council of the PRISM laboratory of University of Versailles. That's why she is a member of the PRISM laboratory (CNRS UMR 8144).

Ahmad Shahin and Fadi Chakik

5. Mr. Michel Ménard (Pr/L3i) and Mr. Abdallah ElHamidi (McF-HDR/MIA) – University of La Rochelle. In order to strengthen a partnership existing between two French Laboratories (L3i and MIA), we have a proposition of a Master 2 subject in common.
6. Mrs. Maitine Bergoumioux (PR/MAPMOi) – University of Orleans. In order to strengthen a partnership existing with a French laboratory MAPMOI, we are elaborating a Master 2 subject and a COTUTELLE Thesis about the uses of Image Treatment Tools in Medical Imaging with a possibility of financing a 3 months stay of research at the Orleans University for a student in the Lebanese University.
7. Cooperation with *Vincent Lepetit* (cvLab/EPFL) A Research Project in common (Fadi Chakik and Ahmad Shahin). It is predicted that this cooperation extends till the year 2010-2011.

8. Research Projects with Pr. Fadi Dornaika, Ikerbasque Foundation for research, Spain. This research cooperation gave rise to tens of publications in International conferences and a submission of 2 papers in International Journals. Two research projects in Computer Vision and Artificial Intelligence were written for the submission to a financing by QNRF (Qatar National Research Funding)/ Program NPRP, Third cycle (Postgraduate). These projects QNRF gave rise to a research group by including researchers from the Laboratory *LaMA-Lebanon* (EDST), and from the *Ikerbasque* Foundation for research (Spain), *Qatar University* (Qatar) and from the Laboratory « *Computer Vision Centre* » (Spain).

Title of the project: *From Images to Augmented Reality Applications – Identifying*: NPRP4-1300-1-203

Title of the project: *Automatic Facial Image Analysis in Videos: Recognition, 3D tracking, and facial expression recognition.*

9. Establishment of a research project in Bioinformatics in order to be financed by Qatar National Research Fund/National Priorities Research Program – forth cycle.

Title of the project: *Vaccinomics: Computer-Aided Design of Epitope-depleted therapeutic proteins*

ID: NPRP 4 - 794 - 1 - 120

10. Cooperation on research projects with Pr. **Emad A. El-Sebakhy** (MEDai Inc, Elsevier Company) in order to establish a partnership between his research group and the Master 2R " Bioinformatics and Modeling" of the AZM Center (EDST). This cooperation with Pr. El-Sebakhy gave rise to a definition and an editorial of 2 project propositions in the field of bioinformatics which were submitted for the financing by QNRF (Qatar National Research Funding).

Title of the project: *Intelligence Systems and Mining Retrieval Tools for Bioinformatics Databases: Insights through Chronic Diseases and Complex Biological Systems.*

Title of the project: *The Capability of Data Mining in Developing Perforation Optimization Tools for Horizontal Wells: Enhance Oil Recovery.*

Contact Information

Dr. Dave Winkler (FRACI CChem CPCChem)

Senior Principal Research Scientist

Materials Science and Engineering

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<http://www.csiro.au/people/Dave.Winkler.html>

Project 1:

Title: Design of small molecules to control stem cell pluripotency

Project 2:

Title: Mesoscale modeling of key regulator networks in stem cells

Project 3:

Title: Predictive modeling of nanotoxicity

11. Three projects in the field of Bioinformatics in cooperation with Professor Dave Winkler, CSIRO Laboratory in Australia

Mustapha Jazar

12. Collaboration with the MIA (La Rochelle), in particular with Michel Berthier and Abdallah El Hamidi.

13. Collaboration with the LEPTIAB (La Rochelle), in particular with Aziz Hamdouni.

14. Collaboration with M. Guedda (Amiens) and R. Monneau on the problems related to the intrusion of salted water on the Lebanese coast (Project financed by AUF/MeRSI).

C.2 Supervision of Students

Our team intervenes in many Masters 2R; naturally the members of the team have supervised 22 students and have participated in a big number of jury.

Plus, six thesards are supervised by the members of the team.

1. Supervised Students in Master 2:

Ahmad Shahin

1. Hiyam Kozayha, Semantic Search Engines – Challenges and Solutions, Master 2 in Business Computer, Faculty of Business 3, UL, May 2010.
2. Maher Abdul Rahman, The Ontology of the security of Information systems , Master 2 in Business computer, Faculty of Business 3, UL, May 2010.
3. Maher Jneid, EDP and Image Compression, Master 2 in Mathematics, EDST, UL, in progress, 2009.
4. K. Nachar, Utilization of FcM in image Compression.
5. Rana Mawas
6. Khitam Nachar
7. Nadine Alameddine

Fadi Chakik

8. Zeina Al-Mida, Support Vector Machines for Epitope Binding Classification, Master 2 in Math in Bioinformatics and Modeling, AZM Center for the research in Biotechnology and its applications, UL, September 2010. **This project gave rise to 3 publications in International conferences with reviewers.** An article in a journal is being drafted.
9. Hounayda Fayyad, Mapping with Linear Forms, Master 2 in Math and Images, AZM center for Research in Biotechnology and its applications, UL, September 2010. **This project gave rise to a paper in a journal which is being submitted.**

Hala Naja-Jazzar

10. Supervision of Melhem El Helou. Subject « *Management of the dynamic border of the network 802.16 in vehicular context* »-2010.
11. Supervision of Fouad Abi Dib. Subject « *Management of the quality of service in the networks 802.11p* »-2010.
12. Supervision of Abed Ahmad. Subject « *Management of the dynamic border in a network 802.16.* »-2009.

Rola Naja

13. Boubari, Resource Allocation in heterogeneous Networks, Master project 2009.
14. Ahmad, Management of the dynamic border in a network 802.16, Master project 2010.

Nazih Moukaddem

15. G. EL Mir, Consistent Model and ASIFT, 2010

Mustapha Jazar

16. Zoubaidah Al Sayed, Evolution Problem in a non-homogeneous environment, 2010
17. Batoul Abdel Aziz, Parameters Identification, 2010.
18. I. Abdel Rahmane, Numerical schemas preserving the Lie symmetries of Partial Derivative Equations, 2009.
19. A. Al Doussouki, A bi-harmonic problem with a critical Sobolev exponent constraint, 2009.
20. D. EL Kass, The zero limit of relaxation of the hydrodynamic Model of Whitham which represents the road traffic flow Model, 2009.

Ammar Assoum

21. R. El Hage, Statistic Modeling of facial images, 2009.
22. S. Ali, Forms Recognition using the convolution neurons networks, 2009.

2. Thesards

1. Charbel Rahhal, supervisors: H. Skaff-Molli, P. Molli (Nancy) and **H. Naja-Jazzar**, defense November 2010.
2. Samar Issa, supervisors: A. EL Hamidi (La Rochelle) et **M. Jazar** (UL), defense expected September end of 2011.
3. D. El Kass, supervisors: R. Monneau (ENPC) and **M. Jazar** (UL), defense expected at the end of 2012.
4. El Doussouki, supervisors: M. Guedda (Amiens) and **M. Jazar** (UL), defense expected at the end of 2012.
5. N. Akkari, supervisors: A. Hamdouni (La Rochelle) , **B. Barakeh** and **M. Jazar** (UL), defense expected at the end of 2012.
6. R. El Hage, supervisors : Akil Jrad (UL) and **A. Assoum** (UL).

3. Thesards who have defended 2009-2010

1. Waad EL Sayed, December 2008 (M. Jazar).

2. Hassan Ibrahim, July 2008 (M. Jazar).
3. Ch. El Mir, June 2009 (N. Moukaddem).
4. Ahmad Fino, February 2010 (M. Jazar).

C.3 Consultancy and Expertise Activities

- **R. Najais**, Since December 2009, an expert-consultant at the à la Chamber of Commerce, Industry and Agriculture of Tripoli-Lebanon (CCIAT).
- **R. Najawas** elected (2009) Young Affiliate « Excellent Young Scientist » at the sciences Academy TWAS. As a representative of Young Affiliate, she was invited to assist conferences and scientific reunions in Mexico, South Africa and Alexandria.
- **M. Jazar** was since May 2009, the external expert of the research and Development Institute, www.ird.fr

D. Results and Productions

38 publications: 15 articles in journals, 22 articles in reviewed conferences with and a chapter in a book.

4 submitted articles.

D.1 Articles In Journals with Reviewers

1. **Naja-Jazzar H.**, De Silva N., Skaf-Molli H., Rahhal C., Molli P.: *A RST-based Ontology for Enhancing Documents Content Quality in Collaborative Writing*. In International Journal INFOCOMP, Volume 8, number 3, September 2009.
2. **Naja. R & Ahmad. A.** *On Dynamic Resource Allocation in WiMAX Networks*. Journal of Computer Sciences. In press, December issue, 2010.
3. **Naja. R & Tohme. S.** *Supporting Intelligent Terminals by Cross-layer Adaptation Over HSDPA Network*. In Journal JETR, Academic Journals, Vol. (7), pp.115-121, October, 2009.
4. Jean-Pierre Gerval, Dorin-Mircea Popovici, **Ammar Assoum**, Yann Le Ru, Mihai Polceanu, A Digital Environment Dedicated to Distributed and Cooperative Practical Activities Computers and Advanced Technology in Education à St Thomas (USA), November 2009.
5. **Bilal Barakeh**, Convergence proof of a Monte Carlo Scheme for the resolution of the Smoluchowski Coagulation Equation, Journal of Applied Mathematics-Aplimat, Vol II(2009), number II, 151-158. ISSN: 1337-6365
6. **Bilal Barakeh**, Smoluchowski's Coagulation Equation: Convergence results and analysis of Particle Growth for a numerical Stochastic Scheme, Int. J. of Comput. Science, Vol. 3. No. 3, 263-282, Global Information Publisher (H.K), Co., Ltd.

7. H. Ibrahim, **M. Jazar** and R. Monneau, Dynamics of dislocation densities in a bounded channel. Part I: smooth solutions to a singular coupled parabolic system, CPAA 9 (2010), no. 3.
8. H. Ibrahim, **M. Jazar** and R. Monneau, Dynamics of dislocation densities in a bounded channel. Part II: existence of weak solutions to a singular HJ/parabolic strongly coupled system, CPDE 34 (2009), no. 7-9, 889--917.
9. H. Faour, A. Z. Fino and **M. Jazar**. Local existence and uniqueness for a semi-linear accretive wave equation. JMAA accepted 2010.
10. H. Faour, **M. Jazar** and Ch. Messikh, Blow-up rate for a semi-linear accretive wave equation, Accepted DIE 2010.
11. Dirouich, O. ElMennaoui and **M. Jazar**, On spectral decomposition of unbounded operators and Gelfand's theorem, Semi group Forum (2010) 80, n. 3, 391 - 404.
12. S. Issa, A. El Hamidi and **M. Jazar**, Ill posed minimization problem with sub linear regularizing term, Accepted JMAA 2010.
13. M. Jazar Nonstandard diffusion in image process, with A. El Hamidi and S. Issa. Accepted in JMAA (2009).
14. M. Jazar Pseudo radial solutions of some semi-linear elliptic equations on symmetric domains, with A. El Soufi, DIE, 21 (7-8), 601-622, (2008).
15. M. Jazar Global existence of solutions to a singular parabolic/Hamilton-Jacobi coupled system with Dirichley conditions, with H. Ibrahim and R. Monneau, C. R. Acad. Sci. Paris, Ser. I 346 (2008) 945-950.

D.2 Articles in Conference Proceedings with Reviewers

16. **Assoum**, A Multimodal Environment for Cooperative and Transnational Training Activities International Conference on Engineering Education at Gliwice (Poland), Juillet 2010.
17. **Chakik, A. Shahin**. Boosting Maximum Entropy Classifier Performance for Texture Analysis. 3rd IEEE International Conference on Signal Acquisition and Processing (ICSAP 2011). February 26-28, 2011, Singapore. Paper No: P032. Accepted. To appear.
http://www.ieee.org/conferences_events/conferences/conferencedetails/index.html?Conf_ID=18201
18. **Chakik, A. Shahin**. A Comparison of Maximum Entropy and Neural Networks-Case Study for Classification Tasks. IEEE International Conference on Computer and Computational Intelligence (ICCCI 2010). December 25-26, 2010, Nanning, China. Paper No: I267.
http://www.ieee.org/conferences_events/conferences/conferencedetails/index.html?Conf_ID=18033
19. **A. Chakik, A. M. Shahin**, Walid H. Moudani and Zena Mida. Linear vs. Non-Linear Dimensionality Reduction Techniques in Predicting Class-II MHC Peptide Binding. IEEE – EMB /

- CIBEC 2010 - 5 the Cairo International Conference on Biomedical Engineering. Cairo, Egypt, 16-18 December 2010. Paper No: 2672. <http://www.cibec2010.org>
20. **F. A. Chakik, A. M. Shahin**, Walid H. Moudani and Zena Mida. Structural and Physicochemical Peptide Properties and Dimensionality Reduction Representation in Binding Prediction. Jornadas De Bioinformática - 10th Spanish Symposium on Bioinformatics (JBI2010), workshop on "Bioinformatics for personalized medicine". Malaga, Spain, 27-29 October 2010. Paper No: 55. Accepted. <http://www.bitlab-es.com/jbi2010/program.php>
 21. **F. Chakik**, F. Dornaika and **A. Shahin**. Statistical Learning Approach using Maximum Entropy: Texture Image Classification by Energy Function. 30th International Workshop on Bayesian Inference and Maximum Entropy: Methods in Science and Engineering. Chamonix, France, July 4-9, 2010. Paper No: 40. Accepted. <http://maxent2010.inrialpes.fr/program/accepted-papers/>
 22. **F. Chakik**, F. Dornaika and **A. Shahin**. Bayesian Inference Using Maximum Entropy: Analysis and Application. 30th International Workshop on Bayesian Inference and Maximum Entropy: Methods in Science and Engineering. Chamonix, France, July 4-9, 2010. Paper No: 42. Accepted. <http://maxent2010.inrialpes.fr/program/accepted-papers/>
 23. **F. A. Chakik, A. M. Shahin**, Walid H. Moudani and Zena Mida. Coupling between SVM and technics of dimension reduction for the prediction of peptide association. The international days of biotechnology 2010. 19 - 22 Décembre 2010 December 19-22, 2010, Yasmine Hammamet, Tunis. Accepted. To appear.
<http://www.atbiotech.rnrt.tn/>
 24. **Ahmad Shahin and Fadi Chakik**, Security and eVoting, February 4-5, 2009, National Workshop organized by Lawyers Syndicate, Beirut.
 25. **Ahmad Shahin and Fadi Chakik**, *Image Processing and the Computerized Election Process*, Workshop about Renewing the Electoral System in Lebanon. February 23, 2008. Starco Beirut.
 26. F. Dornaika and **F. Chakik**. *Real-time object detection and tracking in video sequences*. SPIE Electronic Imaging: Intelligent Robots and Computer Vision, San Diego, California, USA, January 2010. Intelligent Robots and Computer Vision XXVII: Algorithms and Techniques (Proceedings Volume). Proceedings of SPIE Volume: 7539, Editor(s): David P. Casasent; Ernest L. Hall; Juha Röning, ISBN:9780819479327
<http://spie.org//app/program/index.cfm?fuseaction=conferencedetail&confid=896003>
 27. **Fadi El Chakik, Ahmad Shahin** and Jihad Al'Jaam. *A priori knowledge and Bayesian Inference of Maximum Entropy: Integration of convexity in the the problem of Breiman*. **The tenth International French Conference about the extraction and management of knowledge, January 2010, Hammamat, Tunis.** <http://www.projets.rnu.tn/egc2010/>
 28. *Fadi Dornaika, Fadi Chakik et Ahmad Shahin. Bayesian Inference of Maximum Entropy for the diagnosis of breast cancer.* **The tenth International French Conference about the extraction**

and management of knowledge, January 2010, Hammamat, Tunis.

<http://www.projets.rnu.tn/egc2010/>

29. F. Chakik, F. Dornaika : The Link between Maximum Entropy Principle and Support Vector Machines. *InSoft Computing Methods for Practical Environmental Solutions: Techniques and Studies*. Eds. Gestalt M. and Rivero D.(USA: IGI Global), 2009.
30. F. Chakik, F. Dornaika and A. Shahin. *Do Maximum Entropy Principle and Vapnick's Support Vector Machines have the same mathematical derivations?* The International Arab Conference on Information Technology, Sana'a, Yemen, December 2009.
31. **Naja R.**, Oubari. A, &Tohme, S. *WiMAX and HSDPA Networks Playing Vertical Mobility Games*. In the Proceedings of IEEE International Conference WOCN. Colombo, Sri-Lanka, 2010.
32. **Naja R.** *How to Bridge the Knowledge Gap and the Digital Divide between the North and the South*. To appear in the Proceedings of International conference Bio vision, 2010.
33. **R. Naja, B. El Hassan, S. Tohme**, *A Cross-Layer study: Impact of Terminal Categories on Adaptability in HSDPA Network*. In the Proceedings of IEEE International Conference on Wireless and Optical Communications Networks, pp. 1 – 5, 28-30 April 2009.
34. S. Issa, A. El Hamidi and **M. Jazar**, Ill posdness of sublinear minimization problems, J. ETMS, acts of mathematical seminar Franco-Egyptian 2010.
35. **Ammar Assoum**, Linear Dimensionality Reduction through Eigenvector Selection for Object Recognition, International Symposium on Visual Computing (ISVC'2010) à Las Vegas (USA), November 2010.
36. **Ammar Assoum**, Selective Locality Preserving Projections for Face Recognition IS&T/SPIE Electronic Imaging (EI), Vol. 7878: Intelligent Robots and Computer Vision XXVIII: Algorithms and Techniques, San Francisco (USA), January 2011.
37. **J. Gerval, D. Popovici, A. Assoum, Y. Le Ru and M. Polceanu**, A Digital Environment Dedicated to Distributed and Cooperative Practical Activities, Computers and Advanced Technology in Education (CATE 2009), November 2009 à St. Thomas, US Virgin Islands.

D.3 Chapter in a Book

38. **Naja. R.** *Vehicular Networks: architecture, protocols and standards*. In "All IP Networks" Book-to be published in 2011 by Pan Stanford, Singapore.

D.4 Submitted Publications

1. **Naja. R.** *Highway Preventive Congestion Control Through Input Regulation in Vehicular Networks*. Submitted.
2. **Naja-Jazzar H.**, Dbouk and Bilal Haj-Ali. *Put Views in your UML models!*, to appear.

3. Ahmad Z. Fino and **Mustapha Jazar**, Blow-up solutions of second-order differential inequalities with a nonlinear memory term, submitted DIE.
4. N. Moukaddem, The reviewed Einstein's general relativity theory and cosmology, submitted JMP.

D.5 Organisation of a Scientific Manifestation

Our team has organized on April 2010 a school of research with more than 40 researchers, which 26 came from foreign countries, under the title: Mathematics, Images and applications. In this context 6 mini-courses from 15:00 till 16:30 and fifteen exhibitions were delivered.

D.6 Tutorial/ Magisterial Course in an International Conference

R.Naja Quality of Service Provisioning and Mobility Handling in Wireless Vehicular Networks. Septembre 2010

Tutorial (duration: 4hours, public:Lecturers attending the conference IEEE WOCN, 2010)

<http://wocn2010.org/W10-tut.html>

D.7 Implications in several activities of research

- **R. Naja** : Technical program co-chair to the conference IEEE WOCN
<http://www.wocn2010.org/>
- **R.Naja** : Technical program co-chair to the conference IEEE AH-ICI
<http://www.ah-ici.org/ah-ici2009/ah09-com.html>
- **R. Naja**: Program chair of the IEEE Workshop VTP
<http://www.ntms-conf.org/vtp2009/committees.html>
- **R. Naja**:« Towards a One World of Scientific Research»- International Conference Biovision 2010- Library of Alexandria-Egypt-2010.
- **M. Jazar**: Lecturer invited to the symposium Franco-Egyptian of mathematics, Le Caire, May 2010. This conference has included stars of the French mathematics school (J.P. Kahane, J.P. Bourguinion, N. EL Karoui, B. Helffer, B. Perthame, C. Villani...)

E. Spring School

Spring School held from 7 till 17 April 2010.

E.1 Goals

- ▶ Allow researchers and post graduate students of the Middle East to acquire training in the fields of EDP, Image Treatment and their applications.
- ▶ Allow students of the Lebanese University to establish new contacts with the world of actual research.
- ▶ The chosen theme is in harmony with the new Master 2 Research that should start at the Lebanese University-Tripoli. The goal of this Master is to train about ten students and researcherseager to become stronger in the fields of the school's activities.
- ▶ Establish possible relations between the students and the researchers of LaMA-Lebanon on one hand, and mathematicians of the region and other regions of the world in particular of Europe and America, on the other hand, which allow students to have contacts with future possible supervisors and co-supervisors.

E.2 Participants

- ▶ 9 Lecturers from Lebanese European University.
- ▶ 20 Students from Arabic Universities.
- ▶ 16 Participants from the Lebanese University and other French Universities.

For more informations visit the website: www.lamalb.net

F. Invitations to Foreign Universities

Mustapha Jazar

January 2009 : CERMICS-ENPC, collaboration with R. Monneau.

June 2009 : LMPT – Tours, collaboration with A. El Soufi.

September 2009 : MIA – La Rochelle, collaboration with A. EL Hamidi.

Fadi Chakik

December 2009: University of Bayonne.

December 2009: San Sebastien (Spain), finishing of a journal paper about the Ikerbaque Foundation for Research with Pr. F. Dornaika.

Ahmad Chahin

June 2009: L3i – University of La Rochelle.

G. The Guests

M. BERTIER (La Rochelle - France)

N. BOUDJLIDA(Nancy - France)

F. CHAROY (Nancy - France)

J. Duchêne (UTC - Troit)

A. El Badia (UTC - France)

A. El Hajj(UTC - Compiegne)

A. EL HAMIDI (La Rochelle-France)

A. EL SOUFI (Tours - France)

A. Hamdouni (La Rochelle – France)

Z. Kharboutly(UTC - Compiegne)

V. Lepetit (EPFL - Suisses)

C. Marque (UTC - Compiegne)

A. MHAMED (Le Havre – France)

R. Monneau (ENPC - France)

R. PETERI (La Rochelle - France)

H. SKAF (Nancy-France)

S. Tohmé (Versailles-France)

M. Bergouniux (Orléans-France)

S. Masnou(Lyon 1 - France)



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