

## CUI ACTIVITY REPORT 2014

1<sup>st</sup> January 2014 to 31 December 2014

### Team

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- **Director**  
Magnetat-Thalman Nadia, Professor



- **Senior Researchers**  
Choi Hon Fai
- **Assistants (PhD students)**  
Assassi Lazhari  
Becker Matthias  
Ben Moussa Maher  
Chincisan Andra  
Nijdam Niels  
Sénécal Simon  
Tisserand Yvain
- **Adjoints / Collaborateurs Scientifiques**  
Arévalo Marlène  
Cadi-Yazli Nedjma
- **Administration**  
Broi Lara

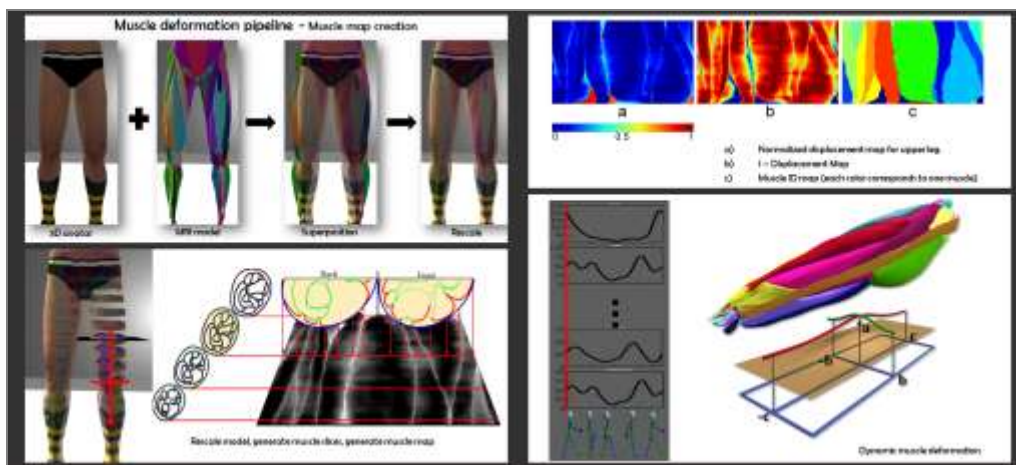
## Domain activities

### ▪ Description of the activities of the laboratory research

MIRALab was founded in 1989 by Professor Nadia Magnenat-Thalmann and has brought together PhD students and researchers from different fields, such as computer science, 3D graphics, 3D simulation, social robotics, 3D fashion design, and cognitive science. This truly interdisciplinary group continues to work in the field of medical informatics, virtual worlds and virtual humans .

Since 1992, MIRALab has participated in more than 50 European Projects and contributes to the management of two International Conferences, CASA and CGI. Moreover, MIRALab produces 3D showcases for museums, galleries, such as fashion shows with virtual models and clothes. In 2014, MIRALab was working on the following projects: ANINEX, EMC2, ITN-DCH, MULTISCALEHUMAN and REPLAY.

The following are some images of our work:



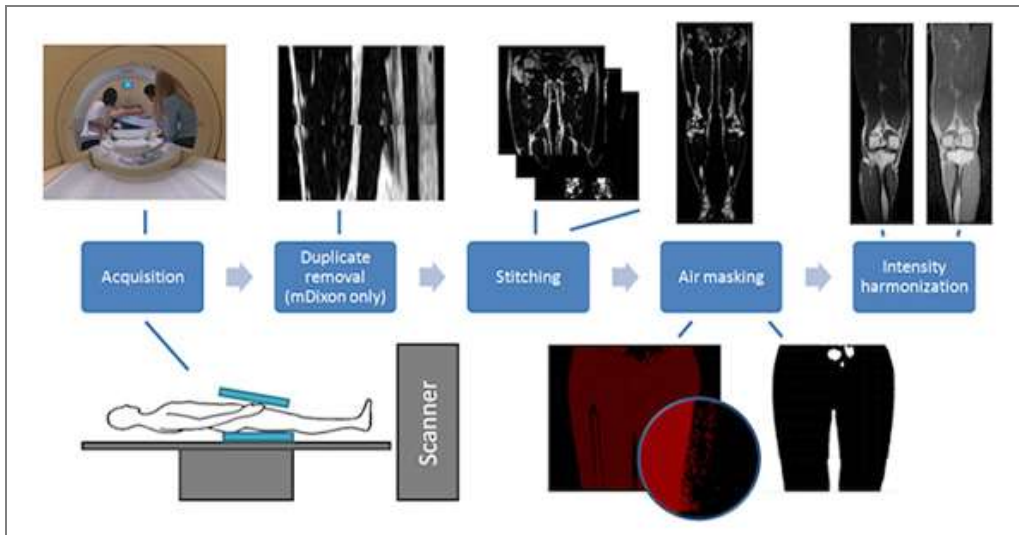
Muscle deformation pipeline:  
Muscle map creation, rescale model, Generate muscle slices and maps, Dynamic muscle deformation



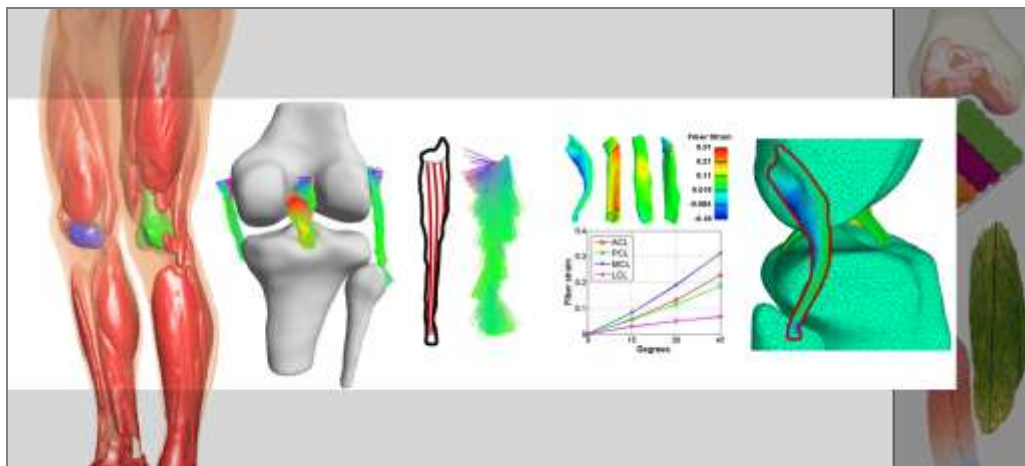
Muscle deformation results



Simulating traditional participative sports



Efficient extraction of musculoskeletal structures - processing



Multimodal knee articulation model

- **Website** : <http://www.miralab.ch>

## PhD Thesis

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- **Niels Nijdam**  
'Context-Aware 3D rendering for User-Centric Pervasive Collaborative computing environments'  
January, 2014

## List of publications - Refereed papers in international journals 2014

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- [1] Z. Zhang, A. Beck, and N. Magnenat Thalmann, **Human-like Behavior Generation based on Head-arms Model for Robot Tracking External Targets and Body Parts**, IEEE Transaction on Cybernetics, vol. 10, no. 2, September 2014
- [2] Z. Yumak, J. Ren, N. Magnenat Thalmann, and J. Yuan, **Modelling Multi-party Interactions among Virtual Characters, Robots and Humans**, MIT Presence: Tele-operators and Virtual Environments (Presence) (IF: 0.912), vol. 23, no. 2, August 4, 2014
- [3] H. F. Choi, A. Chincisan, M. Becker and N. Magnenat Thalmann, **Multimodal Composition of the Digital Patient: a Strategy for the Knee Articulation**, The Visual Computer (IF: 1.073), vol. 30, no. 6-8, pp. 739-749, June 2014
- [4] M. Elgendi, F. Picon, N. Magnenat Thalmann and D. Abbott, **Arm Movement Speed Assessment via a Kinect Camera: A Preliminary Study in Healthy Subjects**, BioMedical Engineering OnLine 2014 (IF: 1.746), doi:10.1186/1475-925X-13-88, June 27, 2014
- [5] J. Hou, L.-P. Chau, N. Magnenat Thalmann and Y. He, **Compressing 3D Human Motions via Keyframe based Geometry Videos (KGVs)**, IEEE Transactions on Circuits and Systems for Video Technology (IF: 2.259), May 13, 2014
- [6] Z. P. Bian, J. Hou, L. P. Chau, and N. Magnenat Thalmann, **Fall Detection Based on Body Part Tracking Using a Depth Camera**, IEEE Journal of Biomedical and Health Informatics (IF: 1.98), April, 2014
- [7] J. Hou, L.-P. Chau, N. Magnenat Thalmann and Y. He, **Scalable and Compact Representation for Motion Capture Data Using Tensor Decomposition**, IEEE Signal Processing Letters (IF: 1.639), vol. 21, no. 3, March 2014
- [8] J. Hou, L.-P. Chau, M. Zhang, N. Magnenat Thalmann and Y. He, **A Highly Efficient Compression Framework for Time-Varying 3D Facial Expressions**, IEEE Transactions on Circuits and Systems for Video Technology (TCSVT) (IF: 2.259), February 2014

## List of publications - Full refereed papers in Conference Proceedings in 2014

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- [1] Z. Yumak, J. Ren, N. Magnenat Thalmann, and J. Yuan, **Tracking and Fusion for Multiparty Interaction with a Virtual Character and a Social Robot**, SIGGRAPH Asia 2014 Autonomous Virtual Humans and Social Robot for Telepresence, Shenzhen, China, December 3, 2014
- [2] N. Magnenat Thalmann, Z. Zhang, **Social Robots and Virtual Humans as Assistive Tools for Improving Our Quality of Life**, The 5th International Conference on Digital Home (ICDH 2014), Guangzhou, China, November 28-30, 2014
- [3] Z.P. Bian, J. Hou, L.P. Chau, and N. Magnenat Thalmann, **Human Computer Interface for Quadriplegic People based on Face Position/Gesture Detection**, ACM Multimedia 2014, Pp 1221-1224, November 2014
- [4] M. Becker and N. Magnenat Thalmann, **Muscle Tissue Labeling of Human Lower Extremities in Multi-Channel mDixon MR Imaging: Concepts and Applications**, 2014 IEEE International Conference on Bioinformatics and Biomedicine (BIBM 2014), Belfast, UK, November 2-5, 2014
- [5] Z. P. Bian, L. P. Chau, and N. Magnenat Thalmann, **Human Computer Interface for Quadriplegic People based on Face Position/Gesture Detection**, Proceedings ACM Multimedia 2014, Orlando, USA, November 3-7, 2014
- [6] H. Zhu, J. Lu, J. Cai, J. Zheng, and N. Magnenat Thalmann, **Poselet-based Multiple Human Identification and Cosegmentation**, IEEE International Conference on Image Processing (ICIP 2014), Paris, France, October 27-30, 2014
- [7] J. Hou, L.P. Chau, Y. He and N. Magnenat Thalmann, **Low-Rank Based Compact Representation of Motion Capture Data**, IEEE International Conference on Image Processing (ICIP 2014), Paris, France, October 27-30, 2014
- [8] N. Magnenat Thalmann, Z. Yumak and A. Beck, **Autonomous Virtual Humans and Social Robots in Telepresence**, 2014 IEEE International Workshop on Multimedia Signal Processing, Jakarta, Indonesia, September 22-24, 2014
- [9] H.F. Choi, A. Chincisan, N. Magnenat Thalmann, **A Collective Approach for Reconstructing 3D Fiber Arrangements in Virtual Musculoskeletal Soft Tissue Models**, workshop of Computational Biomechanics for Medicine IX (MICCAI 2014 Workshop), Massachusetts Institute of Technology (MIT), Boston, USA, September 14, 2014, BEST PAPER AWARD
- [10] J. Hou, Z.-P. Bian, L.-P. Chau, N. Magnenat Thalmann, and Y. He, **Restoring Corrupted Motion Capture Data via Jointly Low-Rank Matrix Recovery**, IEEE International Conference on Multimedia and Expo (ICME 2014), Chengdu, China, July 14-18, 2014
- [11] J. Hou, L.P. Chau, Y. He and N. Magnenat Thalmann, **A Novel Compression Framework for 3D Time-Varying Meshes**, IEEE International Symposium on Circuits and Systems (ISCAS 2014), Melbourne, Australia, June 1-5, 2014
- [12] A. Chincisan, H. F. Choi, L. Assassi, S. Lynch, C. Hurschler and N. Magnenat Thalmann, **Subject-Specific Assessment of Loading Variation in the Knee Ligaments with a View to Preoperative Planning**, IEEE BHI, Valencia, Spain, Pages 640-643, June 1-4, 2014

## List of publications – Books in 2014

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- [1] N. Magnenat Thalmann, O. Ratib, H.F. Choi (Eds.), **3D Multiscale Physiological Human**, Springer, XII, 316 p. 110 illus., 2014

## List of publications – Chapters in Book in 2014

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- [1] M. Becker, and N. Magnenat Thalmann, **Deformable Models in Medical Image Segmentation**, book chapter 3D Multiscale Physiological Human, 1st ed. N. Magnenat Thalmann, O. Ratib, and H. F. Choi, Eds. Springer-Verlag, London, 2014
- [2] S. Sarda, M. Constable, J. Dauwels, S. Dauwels (Okutsu), M. Elgendi, Z. Mengyu, U. Rasheed, Y. Tahir, D. Thalmann, N. Magnenat-Thalmann, **Natural Interaction with Robots**, Knowbots and Smartphones, Springer, 2014, pp 375-387

## List of publications - Research and technical reports

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Several technical reports for the following projects: ANINEX, EMC2, ITN-DCH, MULTISCALEHUMAN and REPLAY.

## Invited talks, Keynotes and Tutorials (Prof. Nadia Magnenat-Thalmann)

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- [1] Keynote speech at International Workshop in SIGGRAPH Asia 2014, **Modelling Awareness and Social Behaviour of Virtual Humans and Social Robots**, Shenzhen, China, December 3, 2014  
(<http://conference.ntu.edu.sg/sgavh2014/Pages/program.aspx>)
- [2] Keynote speech at 5th International Conference on Digital Home (ICDH 2014), **Social Robots and Virtual Humans as Assistive Tools for Improving Our Quality of Life**, Guangzhou, China, November 28-30, 2014  
(<http://icdh.sysu.edu.cn/key>)
- [3] Keynote speech at International Conference on Contemporary Computing and Informatics (IC3I 2014), **Assistive Social Robots for People with Special needs**, Mysore, India, November 27-29, 2014  
(<http://ic3i.org/keynote.html>)
- [4] Overview talk at 2014 IEEE International Workshop on Multimedia Signal Processing (MMSP 2014), **Autonomous Virtual Humans and Social Robots in Telepresence**, Jakarta, Indonesia, September 22, 2014  
(<http://mmsp2014.ilearning.me/357-2/>)
- [5] Invited talk at the 31st Computer Graphics International (CGI 2014), **The digital Patient : from the modelling to the simulation of patient specific articulations**, Sydney, Australia, June 11, 2014  
(<http://sydney.edu.au/engineering/it/~cgi14/program/keynotespeakers.php>)

- [6] Invited talk at International Symposium on Human-centered Interaction for Coexistence, **New trends in 3D Telepresence: BeingThere through Social Robots and Virtual Humans**, CHIC FORUM 2014, Korea Institute of Science and Technology, Korea, May 16, 2014  
([http://imi.ntu.edu.sg/AboutIMI/DirectorOfIMI/Documents/CHIC\\_FORUM\\_2014\\_poster.pdf](http://imi.ntu.edu.sg/AboutIMI/DirectorOfIMI/Documents/CHIC_FORUM_2014_poster.pdf))
- [7] Invited talk at ADSC/I2R Workshop on Immersive Telepresence and Adaptive Streaming, **Past, Present and Future of Immersive Telepresence : Case studies with “Anyone for Tennis” and the BeingThere Centre**, A\*Star Institute for Infocomm Research, Fusionopolis, Singapore, March 18, 2014  
(<http://bookwhen.s3.amazonaws.com/assets/documents/7330/original.pdf?1393487746>)
- [8] Invited talk at The 2nd EMBO Conference on Visualizing Biological Data (VIZBI 2014), **Human Anatomy**, Heidelberg, Germany, March 7, 2014  
(<http://www.vizbi.org/2014/Program/>)
- [9] Invited talk at American Association for the Advancement of Science - AAAS 2014 Annual Meeting, **Predicting Hip Deformations Through Computer Modeling and Simulation**, Chicago, USA, February 14, 2014  
(<http://aaas.confex.com/aaas/2014/webprogram/Session7006.html/>)

## Funded research projects – Participation to European projects

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- **ANINEX**  
*User Centred Computer Animation Techniques for Next Generation Digital Creation and Modelling*  
Period: December 2013 - November 2017  
Type: European Research  
MIRALab Total budget: CHF 188'000.-  
MIRALab Budget 2014: CHF 47'000.-  
  
Partners (5 partners):
  - National Centre for Computer Animation, Bournemouth University – United Kingdom
  - MIRALab, University of Geneva – Switzerland
  - National Laboratory for Information Science and Technology, Tsinghua University – China
  - The State Key Laboratory of Computer Science, Institute of Software, Chinese Academy of Sciences – China
  - The State Key Laboratory of Computer Aided Design and Computer Graphics, Zhejiang University – China
  
- **EMC2**  
*Support Action Towards Excellence in Media Computing and Communication*  
Period: June 2011 – June 2014  
Type: European Research  
MIRALab Total budget: CHF 34'000.-  
MIRALab Budget 2014: CHF 5'600.-

Partners (6 partners):

- Queen Mary, University of London – United Kingdom
- Dublin City University – Ireland
- Institut Telecom – France
- Fraunhofer Gesellschaft zur Foerderung der angewandten Forschung e.V. – Germany
- MIRALab, University of Geneva - Switzerland
- Centre for Research and Technology Hellas – Greece

▪ **ITN-DCH**

*Initial Training Network for Digital Cultural Heritage: Projecting our Past to the Future*

Period: October 2013 - September 2017

Type: European Research

Website: <http://www.itn-dch.org/>

MIRALab Total budget: CHF 459'230.-

MIRALab Budget 2014: CHF 114'800.-

Partners (14 partners):

- Cyprus University of Technology - Cyprus
- National Technical University of Athens - Greece
- Universitaet Stuttgart – Germany
- Foundation for Research and Technology Hellas – Greece
- Fraunhofer Gesellschaft zur Förderung der angewandten Forschung e.v. - Germany
- Katholieke Universiteit Leuven – Belgium
- Fondazione Bruno Kessler – Italy
- Centre National de la Recherche Scientifique - France
- Universidad de Murcia - Spain
- Univerzav Ljubljani - Slovenia
- Arctron 3d Vermessungstechnik-und Softwareentwicklung Gmbh - Germany
- 7Reasons Medien Gmbh - Germany
- The University of Warwick – United Kingdom

▪ **MULTISCALEHUMAN**

*Multi-scale Biological Modalities for Physiological Human Articulation*

Period: October 2011 – September 2015

Type: European Research

Website: <http://multiscalehuman.miralab.ch/>

MIRALab Total budget: CHF 1'100'000.-

MIRALab Budget 2014: CHF132'900.-

Partners (7 partners):

- MIRALab, University of Geneva - Switzerland
- Les Hôpitaux Universitaires de Genève – Switzerland
- Universidade do Minho – Portugal
- Medizinische Hochschule Hannover – Germany
- Consiglio Nazionale Delle Ricerche - Italy
- Softeco Sismat Srl – Italy
- Gottfried Wilhelm Leibniz Universitaet Hannover – Germany



- **REPLAY**

*Reusable low-cost platform for digitizing and preserving traditional participative sports*

Period: March 2013 - February 2016

Type: European Research

MIRALab Total budget: CHF 313'600.-

MIRALab Budget 2014: CHF 104'500.-

Partners (8 partners):

- Fundacion Centro de Tecnologias de Interaccion Visual y Comunicaciones VICOMTECH – Spain
- Dublin City University – Ireland
- MIRALab, University of Geneva – Switzerland
- IN2 Search Interfaces Development Limited – United Kingdom
- Gaelic Athletic Association – Ireland
- Centre For Research and Technology Hellas – Greece
- Eusko Jaurlaritzza-Gobierno Vasco – Spain
- Vicon Motion Systems Limited – United Kingdom

## Others

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- **Refereeing**

- Jury of Ph.D. thesis for New Zealand, France, Sweden, Switzerland and Germany.
- European Union, FP7 Projects, Brussels.
- Research Grants Council of Singapore.
- Natural Sciences and Engineering Research Council of Canada.
- National Science Foundation USA.
- Swiss National Research Foundation.
- Austrian Research Foundation.
- ACM SIGGRAPH, IEEE Transactions on Visualization and Computer Graphics, IEEE Computer Graphics and Applications, IEEE Computer, Communications of ACM, The Visual Computer, Computer Graphics Forum, Computer Vision, Graphics and Image Processing, Presence, International Journal of Human-Computer Studies, Computers and Graphics, cyberworlds conference, ICAART (International Conference on Agents and Artificial Intelligence), Enactive conference, Multimedia Modelling conference, International Conference on Entertainment Computing (ICEC), International Conference on Signal Processing, Image Processing and Pattern Recognition; GRAPP (“International Conference on Computer Graphics Theory and Applications), Conference on Affective Computing and Intelligent Interaction (ACII 2010), EG Workshop on 3D Object Retrieval, IEEE Virtual Reality Conference 2010, Computer Graphics International, CASA conference, SIGGRAPH/EUROGRAPHICS Symposium on Computer Animation, etc

- **Tutorial and Panels**

- [1] ACM SIGGRAPH ASIA 2014 Course on **Multimodal Human-Machine Interaction including Virtual Humans and Social Robots**, Shenzhen, China, December 4, 2014  
(<http://sa2014.siggraph.org/en/attendees/courses.html?view=session&type=courses&sessionid=29>)

- **Conference/Program Chair and Festival Chair**

Dec 2014                      Course Organizer, SIGGRAPH ASIA 2014, Shenzhen, China

May 2014                      Conference Co-chair, 27th International Conference on Computer Animation and Social Agents (CASA 2014), Houston, Texas, USA

- **Member of Conference Program Committees**

- [1] **SGAVH 2014, SIGGRAPH ASIA 2014 International Workshop on Autonomous Virtual Humans and Social Robot for Tele-presence**, Shenzhen, China, December 2014
- [2] **VRST 2014, The 20th ACM Symposium on Virtual Reality Software and Technology**, The University of Edinburgh, UK, November 2014
- [3] **ICMI 2014, The 16th ACM International Conference on Multimodal Interaction**, Istanbul, Turkey, November 2014
- [4] **MIG 2014, The 7th International ACM SIGGRAPH Conference on Motion in Games 2014**, Los Angeles, USA, November 2014
- [5] **ICIP 2014, IEEE International Conference on Image Processing**, Paris, France, October 2014
- [6] **CW 2014, International Conference on Cyberworlds 2014**, Santander, Spain, October 2014
- [7] **ICDVRAT 2014, The 10th International Conference on Disability, Virtual Reality and Associated Technologies**, Gothenburg, Sweden, September 2014
- [8] **RO-MAN 2014, The 23rd IEEE International Symposium on Robot and Human Interactive Communication**, Scotland, UK, August 2014
- [9] **BioVis 2014, The 4th Symposium on Biological Data Visualization**, Boston, USA, July 2014
- [10] **ISMICT 2014, The 8th International Symposium on Medical Information and Communication Technology**, Florence, Italy, April 2014
- [11] **ICAART 2014, The 6th International Conference on Agents and Artificial Intelligence**, Angers, France, March 2014
- [12] **GRAPP 2014, The 9th International Conference on Computer Graphics Theory and Applications**, Lisbon, Portugal, January 2014
- [13] **MMM 2014, The 20th Anniversary International Conference on MultiMedia Modeling Dublin**, Ireland, January 2014

- **International and National Advisory board Expertise**

- 2013-2016 Member of the Scientific Council of the Institute of Mines-Telecom, Paris, France
- 2013-2016 Expert on the advanced grant panel of the European Research Council (ERC)

- **Editorial responsibilities**

- Since 2014 Associate Editor, **Frontiers in Robotics**, Nature Publisher
- Since 2010 Editorial Adviser of the journal of **Graphical Models** published by Elsevier
- Since 2000 Editor-in-Chief of the Journal **The Visual Computer** published by Springer Verlag, Germany
- Since 2000 Editor of the Journal of **Computational Geometry** published by Elsevier, Holland
- Since 1990 Co-founder and Co-editor-in-chief, **Journal of Visualization and Computer Animation**, John Wiley and Sons.

- **Honours and scientific awards**

- 2014 **Best Overall Paper Award at IEEE BIBM 2014 for Muscle Tissue Labeling of Human Lower Extremities in Multi-Channel mDixon MR Imaging: Concepts and Applications**, 2014 IEEE International Conference on Bioinformatics and Biomedicine (BIBM 2014), Belfast, UK, November 2-5, 2014 (with M. Becker)
- 2014 **Best Paper Award at MICCAI 2014 for A Collective Approach for Reconstructing 3D Fiber Arrangements in Virtual Musculoskeletal Soft Tissue Models**, Computational Biomechanics for Medicine IX workshop (MICCAI 2014), MIT, Boston, USA, September 14, 2014 (with H.F. Choi, A. Chincisan)