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RESEARCH TOPICS

- Neuromorphic Vision and Computation, Artificial Retinas, Event-based Sensing and Computing,
- Retina prosthetics, Optogenetics Stimulation.
- Computer Vision, Robotics, Theoretical Neurosciences,

APPOINTMENTS

- 2016-present, **Professor**, University of Pittsburgh/ Medical Center ,
- 2016-present, **Adjunct Professor**, Robotics Insitute, Carnegie Mellon University,
- 2014-Present, **Professor**, Université Pierre et Marie Curie, Institut de la Vision,
- 2013-Present, **Co Director**, European Institute of Theoretical Neurosciences, Human Brain Project,
- 2011-Present, **Team Leader of the Neuromorphic lab** Retina stimulation, Neuromorphic Computation, Retina models and implants design,
- 2011-12, **Associate member**, IIT (Italian Institute of Technology), Cognitive Humanoids Lab (ICUB), Italy,
- 2008, **CNRS delegation** Institut des Systèmes Intelligents et Robotique, Université Pierre et Marie Curie,
- 2007-10, **Team Leader of the General Vision Lab** Institut des Systèmes Intelligents et Robotique, Université Pierre et Marie Curie,
- 2007, **Invited Professor**, Laboratory of Adaptive Machine Systems, University of Osaka, Japan
- 1999, **Associate Professor(Maître de Conférence)**, 61^{eme}section, Université Pierre et Marie Curie,
- 1998-1999, **Lecturer (Attaché temporaire d'enseignement et Recherche)**, Université Pierre et Marie Curie,
- 1994-1997, **Ph.D**, Université Pierre et Marie Curie,
- 1995-97, **Lecturer**, Université Paris Nord,

PROFESSIONAL PREPARATION

- 2006, **Habilitation à Diriger des Recherches**, Université Pierre et Marie Curie,
- 1994-98, **Ph.D in artificial vision**, Université Pierre et Marie Curie, highest honors (mention Très Honorable avec F'elicitations du Jury),
- 1993-94, **DEA Robotique**, Université Pierre et Marie Curie, mention Bien, (2nd/65),
- 1991-92 **Bachelor and Masters in applied mathematics**, Université Paris Nord,

Projects

- Event-Vis, research grant funded by Chronocam SAS, 4M$ (2018-2022)
- Machine Learning for Automated Diagnosis, Shear Foundation, 300k$ (2018)
- co-PI Visual restoration : Cortical Visual Restoration using Optogenetic Therapy, Darpa DARPA BAA-16-09, 2/30 M$ (2017-2020)
- PI ULPEC : Ultra-Low Power Event-based Camera : European Comission H2020-ICT-2016-2017, 1.5/4 MEuros, (2017-2020)
- PI Brainiac : A full Temporal sensing and computing neuromorphic scalable platform for visual processing, DARPA-15-35, 800k$,(2016-2017)

- Co-Pi Helmholtz : ERC Synergy, with the Institut Langevin, developement of event-based MHz novel photonics technonolgies for retina imaging (OCT, Adaptive Optics), 1.5/13 MEuros. (2015-2019)
- PI Ecomode : Coordinator and PI, Event-Driven Compressive Vision for Multimodal Interaction with Mobile Devices, funding from the European Union Horizon 2020 research and innovation programme under grant agreement No 644096, 1.2/4 MEuros
- PI aCORE : The asynchronous COmputational REtina, FET Flagship Human Brain Project, (2014-2016), 200 kEuros
- PI SightAgain : Optogenetics and Implants Stimulation Strategies for Visual Restoration, banque publique d'investissement (2014-2018), 1.8 MEuros
- PI MIRA : National Research Agency, Neuromorphic High Speed Visual Processing using Memristors (2015-2019), 400kEuros
- PI OptoGlass : Developement of Optogenetics stimulation Goggles, funded by Gensight-Biologics (2015-2018), 1.8MEuros
- co-PI FRM : Retina Connectomics using Brainbow, (2015-2019), 300kEuros
- PI OSRAM : Event-based Visual tracking of crowds, (2015-2016), 100kEuros.

Former Projects - NEUROCARE : Neuronal NanoCarbon Interfacing Structures, EU project FP7 280433, Program Nanotechnology based implantable and interfaceable devices, 3MEuros, 2012-15,
- EMORPH : Event-Driven Morphological Computation for Embodied Systems, EU FP7 Initiative on Embodied Intelligence.
- IMPLANT : 3D Diamond Implants (Fabrication d'implant 3D diamant 64 voies) (ITMO-AVISAN) , 1.6Meuros.
- RETINE : Development of a retina implant, (CEA-List, ESIEE-Paris, IDV), National Research Agency.
- MEDINAS : Diamond Electrode Matrix for Soft Neural Interfaces (Matrices d'Electrodes en Diamant pour l'Interfaçage Neuronal Appliqué à la Suppléance fonctionnelle).
- PACOME : Active Sensors for Omnidirectional Sensing for localization and mapping - National Research Agency, 2008-11,
- FASTNAV : Autonomous Navigation of Field Robots in Natural Environment, French DARPA, 520 Keuros, 2007-10,
- ASAROME : Autonomous Sailing Robot for Oceanographic MEasurements, ANR (National Research Agency) Program Interactive systems and robotics, 1.2 Meuros, 2007-10,
- FAST : Fast and Autonomous Rover System, ANR (National Research Agency) Program Interactive systems and robotics, 650kEuros, 2007-10,
- PARMA : Perception Active multimodale pour la robotique Rapide, Mobile et Autonome, en milieux ouverts, UPMC Innovation projects, 160keuros, 2007-10, - ICEA : Integrating Cognition, Emotion and Autonomy, European Integrated Project IST027819, 200609, 450 Keuros
- CATOPSYS : Omnidirectional Catadioptric Projector (Systèmes catadioptriques de projection panoramique pour la réalité mixte), Programme Audiovisuel & Multimedia, ANR (National Research Agency), 180 Keuros, 200609,
- PILE : International Program for the Language of Children (Programme International pour le Langage de l'Enfant), Necker-Enfants Malades Hospital of l'APHP, EADS fondation and SFR Fondation, 135 Keuros, 2006-09,

STUDENT REASEARCH TRAINING

Ongoing : Q. Sabatier (2018), G. Haessig (2019), K. Géhère (2019), A. Marcireau (2019), X. Berthelon (2019), K. Arth (2019), M. Poujade (2020), O. Oubari (2021), E. Wulfman (2021), J.M. Maro (2021), V. Maison(2021), F. Conti(2021), F. Rutard (2021), L. Dardelet (2021)

Former Ph.D : L. Smadja (2003), J. Douret (2004), S.H. Ieng (2005), L. Lacheze (2008), H. Romero (2008), V. Guitteny (2007), T. Debaecker (2009), R. Chang (2009), M. Yamakado (2011), H. Lorach (2012), F.C. Dong (2012), Z.J. Ni (2013), C. Meyer (2013), C. Clercq (2013), J. Carneiro (2014), X. Lagorce (2015), S. Kime (2016), D. Reverter (2017)

ENTREPRENEURAL ACTIVITIES

Founder of Pixium, Retina prosthesis company, http ://www.pixium-vision.com (2011),
Founder of Chronocam, Event-based machine vision sensors and systems, http ://www.chronocam.com/(2014),
Advisor of Gensight Biologics, Optogenetics stimulation for visual restoration (2013),
Founder of Chronolife, Multisensory fusion for medical monitoring, (2016),
Founder Brainiac, Neuromorphic Event-based Computers, (2016),

AWARDS AND NOTEWORTHY RECOGNITIONS

- Featured in Journal L'express, dec (2017),
- Featured in Journal Biotech Finances February, No 71 (2016),
- Member of the advisory board of the Institute of Neuromorphic Engineering and The Telluride Neuromorphic and Cognition workshop, (2016),
- Featued in EETimes, "Imaging Revolution : Forget Frames", (2016),
- "Giving Machines Humanlike eyes", IEEE Spectrum 52(12) :44-49, December,(2015),
- Best industry paper award at the British Machine Vision Conference (BMVC) 2014,
- Featured in Arte TV, Future Mag for "The bionic Eye", (2014),
- Feature in Encyclo TV, for "Retina Implant technoligies", (2013),
- Featured in FRANCE 3 National TV, "Ce n'est pas sorcier" on Bionic Eyes, (2013)
- Featured in Radio France Internationale, program "Question Santé" on retina implants, (2013),
- Laureàt Technologie 2013 by the journal "La Recherche" (French equivalent of Scientific American) for the work appearing in the paper "Artificial retina : the multichannel processing and temporal dynamic of the biological system achieved with an asynchronous model, Journal of Neural Engineering 2012,
- Invited Speaker for the National Week of the Brain on Retinal Prosthesis (2012),
- Best Paper Deutsche Telecom Prize ECCV/Omnivis08 (2008),
- Robocup, Vice Europe Champion (2001), Semi-Finalist (2000),

SELECTED SYNERGISTIC ACTIVITIES

Program committee

European Conference on Computer Vision ECCV, International Conference on Computer Vision and Pattern Recognition CVPR/ICCV, IEEE International Conference on Robotics and Automation(ICRA), IEEE International Conference on Intelligent Robots (IROS) and Systems et Simulation of Artificial Behavior, IEEE Int. Conf. on Perception and Communication of Video and Graphics.

SELECTED INVITED LECTURES

University of Osaka, Dept. of Adaptive Machine Systems, Osaka University, Fev 2008, Pr. M. Asada, INRIA Rhone-Alpes, Nov 2007, Dr. P. Sturm, UTC Compiegne, Heudyasic, France, Oct 2007, Dr. R. Lozano, Center of Intelligent Machines, Univ McGill Canada, Fev 2005, Pr. J. Cooperstock, Nara Institute, ATR Lab, Japan, Avril 2001, Pr. H. Ishiguro, Department of Mechanical Engineering for Computer-Controlled Machinery, Osaka, Japan Avril 2001„ Pr. M. Asada, Salk Institute - UCSD, Juillet 2012, Pr. T. Sejnowski, Computer Vision and Robotics Research Laboratory - UCSD, July 2011, Pr. M. Trivedi, Qualcomm, Brain Corporation, San Diego, Juillet 2011, Dr. E. Izhikevich, Institute for Infocomm Research (I2R/A-Star), Singapore, Sep 2010, Italian Institute of Technology Italy, Mai 2009, Pr G. Metta, Laboratoire d'Analyse et d'Architecture des Systemes (LAAS), Toulouse, Mai 2009, Dr. S. Lacroix, ETH, Neuroinformatik Lab, Switzerland, april 2008, Pr. T. Delbruck, UCSD

Institute for Neural Computation, 2015, Google[X] 2015, Qualcomm 2016, invited speaker The 4th International Conference on Biomimetic and Biohybrid Systems 2015.

Publications

Books :

1. R.Benosman, S.B.Kang, (2002) Panoramic Vision : Sensors Theory and Applications, Springer Verlag, Monographs in Computer Science, NY, ISBN 0-387-95111-3. re-edited in 2013.
2. Z.J Ni, C. Pacoret, R. Benosman, S. Regnier (2014) Haptic Feedback Teleoperation of Optical Tweezers, John Wiley & Sons

Chapters

1. R. Hornig, M. Dapper, E. Le Joliff, R. Hill, K. Ishaque, C.Posch, R. Benosman, Y. Lemer, J.A. Sahel, S. Picaud (2017) Pixium Vision : First Clinical Results and Innovative Developments, Artificial Vision :A Clinical Guide, Springer, Editors : Gabel, Veit Peter (Ed.)
2. J.A.Sahel , S.Picaud, R.Benosman, et al., (2011) Retinal implants : from pathophysiology to nanoscience. Nanosciences in medicine. Springer Healtcare Paris, pp 208-213.
3. C. Bartolozzi, R. Benosman et al (2016), Wiley Encyclopedia of Electrical and Electronics Engineering
4. T.Debaecker, R.Benosman, (2009), Image Sensor model using Geometric Algebra : from calibration to motion estimation, Applications of Geometric Algebras in Computer Science and Engineering, Springer Verlag
5. S.H.Ieng, R.Benosman, (2006), Geometric construction of the caustic surface of a catadioptric non central sensor, Beyond the single view point, Kluwer 06, Editors K.Daniilidis and R.Klette.

Recent Patents

1. 3D electrodes for retina stimulation, FR 10 53381 (licensed to Pixium Vision),
2. Method of controlling a Visual restoration device FR 11 54116 (licensed to Pixium Vision and Gensight Biologics),
3. Event-based 3D reconstruction of scenes from Event-based cameras, FR 11 61320 (licensed to Chronocam),
4. Event-based Optical flow from an event based camera FR 11 62137 (licensed to Chronocam and Gensight Biologics)
5. Event-based Iterative closest point for visual tracking FR 13 53838 (licensed to Chronocam),
6. Device to visualize a sequence of image from an event based camera FR1452557 (licensed to Pixium Vision and Gensight Biologics),
7. Method to display an event based scene for visualization and retina stimulation FR1559601 (licensed to Pixium Vision and Gensight Biologics),
8. Event based Iterative Fast Fourrier Transform TFD Iterative FR1552154 (Licensed to Chonolife),
9. Event based stereo matching FR1552155 (licensed to Chronocam),
10. A Hierarchy Of event-based Time-Surfaces for pattern recognition, pending (option for licensing from Chronocam),
11. Passive subretinal implant using an Active Shunt, pending (option for licensing from Pixium Vision),
12. Downsampling - Asynchronous spatio-temporal downsampling for low resolution retinal prostheses, EP15306193 22-07-2015 (licensed to Pixium Vision),
13. Software libATIS (SDK) (licensed to Chronocam),
14. Software KaER (SDK) (licensed to Chronocam),
15. Spike Time Interval Computational Kernel, a Framework for General Purpose Computation Using Neurons, Precise Timing, Delays, and Synchrony, FR1556659, 13-07-2015, (licensed to Brainiac)

Journals :

73. D. Reverter Valeiras, X. Clady, S.H. Ieng, R. Benosman (2018).Event-Based Line Fitting and Segment Detection using a Neuromorphic Visual Sensor, IEEE Transactions on Neural Networks and Learning Systems, to appear

72. G. Cohen, S. Afshar, G. Orchard, J. Tapson, R Benosman, A. Van Shaik (2018)Spatial and Temporal Downsampling in Event-Based Visual Classification, IEEE Transactions on Neural Networks and Learning Systems, to appear

71. A. Marcireau, S.H. Ieng, G. Chenegros, C. Simon Chane, R. Benosman (2018) Event-based color segmentation with a high dynamic range event-based color sensor, Frontiers in Neuroscience, section Neuromorphic Engineering, to appear

70. G Haessig, A Cassidy, R Alvarez, R Benosman, G Orchard (2018), Spiking Optical Flow for Event-based Sensors Using IBM's TrueNorth Neurosynaptic System, IEEE Transactions on Biomedical Circuits and Systems (TBioCAS), accepted, (arXiv preprint arXiv :1710.09820)

69. X Clady, JM Maro, S Barré, RB Benosman (2017) A Motion-Based Feature for Event-Based Pattern Recognition, Frontiers in neuroscience 10, 594

68. S.H. Ieng, J. Carneiro, R.B. Benosman (2017) Event-Based 3D Motion Flow Estimation Using 4D Spatio Temporal Subspaces Properties, Frontiers in neuroscience 10, 596

67. X Berthelon, G Chenegros, N Libert, JA Sahel, K Grieve, R Benosman (2017) Full-field OCT technique for high speed event-based optical flow and particle tracking, Optics Express 25 (11), pp 12611-12621

66. M Osswald, SH Ieng, R Benosman, G Indiveri (2017) A spiking neural network model of 3D perception for event-based neuromorphic stereo vision systems, Nature Scientific reports vol 7, number 40703

65. Q. Sabatier, S.H. Ieng, R. Benosman (2017), "Asynchronous Event-based Fourier Analysis", IEEE Transactions on Image Processing 26 (5), pp 2192-2202

64. X. Lagorce, G. Orchard, F. Galluppi, B. E. Shi, R. Benosman (2016), "HOTS : A Hierarchy Of event-based Time-Surfaces for pattern recognition", IEEE Trans. Pattern Anal. Mach. Intell, July, doi :10.1109/TPAMI.2016.2574○

63. X. Clady, J.M Maro, S. Barre, R. Benosman1 (2016), "A Motion-based Feature for Event-based Vision", Frontiers on Neuromorphic engineering , Research Article, Nov

62. S.H. Ieng, J. Carneiro, R. Benosman (2016), "Event-based 3D Motion Flow Estima tion using 4D Spatio Temporal Subspaces Properties",Frontiers on Neuromorphic engineering ,Research Article,

61. L. A. Camunas-Mesa, T. Serrano-Gotarredona, S. Ieng, R. Benosman, B. Linares-Barranco (2016) Event-driven Stereo Visual Tracking Algorithm to Solve Object Occlusion, IEEE Trans. on Neural Network and Learning Systems,

60. S. Kime, F. Galluppi, R Benosman, J. Lorenceau, (2016), "Psychophysical assessment of perceptual performance with varying display frame rates", IEEE/OSA Journal of Display Technology, to appear

59. C. Simon Chane, S.H. Ieng, C. Posch, R Benosman (2016) "Event-Based Tone Mapping for Asynchronous Time-Based Image Sensor", Frontiers in Neuroscience(Neuromorphic Engineering), to appear.

58. M. Osswald, R Benosman, G. Indiveri, (2016) "Spikes to the Rescue : Understanding 3D Perception and Solving Stereo Vision Using Event-based Neuromorphic Computing Architectures", Nature scientific reports, to appear

57. D. Reverter Valeiras, S. Kime, S.H. Ieng, R. Benosman (2016), "An Event-Based Solution to the Perspective-n-Point Problem", Frontiers in Neuroscience 10(208), April

56. D. Reverter-Valeiras, G. Orchard, S.H. Ieng, R. Benosman (2016), "Neuromorphic Event-Based 3D Pose Estimation", in Frontiers in Neuroscience, VOL.9, number 00522,

55. G. K. Cohen, G. Orchard, S.H. Ieng, J. Tapson, R. Benosman, A. van Schaik (2016) "Skimming Digits : Neuromorphic Classification of Spike- Encoded Images", Frontiers in Neuroscience, vol 10, issue 184,

54. M. Giulioni, X. Lagorce, F. Galluppi, R. Benosman (2016), "Event-based computation of motion flow on a neuromorphic analog neural platform", Frontiers in neuroscience, Feb 16 ;10 :35.

53. C. Posch, R. Benosman, R. Etienne-Cummings (2015), "Giving Machines Humanlike eyes", IEEE Spectrum 52(12) :44-49, December

52. A. Bendali, L. Rousseau, G. Lissorgues, E. Scorsone, M. Djilas, J. Degardin, E. Dubus, S. Fouquet, R. Benosman, P. Bergonzo, J.A. Sahel, S. Picaud (2015) "Synthetic 3D diamond-based electrodes for flexible retinal neuroprostheses : Model, production and in vivo biocompatibility", Biomaterials. 2015 Oct ;67 :73-83.

51. X. Lagorce, R. Benosman (2015) "Stick : Spike time interval computational kernel, a framework for general purpose computation using neurons, precise timing, delays, and synchrony, Neural Computation", Neural Computation (MIT Press), 27 (11), pp.2261-2317.

50. G. Orchard, C. Meyer, R. Etienne-Cummings, C. Posch, N. Thakor, R. Benosman (2015) "HFirst : A Temporal Approach to Object Recognition", IEEE Trans. Pattern Anal. Mach. Intell. 37(10) : 2028-2040,

49. D. Reverter Valeiras, X. Lagorce, X. Clady, C. Bartolozzi, S. H. Ieng, R. Benosman (2015) "An Asynchronous Neuromorphic Event-Driven Visual Part-Based Shape Tracking,Äù in IEEE Transactions on Neural Networks and Learning Systems, Volume :26, Issue : 12, Page(s) : 3045 - 3059,

48. H. Akolkar, C. Meyer, X. Clady, O. Marre, Ch. Bartolozzi, S.Panzeri, R.Benosman,(2015) "What can neuromorphic event-based precise timing add to spike-based pattern recognition ?", Neural Computation, Mar ;27(3),

47. X. Lagorce, E. Stromatias, F. Galluppi, L. Plana, S.C. Liu, S. Furber, R.B. Benosman (2015) "Breaking The Millisecond Barrier On SpiNNaker : Implementing Asynchronous Event-Based Plastic Models With Microsecond Resolution", in Frontiers in Neuroscience,VOL.9, number 00206,

46. X. Lagorce, S.H. Ieng, X. Clady, M. Pfeiffer, R.B. Benosman (2015) "Spatiotemporal Features for Asynchronous Event-based Data", Frontiers in Neuroscience, VOL.9, number 00046, 2015

45. F. Galluppi, X. Lagorce, E. Stromatias, M. Pfeiffer, L. Plana, S.B. Furber, R.B. Benosman (2015) "A framework for plasticity implementation on the SpiNNaker neural architecture,Äù, Frontiers in Neuroscience, VOL.8, number 00429,

44. A. Bendali, Y. Roupioz, V. Forster, T. Livache, S..L. Bouguelia, R.B. Benosman, P. Mailley, J.A Sahel, S.Picaud,(2014) "Cell specific electrodes for neuronal network reconstruction and monitoring", Analyst, Probe and Chip Approaches to Cell Analysis themed issue.

43. X. Lagorce, C. Meyer, S.H. Ieng, D. Filliat, R. Benosman (2014) "Asynchronous Event-Based Multikernel Algorithm for High-Speed Visual Features Tracking,Äù in Transactions on Neural Networks and Learning Systems, Volume :26, Issue : 8, Page(s) : 1710 - 1720, Sept.

42. L.A. Camunas-Mesa, T. Serrano-Gotarredona, S.H. Ieng, R. Benosman, B. Linares-Barranco (2014) "On the use of orientation filters for 3D reconstruction in event-driven stereo vision." Front Neurosci. 2014 Mar 31 ;8 :48.

41. X. Clady, C. Clercq Charles, S.H. Ieng, F. Houseini, M. Randazzo, L. Natale, C. Bartolozzi, R.B. Benosman (2014) "Asynchronous Visual Event-based Time-to-Contact" Frontiers in Neuroscience, VOL.8, number 00009,

40. S.-H. Ieng, C. Posch, R. Benosman,(2014) "Asynchronous Neuromorphic Event-driven Image Filtering", Proceedings of the IEEE, Volume 102, issue 10, September,

39. A. Bendali, H. Lorach, M. Djilas, O. Marre, R. Bensoman, L. Rousseau, G. Lissorgues, E. Scorsone, P. Bergonzo, J.A. Garrido, J.A. Sahel, S. Picaud (2013) "Restoring vision in blind patients following photoreceptor degeneration : clinical results and future challenges", Biol Aujourdhui.207(2), pp12332. doi : 10.1051/jbio/2013008

38. Z. Ni, S.-H. Ieng, C. Posch, S. Regnier, R.B. Benosman(2015) "Visual Tracking using Neuromorphic Asynchronous Event-based Cameras, Neural Computation, April, Vol. 27, No. 4, Pages 925953,

37. X. Lagorce, C.Meyer, S.-H. Ieng, D.Filliat, R.Benosman, "Asynchronous Event-Based Multi-kernel Algorithm for High Speed Visual Features Tracking", IEEE transaction on Neural Networks and Learning Systems, Volume :PP, issue : 99, doi : 10.1109/TNNLS.2014.2352401, 2014

36. A. Shaverdian, R.P Agarwal, R.B Benosman, "The bistability of higher order differences of discrete periodic signals, Advances in difference equations", 2014 :60 doi :10.1186/1687-1847-2014-60

35. L.A. Camunas-Mesa, T. Serrano-Gotarredona, S.-H. Ieng, R. Benosman, B. Linares-Barranco, (2014) "On the use of Orientation Filters for 3D Reconstruction in Event-Driven Stereo Vision", Frontiers in Neuromorphic Engineering.

34. X. Clady, C. Clercq, S.-H. Ieng, F. Houseini, M. Randazzo, L. Natale, C. Bartolozzi, R. Benosman,(2014) "Asynchronous Visual Event-based Time-to-Contact", Front. Neurosci., 07 February | doi : 10.3389/fnins.2014.00009.

33. K. Loulier, R. Barry, P. Mahou, Y. Le Franc, W. Supatto, K.S. Matho, S.-H. Ieng, S. Fouquet, E. Dupin, R. Benosman, A. Chedotal, E. Beaurepaire, X. Morin, J. Livet, "Multiplex cell and lineage tracking with combinatorial labels", Neuron, Volume : 12, pp 234238. 2014

32. A. Bendali, H. Lorach, M. Djilas, O. Marre, R. Bensoman, L. Rousseau, G. Lissorgues, E. Scorsone, P. Bergonzo, J.A. Garrido, J.A. Sahel, S. Picaud (2013) Restoring vision in blind patients following photo-receptor degeneration : clinical results and future challenges, Biol Aujourdhui. 2013 ;207(2) :123-32. doi : 10.1051/jbio/2013008,

31. A.Y. Shahverdian, A. Kilicman, R.B. Benosman, (2014) Higher Difference Structure of Some Discrete Processes, Journal of Advances in Difference Equations,

30. Z. Ni, S.H Ieng, C. Posch, S. Regnier, R.B. Benosman, (2014),Visual Tracking using Neuromorphic Asynchronous Event-based Cameras, Neural Computation, vol 27, issue 4, pp92553,

29. C.Meyer, H.Akolkar, O.Marre, Ch. Bartolozzi, S.Panzeri, R.Benosman (2014), What can asynchronous event-based acquisition add to pattern recognition ?, Neural Computation,vol 27, issue 3, pp56193

28. X.Lagorce, C.Meyer, S.H Ieng, D.Filliat, R.Benosman, (2014) Asynchronous Event-Based Multikernel Algorithm for High Speed Visual Features Tracking, IEEE transaction on Neural Networks and Learning Systems, pp 1710-1720, vol 26, issue 8

27. K. Loulier1, K.S. Matho, Y. Le Franc, W. Supatto, R. Barry, P. Mahou, S.H. Ieng, S. Fouquet, A. Chedotal, R. Benosman, E. Beaurepaire, X. Morin, J. Livet (2013) Studying connectivity and brain development with combinatorial Brainbow labels, Frontiers in Neuroinformatics, January

26. X.Clady, C.Clercq, S.H Ieng, F.Houseini, M.Randazzo, L.Natale, C.Bartolozzi, R.Benosman (2013) Asynchronous Visual Event-based Time-to-Contact, Frontiers in Neuromorphic Engineering,

25. K.Loulier, R.Barry, P.Mahou, Y. Le Franc, W. Supatto, K.S. Matho, S.H. Ieng, S.Fouquet, E.Dupin, R.Benosman, A.Chedotal, E.Beaurepaire, X.Morin, J.Livet, (2013) Multiplex cell and lineage tracking with combinatorial labels, Neuron, vol 12, pp 234-238,

24. J.Carneiro, S.H.Ieng, C.Posch, R.Benosman, (2013) Asynchronous Event-Based 3D Reconstruction From Neuromorphic Retinas, Neural Networks, Volume 45, September, 2013 Pages 27-38

23. R.Benosman, C.Clercq, S.H.Ieng, C.Posch, C.Bartolozzi, (2013) Asynchronous Event-Based Motion Flow, Neural Networks, accepte,

22. A.Y.Shahverdian, A.Kilicman, R.Benosman, (2012) Higher Difference Structure of Some Discrete Processes, Advances in Difference Equations, 2012 :202 doi :10.1186/1687-1847-2012-202

21. F.Dong, S.H.Ieng., X.Savatier, R.Etienne-Cumming, R.Benosman, (2012) ‚ÄúPlenoptic Cameras in Real-Time Robotics‚Äù, International Journal of Robotics Research, Nov 2012,

20. H.Lorach, O.Marre, J.A.Sahel, R.Benosman,S.Picaud (2012) Neural stimulation for visual rehabilitation : advances and challenges, Journal of Physiology of Paris, Elsevier

19. R.Benosman, S-H. Ieng , C. Clercq, C. Bartolozzi, M. Srinivasan, (2012) Asynchronous frameless event-based optical flow, Neural Networks. Volume 27, March, Pages 32‚Äì37,

18. S.Maybank, S-H Ieng, R. Benosman, (2012). A Fisher-Rao metric for paracatadioptric images of lines. International Journal on Computer Vision,

17. Z.Ni, C. Pacoret, R. Benosman, S-H. Ieng, S. Regnier, S. (2012). Asynchronous Event Based High Speed Vision for Micro-particles Tracking. Journal of microscopy. Volume 245, Issue 3, pages 236‚Äì244, March,

16. Z.NI, A. Bolopion, J. Agnus, R. Benosman, S. Regnier, (2012) Asynchronous Event-based Visual Shape Tracking for Stable Haptic Feedback in Microrobotics, IEEE Transactions on Robotics, 28 (5), pp.1081-1089.

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