## **Bibliographies**

## A Bibliography of Technological Applications of Spiking Neural P Systems

Gexiang Zhang<sup>1,2</sup>, Qiang Yang<sup>1</sup>, Linqiang Pan<sup>3</sup>

- Robotics Research Center, Key Laboratory of Fluid and Power Machinery of Ministry of Education, Xihua University, Chengdu, 610039, China
- <sup>2</sup> School of Electrical Engineering, Southwest Jiaotong University, Chengdu 610031, China
- <sup>3</sup> School of Automation, Huazhong University of Science and Technology, Wuhan 430074, China

This is a bibliography of technological applications of spiking neural P systems (SN P systems, for short) reported in the past years.

The study of SN P systems and of their applications is a very active and significant research topic. The bibliography may be useful and beneficial to the researchers in the community of membrane computing and related areas, especially to the researchers and students who are working on SN P systems.

Some of references in the list come from "A bibliography of spiking neural P systems" (L. Pan, T. Wu, Z. Zhang, *Bulletin of IMCS*, 2016, vol. 1, 63–78, online: http://membranecomputing.net/ IMCSBulletin/). There are also some updates. This list is meant to highlight the applications of SN P systems.

## References

- 1. S. Aoki, A. Fujiwara: Asynchronous SN P systems for sorting. Networking and Computing (ICNC), 2012 Third International Conference on. IEEE, 2012, 221–225.
- 2. A. Binder, R. Freund, M. Oswald: Extended spiking neural P systems with astrocytes variants for modelling the brain. *Proc. 13th Intern. Symp. AL and Robotics*, AROB2008, Beppu, Japan, 520–524.
- R. Ceterchi, A.I. Tomescu: Spiking neural P systems, a natural model for sorting networks. BWMC2008, 93–106.
- R. Ceterchi, A.I. Tomescu: Computing the maximum bisimulation with spiking neural P systems. Computation, cooperation, and life, Springer Berlin Heidelberg, 2011, 151–157.

- 5. R. Ceterchi, A.I. Tomescu: Implementing sorting networks with spiking neural P systems. *Fundamenta Informaticae*, 87, 1 (2008), 35–48.
- H. Chen, X. Gao: Decimal Transforming Operations in Spiking Neural P Systems.
  2nd International Conference on Biomedical Engineering and Informatics, 2009.
- K. Chen, J. Wang, Z. Sun, J. Luo, T. Liu: Programmable Logic Controller Stage Programming Using Spiking Neural P Systems. *Journal of Computational and The-oretical Nanoscience*, 12, 7 (2015), 1292–1299.
- D. Díaz-Pernil, F. Peña-Cantillana, M. A. Gutiérrez-Naranjo: A parallel algorithm for skeletonizing images by using spiking neural P systems. *Neurocomputing*, 115 (2013), 81–91.
- 9. D. Díaz-Pernil, F. Peña-Cantillana, M. A. Gutiérrez-Naranjo: Skeletonizing images by using spiking neural P systems. *BWMC2010*, 91–103.
- S. Elias, A. Chandar, K. G.Krithivasan, S. V. Raghavan: An Adaptive e- Learning Environment using Distributed Spiking Neural P Systems. *Technology for Education* (T4E), 2011 IEEE International Conference on. IEEE, 2011, 56–60.
- 11. R. Freund, M. Oswald: Regular  $\omega$ -languages defined by extended spiking neural P systems. Fundamenta Informaticae, 83, 1–2 (2008), 65–73.
- X. Gao, H. Chen: Signed integer arithmetic on spiking neural P systems. Applied Mechanics and Materials, 20 (2010), 779–784.
- M.A. Gutiérrez-Naranjo, A. Leporati: Solving numerical NP-complete problems by spiking neural P systems with pre-computed resources. BWMC2008, 193–210.
- 14. M.A. Gutiérrez-Naranjo, A. Leporati: Performing arithmetic operations with spiking neural P systems. *BWMC2009*, vol. I, 181–198.
- M. A. Gutiérrez-Naranjo, A. Leporati: First steps towards a CPU made of spiking neural P systems. Int. J. of Computers, Communications and Control, 4, 3 (2009), 244–252.
- 16. M.A. Gutiérrez-Naranjo, M.J. Pérez-Jiménez: A first model for Hebbian learning with spiking neural P systems. *BWMC2008*, 211–234.
- 17. M.A. Gutiérrez-Naranjo, M.J. Pérez-Jiménez: Hebbian learning from spiking neural P systems view. Proc. WMC9, Edinburgh, UK, 2008, 217–230.
- 18. M.A. Gutiérrez-Naranjo, M.J. Pérez-Jiménez: A Spiking Neural P system based model for Hebbian Learning. *Proc. WMC9*, Edinburgh, UK, 2008, 189–207.
- R. Hamabe, A. Fujiwara: Asynchronous SN P systems for logical and arithmetic operations. Proceedings of International Conference on Foundations of Computer Science, 2012, 58–64.
- O.H. Ibarra, A. Păun, A. Rodriguez-Patón: Sequentiality induced by spike numbers in SN P systems. Proc. 14th Intern. Meeting on DNA Computing, Prague, June 2008, 36–46.
- 21. O.H. Ibarra, S. Woodworth: Characterizing regular languages by spiking neural P systems. *Intern. J. Found. Computer Sci.*, 18, 6 (2007), 1247–1256.
- 22. R. Idowu, R. Chandren, Z. Othman: Advocating the use of fuzzy reasoning spiking neural P systems in intrusion detection. ACMC 2014, 1–5.
- R. Idowu, R. Muniyandi, Z. Othman: The Prospects of Using Spiking Neural P Systems for Intrusion Detection. *International Journal of Information and Network* Security, 2, 6 (2013), 492.
- M. Ionescu, D. Sburlan: Some applications of spiking neural P systems. Proc. WMC8, Thessaloniki, June 2007, 383–394, and Computing and Informatics, 27 (2008), 515–528.

- M. Ionescu, C.I. Tîrnăucă, C. Tîrnăucă: Dreams and spiking neural P systems. Romanian J. Inform. Sci. and Technology, 12, 2 (2009), 209–217.
- M. Ionescu, D. Sburlan: Some applications of spiking neural P systems. Computing and Informatics, 27, 3 (2012), 515–528.
- 27. T.-O. Ishdorj, A. Leporati: Uniform solutions to SAT and 3-SAT by spiking neural P systems with pre-computed resources. *Natural Computing*, 7, 4 (2008), 519–534.
- T.-O. Ishdorj, A. Leporati, L. Pan, X. Zeng, X. Zhang: Deterministic solutions to QSAT and Q3SAT by spiking neural P systems with precomputed resources. *Theo*retical Computer Sci., 411, 25 (2010), 2345–2358.
- T.-O. Ishdorj, A. Leporati, L. Pan, J. Wang: Solving NP-Complete problems by spiking neural p systems with budding rules. *Proc. WMC10*, Curtea de Argeş, Romania, August 2009, 335–353.
- Y. Kong, D. Zhao: Parallel Programming in Spiking Neural P Systems with Synapses States. Journal of Computational and Theoretical Nanoscience, 12, 10 (2015), 3418–3423.
- 31. A. Leporati, M. A. Gutiérrez-Naranjo: Solving Subset Sum by spiking neural P systems with pre-computed resources. Fundamenta Informaticae, 87, 1 (2008), 61–77.
- A. Leporati, G. Mauri: Towards a High-Level Programming of Spiking Neural P Systems. Emerging Paradigms in Informatics, Systems and Communication, (2009), 99.
- A. Leporati, G. Mauri, C. Zandron, Gh. Păun, M.J. Pérez-Jiménez: Uniform solutions to SAT and Subset-Sum by spiking neural P systems. *Natural computing*, 8, 4 (2009), 681–702.
- 34. A. Leporati, C. Zandron, C. Ferretti, G. Mauri: Solving numerical NP-complete problems with spiking neural P systems. *Proc. WMC8*, Thessaloniki, June 2007, 405–424.
- X. Li, Z. Wang, W. Lu, Z. Chen, Y. Wang, X. Shi: A Spiking Neural System Based on DNA Strand Displacement. *Journal of Computational and Theoretical Nanoscience*, 12, 2 (2015), 298–304.
- X. Liu, Z. Li, J. Liu, X. Zeng: Implementation of Arithmetic Operations With Time-Free Spiking Neural P Systems. *IEEE Transactions on NanoBioscience*, 14, 6 (2015), 617–624.
- X. Liu, Z. Li, J. Suo, J. Liu, X. Min: A uniform solution to integer factorization using time-free spiking neural P system. Neural Computing and Applications, 26, 5 (2015), 1241–1247.
- 38. L. F. Macías-Ramos, M. A. Martínez-del-Amor, M.J. Pérez-Jiménez: Simulating FRSN P Systems with Real Numbers in P-Lingua on sequential and CUDA platforms. 16th International Conference on Membrane Computing 2015 (G. Rozenberg et al., eds.), LNCS 9504, 2015, Springer Berlin Heidelberg, 262–276.
- V. P. Metta, A. Kelemenová: Sorting Using Spiking Neural P Systems with Antispikes and Rules on Synapses. 16th International Conference on Membrane Computing 2015 (G. Rozenberg et al., eds.), LNCS 9504, 2015, Springer Berlin Heidelberg, 290–303.
- 40. V.P. Metta, K. Krithivasan: Spiking neural P systems and Petri nets. *Proceedings of the International Workshop on Machine Intelligence Research*, 2009.
- 41. V. P. Metta, K. Krithivasan, D. Garg: Protocol Modeling in Spiking Neural P systems and Petri nets. *International Journal of Computer Applications*, 1, 24 (2010), 56–61.
- 42. J.M. Mingo: Sleep-awake switch with spiking neural P systems: A basic proposal and new issues. *BWMC2009*, vol. II, 59–72.

- 43. T. Y. Nishida: Computing k-block Morphisms by Spiking Neural P Systems. Fundamenta Informaticae, 111, 4 (2011), 453–464.
- 44. A. Obtulowicz: Spiking neural P systems and modularization of complex networks from cortical neural network to social networks. *BWMC2009*, 109–114.
- 45. Gh. Păun, M.J. Pérez-Jiménez: Spiking neural P systems. Recent results, research topics. Algorithmic Bioprocesses (A. Condon, D. Harel, J. N. Kok, A. Salomaa, E. Winfree, eds.), Springer Berlin Heidelberg, 2009, 273–291.
- 46. Gh. Păun, M.J. Pérez-Jiménez: Spiking neural P systems. An overview. Advancing Artificial Intelligence through Biological Process Applications (A.B. Porto, A. Pazos, W. Buno, eds.), Medical Information Science Reference, Hershey, New York, 2008, 60–73.
- 47. Gh. Păun, M.J. Pérez-Jiménez, G. Rozenberg: Computing morphisms by spiking neural P systems. *Intern. J. Found. Computer Sci.*, 18, 6 (2007), 1371–1382.
- 48. X. Peng, X. Fan, J. Liu: Performing Balanced Ternary Logic and Arithmetic Operations with Spiking Neural P Systems with Anti-Spikes. *Advanced Materials Research.* Trans Tech Publications, 505 (2012), 378–385.
- 49. H. Peng, J. Wang: Adaptive spiking neural P systems. 2010 Sixth International Conference of Natural Computing (ICNC2010), 2010, vol. 6, 3008–3011.
- H. Peng, J. Wang, M.J. Pérez-Jiménez, H. Wang, J. Shao, T. Wang: Fuzzy reasoning spiking neural P system for fault diagnosis. *Information Sciences*, 235 (2013), 106– 116.
- M.J. Pérez-Jiménez: Simulating FRSN P Systems with Real Numbers in P-Lingua on sequential and CUDA platforms. 16th International Conference on Membrane Computing 2015 (G. Rozenberg et al., eds.), LNCS 9504, 2015, Springer Berlin Heidelberg, 262.
- C. Qiu, L. Xiang, X. Liu: Broadcast Routing Algorithms in Hypercube Based on SN P Systems. *Pervasive Computing and the Networked World*, Springer International Publishing, 2013, 487–496.
- D. Reid, M. Barrett-Baxendale: Spatiotemporal Processing in a Spiking Neural P System. Proc. DESE'09, 2009, 394–399.
- 54. T. Song, L. Luo, J. He, Z. Chen, K. Zhang: Solving subset sum problems by time-free spiking neural P systems. *Applied Mathematics & Information Sciences*, 8, 1 (2014), 327.
- 55. T. Wang, J. Wang, H. Peng, H. Wang: Knowledge representation and reasoning based on FRSN P system. *Intelligent Control and Automation (WCICA), 2011 9th World Congress on. IEEE*, 2011, 849–854.
- 56. T. Wang, T. Wang, H. Peng, Y. Deng: Knowledge representation using fuzzy spiking neural P system. *Proceedings of the IEEE Sixth International Conference on Bio-Inspired Computing: Theories and Applications*, Changsha, China, 2010, 586–590.
- 57. T. Wang, G. Zhang, M.J. Pérez-Jiménez: Application of weighted fuzzy reasoning spiking neural P systems to fault diagnosis in traction power supply systems of high-speed railways. *BWMC2014*, 329–350.
- T. Wang, G. Zhang, M.J. Pérez-Jiménez: Fault diagnosis models for electric locomotive systems based on fuzzy reasoning spiking neural P systems. 15th International Conference on Membrane Computing 2014 (M. Gheorghe et al., eds.), LNCS 8961, Springer, 2014, 385–395.
- 59. T. Wang, G. Zhang, M.J. Pérez-Jiménez, J. Chen: Weighted fuzzy reasoning spiking neural P systems: application to fault diagnosis in traction power supply systems of

- high-speed railways. Journal of Computational and Theoretical Nanoscience, 12, 7 (2015), 1103–1114.
- T. Wang, G. Zhang, H. Rong, M.J. Pérez-Jiménez: Application of fuzzy reasoning spiking neural P systems to fault diagnosis. *International Journal of Computers Communications & Control*, 9, 6 (2014), 786–799.
- T. Wang, G. Zhang, J. Zhao, J. Wang, M.J. Pérez-Jiménez: Fault diagnosis of electric power systems based on fuzzy reasoning spiking neural P systems. *IEEE Transactions* on Power Systems, 30, 3 (2015), 1182–1194.
- 62. J. Wang, H. J. Hoogeboom, L. Pan, Gh. Păun, M.J. Pérez-Jiménez: Spiking neural P systems with weights. *Neural Computation*, 22, 10 (2010), 2615–2646.
- J. Wang, H. J. Hoogeboom, L. Pan: Spiking neural P systems with neuron division. 11th International Conference on Membrane Computing 2010 (M. Gheorghe et al., eds.), LNCS 6501, Springer, 2010, 361–376.
- 64. J. Wang, H. J. Hoogeboom, L. Pan, Gh. Păun: Spiking neural P systems with weights and thresholds. *Proc.* 10th Workshop Membrane Comput., Aug. 2009, 514–533.
- J. Wang, H. Peng: Fuzzy knowledge representation based on an improving spiking neural P system. 2010 Sixth International Conference on Natural Computation (ICNC2010), 2010, 3012–3015.
- J. Wang, H. Peng: Adaptive fuzzy spiking neural P systems for fuzzy inference and learning. *International Journal of Computer Mathematics*, 90, 4 (2013), 857–868.
- 67. J. Wang, P. Shi, H. Peng, M.J. Pérez-Jiménez, T. Wang: Weighted fuzzy spiking neural P systems. *IEEE Transactions on Fuzzy Systems*, 21, 2 (2013), 209–220.
- J. Wang, L. Zhou, H. Peng, G. Zhang: An extended spiking neural P system for fuzzy knowledge representation. *International Journal of Innovative Computing, Informa*tion and Control, 7, 7 (2011), 3709–3724.
- 69. G. Xiong, D. Shi, L. Zhu, X. Duan: A new approach to fault diagnosis of power systems using fuzzy reasoning spiking neural P systems. *Mathematical Problems in Engineering*, 2013 (2013).
- L. Xu, P. Jeavons: Simple neural-like P systems for maximal independent set selection. Neural computation, 25, 6 (2013), 1642–1659.
- 71. J. Xue, X. Liu: Solving directed hamilton path problem in parallel by improved SN p system. *Pervasive Computing and the Networked World*, Springer Berlin Heidelberg, 2012, 689–696.
- X. Zeng, C. Lu, L. Pan: A weakly universal spiking neural P system. Mathematical and Computer Modelling, 52, 11 (2010), 1940–1946.
- 73. X. Zeng, T. Song, L. Pan, X. Zhang: Spiking neural P systems for arithmetic operations. *Proc. IEEE Sixth International Conference on Bio-Inspired Computing: Theories and Applications*, Penang, Malaysia, 2011, 296–301.
- X. Zeng, T. Song, X. Zhang, L. Pan: Performing four basic arithmetic operations with spiking neural P systems. *IEEE Transactions on NanoBioscience*, 11, 4, (2012), 366–374.
- 75. X. Zhang, T.-O. Ishdorj, X. Zeng, L. Pan: Solving PSPACE-complete problems by spiking neural P systems with pre-computed resources. Submitted, 2008.
- G. Zhang, H. Rong, F. Neri, M.J. Pérez-Jiménez: An optimization spiking neural P system for approximately solving combinatorial optimization problems. *International Journal of Neural Systems*, 24, 5 (2014), 1440006.
- 77. X. Zhang, X. Zeng, B. Luo, J. Xu: Several applications of spiking neural P systems with weights. *Journal of Computational and Theoretical Nanoscience*, 9, 6 (2012), 769–777.

- H. Peng, J. Wang, J. Ming, P. Shi, M. J. Pérez-Jiménez, W. Yu, C. Tao: Fault Diagnosis of Power Systems Using Intuitionistic Fuzzy Spiking Neural P Systems. *IEEE Transactions on Smart Grid*, accepted, doi:10.1109/TSG.2017.2670602.
- 79. J. Wang, H. Peng, M. Tu, M. J. Pérez-Jiménez, P. Shi: A Fault Diagnosis Method of Power Systems Based on an Improved Adaptive Fuzzy Spiking Neural P Systems and PSO Algorithms. *Chinese Journal of Electronics*, 25, 2(2016), 320–327.
- 80. T. Song, P. Zheng, M.L.D. Wong, X. Wang: Design of logic gates using spiking neural P systems with homogeneous neurons and astrocytes-like control. *Information Sciences*, 372(2016), 380–391.
- 81. Z. Chen, P. Zhang, X. Wang, X. Shi, T. Wu, P. Zheng: A computational approach for nuclear export signals identification using spiking neural P systems. *Neural Computing and Applications*, 2016, 1–11.
- 82. C. Diaz, T. Frias, G. Sanchez, H. Perez, K. Toscano, G. Duchen: A novel parallel multiplier using spiking neural P systems with dendritic delays. *Neurocomputing*, 239(2017), 113–121.
- 83. K. Huang, T. Wang, Y. He, G. Zhang, M. J. Pérez-Jiménez: Temporal Fuzzy Reasoning Spiking Neural P Systems with Real Numbers for Power System Fault Diagnosis. *Journal of Computational and Theoretical Nanoscience*, 13, 6(2016), 3804–3814.
- 84. K. Huang, G. Zhang, X. Wei, H. Rong, Y. He, T. Wang: Fault Classification of Power Transmission Lines Using Fuzzy Reasoning Spiking Neural P Systems. *Bio-Inspired Computing-Theories and Applications*, 2016, 109–117.
- 85. Y. Yahya, A. Qian, A. Yahya: Power Transformer Fault Diagnosis Using Fuzzy Reasoning Spiking Neural P Systems. *Journal of Intelligent Learning Systems and Applications*, 8, 2016, 77–91.
- 86. J. Li, Y. Huang, J. Xu: Decoder Design Based on Spiking Neural P Systems. *IEEE Transactions on NanoBioscience*, 15, 7, 2016, 639–644.
- 87. G. Duchen, C. Diaz, G. Sanchez, H. Perez: First steps toward memory processor unit architecture based on SN P systems. *Electronics Letters*, 53, 6, 2017, 384–385.
- C. Tao, W. Yu, J. Wang, P. Hong, K. Chen, J. Ming: Fault Diagnosis of Power Systems Based on Triangular Fuzzy Spiking Neural P Systems. *Bio-Inspired Computing-Theories and Applications*, 2016, 385–398.
- J. Xue, X. Liu, P. Chen. Rhombic Grid Based Clustering Algorithm with Spiking Neural P Systems. *Journal of Computational and Theoretical Nanoscience*, 13, 6, 2016, 3895–3901.