

Biomimetic Chaotic Sensors for Water Salinity Measurements and Conductive Titrimetry

Horia-Nicolai L. Teodorescu, Victor P. Cojocaru

<https://doi.org/10.1109/EST.2012.42>

Abstract

We present a simple sensor based on chaotic dynamics for the determination of water salinity. The sensor is based on the change in dynamics produced in a nonlinear dynamic circuit, which has a circuit element composed of the measured saline solution and electrodes.

References

1. E. A. C. Johnson, R.H.C. Bonser and G. Jeronimidis, Recent advances in biomimetic sensing technologies. *Phil. Trans. R. Soc. A* 2009 367, 1559-1569
2. W. Liu, A. Menciassi, S. Scapellato, P. Dario, Yuquan Chen, A biomimetic sensor for a crawling minirobot. *Robotics and Autonomous Systems* 54 (2006) 513-528
3. A. Hyldgård, Í. Ólafsdóttir, M. Olesen, T. Hedegaard, O. Hansen, E.V. Thomsen, Fish & Chips: Four Electrode Conductivity / Salinity Sensor on a Silicon Multi-sensor Chip for Fisheries Research. *IEEE Conf Sensors*, 2005, Oct. 30 2005-Nov. 3 2005, pp. 1124-1127
4. A. Hyldgård, D. Mortensen, K. Birkelund, O. Hansen, E.V. Thomsen, Autonomous multi-sensor micro-system for measurement of ocean water salinity. *Sensors & Actuators A*, 147, 2-3, 2008, pp. 474-484
5. H. Kim, T. Song, K.-H. Ahn, Sharply tuned small force measurement with a biomimetic sensor. *Appl. Phys. Lett.* 98, 013704 (2011)
6. K. Birkelund, L. Nørgaard, E.V. Thomsen, Enhanced polymeric encapsulation for MEMS based multi sensors for fisheries research. *Sensors and Actuators A: Physical*. Vol. 170, Issues 1-2, Nov. 2011, pp. 196-201
7. Nearing, M. Betka, S. Quinn, H. Hentschel, M. Elger, M. Baum, M. Bai, N. Chattopadhyay, E.M. Brown, S. C. Hebert, and H. W. Harris, Polyvalent cation receptor proteins (CaRs) are salinity sensors in fish. *PNAS*, July 9, 2002, vol. 99, no. 14, 9231-9236
8. H.N. Teodorescu (1999), Non-linear-oscillator proximity transducer, RO115316 (Romanian Patent). Publication date: 1999-12-30, Inventor: H.N. Teodorescu. Priority number(s) RO1995-0000903 19950512. Patent Application 95-00903 A, Romania, 12 May 1995.
9. Teodorescu, H.N., Method for measuring at least one parameter and device for carrying this method. European patent application, EP 0 981 038 A1, date of publication 23.02.2000 Bulletin 2000/08, date of filing 19.08.1998. Patent Application #988-10802.3, Aug. 1998/23.02.2000, EP0981038 (A1) Priority number(s): EP19980810802 19980819, patent: EP 981 038 A1 / 23.02.2000
10. H. N. Teodorescu, A-Life Sensing: Chaotic Measuring Systems and Evolvable Measuring. *Proc. Iizuka'2000 Conference*, pp. 507-514 (available online at <http://flsi.cird.or.jp/iizuka2000/CONTENTS.PDF>, accessed March 25, 2012)

Third International Conference on Emerging Security Technologies

5-7 Sept. 2012, Lisbon, Portugal

11. H. N. Teodorescu (2000), Modeling natural sensitivity: A-Life sensitive, selective sensors. *J. Biomedical Fuzzy and Human Sciences*. 6, (1), October 2000, pp. 29-34
12. X. Peillon, HN. Teodorescu, D. Mlynek, A. Kandel, Analysis of chaos sensitivity in circuits based on Wien oscillators, *Int. J. Chaos Theory & Applic.*, vol. 4 (1999), nr. 4, pp. 21-34
13. H. N. Teodorescu, A. Kandel, Grigoras F., Mlynek D. (2002a), Measuring with chaos: Sensorial systems and A-/t-ganglions. *Proc. Romanian Academy, Series A*, 3, (1-2), 2002, pp. 55-62.
14. H. N. Teodorescu et al (2002b), An artificial retina based on chaotic neuronal ganglions, *Proc. Int. Invitational Workshop on Intelligent Interface Devices*. Supported by the Japan Society for the Promotion of Science, under Grant-In-Aid for Research for the Future Program. March 13-14, pp. 39-43, 2002 Kitakyushu, Japan.
15. H. N. Teodorescu, C. Zamfir, Intelligent Sensor, Monitoring and Control Systems Based on Nonlinear Dynamics for Space Environments, *Int. Conf. Environmental Systems, European Symp. Space Environmental Control Systems*, SAE International, Rome, Italy. SAE Technical Paper 2005-01-2875, 2005, doi:10.4271/2005-01-2875 (2005)
16. H.-N. Teodorescu, Dynamic Computers, Artificial Life and Communications (Invited paper). *Proceedings of ICCO 2004, Baile Felix Spa-Oradea, Romania*, pp. 41-52, 2004
17. H.N. Teodorescu, O nouă clasă de circuite haotice bazate pe buclă de reacție capacitivă. (in Romanian). *Proc. 3rd Int. Conf. ICTEI 2010, Chisinau, 20-23 May 2010, Vol. I*, pp. 319-325
18. H.N. Teodorescu, V. Cojocaru, Complex Signal Generators based on Capacitors and on Piezoelectric Loads, In C. Skiadas, I. Dimotikalis, C. Skiadas (Eds.), *Chaos Theory - Modeling, Simulator and Application*, World Scientific 2011, Singapore, pp. 423-430