

REFERENCES

1. A. S. Sedra and K. C. Smith, *Microelectronic Circuit*. (Oxford University Press, New York) 2004,
2. A. Budak, *Passive and active network analysis and synthesis*. Houghton Mifflin, Boston, 1974.
3. F. G. Rudolf, *Oscillator Circuits*, Newnes, 2004.
4. C. Toumazou, F. J. Lidgey, and D. G. Haigh, *Analogue IC design: the currentmode approach*, London, Peter Peregrinus Ltd, 1990.
5. A. S. Sedra, and K. C. Smith, "A second generation current conveyor and its applications," *IEEE Transactions on Circuit Theory*, vol. 17, no. 1, pp. 132–134, 1970.
6. A. Sedra, G. Roberts, and F. Gohn, "The current-conveyor: history, progress and new results," *IEE Proceedings Circuits, Devices and Systems*, vol. 137, no. 2, pp. 78-87, April 1990.
7. S. Long, and J. Zhang, "Low power GaAs current-mode 1.2 Gb/s interchip interconnections," *IEEE Journal of Solid-State Circuits*, vol. 32, pp. 890-897, 1997.
8. R. L. Geiger, and E. S. Sinencio, "Active filter design using operational transconductance amplifiers: a tutorial," *IEEE Circuits and Devices Magazine*, vol.1, pp. 20–23, 1985.
9. A. M. Ismail, and A. M. Soliman, "Novel CMOS current feedback op-amp realization suitable for high frequency applications," *IEEE Transactions on Circuits and Systems–I*, vol. 47, pp. 918–921, 2000.
10. S. Maheshwari, and I. A. Khan, "Current-controlled current differencing buffered amplifier: implementation and applications," *Active and Passive Electronic Components*, vol. 27, pp. 219–227, 2004.
11. W. Chiu, S. I. Liu, H. W. Tsao, and J. J. Chen, "CMOS differential difference current conveyors and their applications," *IEE Proceedings on Circuits, Devices and Systems*, vol. 143, pp. 91–96, 1996.
12. C. Acar, and S. Ozoguz, "A new versatile building block: current differencing buffered amplifier," *Microelectronics Journal*, vol. 30, pp. 157–160, 1999.

13. M. Higashimura, "Realization of current-mode transfer function using four terminal floating nullor," *Electronics Letters*, vol. 27, pp. 170–171, 1991.
14. E. Sackinger, and W. Guggenbühl, "A versatile building block: The CMOS differential difference amplifier," *IEEE Journal of Solid-State Circuits*, vol. SC-22, pp. 287–294, 1987.
15. D. Biolek, "CDTA – building block for current-mode analog signal processing," *In Proceedings of the European conference on circuit theory and design*, Krakow, Poland, vol. III, pp. 397–400, 2003.
16. M. Siripruchyanun, and W. Jaikla, "CMOS current-controlled current differencing transconductance amplifier and applications to analog signal processing," *International Journal of Electronics and Communication (AEU)*, vol. 62, pp. 277-287, 2008.
17. F. Kacar, A. Yesil, and A. Noori, "New CMOS realization of voltage differencing buffered amplifier and its biquad filter applications," *Radioengineering*, vol. 21, pp. 333–339, 2012.
18. D. Pal, A. Srinivasulu, B. B. Pal, A. Demosthenous, and B. N. Das, "Current conveyor-based square/triangular waveform generators with improved linearity," *IEEE Transactions on Instrumentation and Measurement*, vol. 58, no. 7, pp. 2174–2180, 2009.
19. A. Srinivasulu, "A novel current conveyor-based schmitt trigger and its application as a relaxation oscillator," *International Journal of Circuit Theory and Applications*, vol. 39, no. 6, pp. 679-686. 2011.
20. A. M. Soliman, M. H. Al-Shamaa, and M. D. Albab, "Active compensation of RC oscillators," *Frequenz*, vol. 42, no. 11-12, pp. 325– 332, 1988.
21. A. M. Soliman, "Simple sinusoidal active RC oscillators," *International Journal of Electronics*, vol. 39, no. 4, pp. 455-458, 1975.
22. M. T. Abuelmatti, A. A. Al-ghumaiz, and M. K. Khan, "Novel CCII-based single element controlled oscillators employing grounded resistors and capacitors," *International Journal of Electronics*, vol. 78, no. 6, pp. 1107–1112, 1995.
23. C. M. Chang, "Novel current conveyor based single resistance controlled voltage controlled oscillator employing grounded resistors and capacitors," *Electronics Letters*, vol. 30, no. 3, pp. 181–183, 1994.

24. M. T. Abuelmaatti, and S. M. Al-Shahrani, "New CFOA-based triangular/square wave generator," *International Journal of Electronics*, vol. 84, no. 6, pp. 583-588, 1998.
25. A. D. Marcellis, D. C. Claudia, F. Giuseppe, and S. Vincenzo, "A CCII-based wide frequency range square waveform generator," *International Journal of Circuit Theory and Applications*, vol. 41, no. 1, pp. 1-13, 2011.
26. R. S. Del, A. D. Marcellis, G. Ferriand, and V. Stornelli, "Low voltage integrated astable multivibrator based on a single CCII," *In Proceedings of IEEE Research in Microelectronics and Electronics Conference Prime*, France, pp. 177-180. 2007.
27. W. S. Chung, H. Kim, H. W. Cha, and H. J. Kim, "Triangular/square-wave generator with independently controllable frequency and amplitude," *IEEE Transactions on Instrumentation and Measurement*, vol. 54, no. 1, pp. 105-109, 2005.
28. A. S. Haque, M. M. Hossain, W.A. Davis, H. T. Russell Jr and R. L. Carter, "Design of sinusoidal, triangular, and square wave generator using current feedback operational amplifier (CFOA)," *in proceedings of IEEE Region 5 Technical, Professional and Student Conference*, Kansas City, pp. 1-5, 2008.
29. D. R. Bhaskar, S. S. Gupta, R. Senani and A. K. Singh, "New CFOA-based sinusoidal oscillators retaining independent control of oscillation frequency even under the influence of parasitic impedances," *Analog Integrated Circuits and Signal Processing*, vol. 73, no. 1, pp.427-437, 2012.
30. A. M. Soliman, "Current mode CCII oscillators using grounded capacitors and resistors," *International Journal of Circuit Theory and Applications*, vol. 26, no. 5, pp. 431-438, 1998.
31. K. N. Salama, and A. M. Soliman, "Active RC applications of the operational transistor amplifier," *Frequenz Journal*, vol. 54, no. 7-8, pp. 171-176, 2000.
32. K. N. Salama, and A. M. Soliman, "CMOS operational transresistance amplifier for analog signal processing applications," *Microelectronic Journal*, vol. 30, no. 3, pp. 235-245, 1999.
33. A. Toker, S. Ozoguz, O. Cicekoglu, and C. Acar, "Current-mode all-pass filters using current differencing buffered amplifier and a new high-Q band pass filter configuration," *IEEE Transactions on Circuits and Systems- II*, vol. 47, no. 9, pp. 34-38, 2000.

34. M. Hassan and A. M. Soliman, "A modified CMOS realization of the operational transresistance amplifier," *Frequenz Journal*, vol. 60, no. 3-4, pp. 70-76, 2006.
35. J. J. Chen, H. W. Tsao, and C. C. Chen, "Operational transresistance amplifier using CMOS technology," *Electronics Letters*, vol. 28, no. 22, pp. 2087-2088, 1992.
36. J. J. Chen, H. W. Tsao, S. I. Liu, and W. Chiu, "Parasitic-capacitance insensitive current-mode filters using operational transresistance amplifiers," *IEE Proceedings-Circuits, Devices and Systems*, vol. 142, no. 3, pp. 186-192, 2001.
37. H. Elwan, A. M. Soliman, and M. A. Ismail, "CMOS norton amplifier-based digitally controlled VGA for low power wireless applications," *IEEE Transactions on Circuits and Systems- II*, vol. 48, no. 3, pp. 245-254, 2001.
38. A. Rahman, K. Kafrawy, and A. M. Soliman, "A modified CMOS differential operational transresistance Amplifier (OTRA)," *International journal of electronics and communication (AEU)*, vol. 63, pp. 1067-1071, 2009.
39. A. Ravindran, A. Salva, I. Younus, and M. Ismail, "A 0.8V CMOS filter based on a novel low voltage operational transresistance amplifier," in *Proceedings IEEE Midwest Symposium on Circuits and Systems*, pp. 368-371, 2002.
40. G. Kapur, S. Mittal, C. Markan, and V. P. Priya, "Design of field programmable operation amplifier using floating gate MOSFETs," *Microelectronics and Solid State Electronics*, vol. 2, no. 2, pp. 11-23, 2013.
41. A. Durak and H. Kuntman, "A new CMOS differential OTRA design for the low voltage power supplies in the submicron technology," *Turkish journal of electrical engineering and computer sciences*, vol. 13, no. 1, pp. 23-37, 2005.
42. C. S. Lopez, F. V. Fernandez, and E. T. Cuautle, "Generalized admittance matrix models of OTRAs and COAs," *Microelectronics Journal*, vol. 41, pp. 502-505, 2010.
43. C. S. Lopez, E. M. Romero, and E. T. Cuautle, "Symbolic analysis of OTRAs-based circuits," *Journal of Applied Research and Technology*, vol. 9, pp. 69-80, 2011.
44. C. S. Lopez, F. V. Fernandez, E. T. Cuautle, and S. X. D. Tan, "Pathological element-based active device models and their application to symbolic analysis,"

- IEEE Transactions on Circuits and Systems-I: Regular papers*, vol. 58, pp. 1382–1395, 2011.
45. C. L. Hou, H. C. Chien, and Y. K. Lo, “Squarewave generators employing OTRAs,” *IET Proceedings Circuits Devices and Systems*, vol. 152, no. 6, pp. 718–722, 2005.
 46. Y. K. Lo, and H. C. Chien, “Switch controllable OTRA based square/triangular waveform generator,” *IEEE Transactions on Circuits and Systems- II*, vol. 54, no. 12, pp. 1110–1114, 2007.
 47. Y. K. Lo, and H. C. Chien, “Single OTRA-based current-mode mono stable multivibrator with two triggering modes and a reduced recovery time,” *IET Circuits Devices and Systems*, vol. 1, no. 3, pp. 257–261, 2007.
 48. Y. K. Lo, and H. C. Chien, “Current-mode monostable multivibrators using OTRAs,” *IEEE Transactions on Circuits and Systems- II: Express Briefs*, vol. 53, no. 11, pp. 1274 – 1278, 2006.
 49. AD 844 Current Feedback Op-Amp Data Sheet, Analog Devices Inc., Norwood, MA, 1990.
 50. K. N. Salama, and A. M. Soliman, “Novel oscillators using the operational transresistance amplifier,” *Microelectronics Journal*, vol. 31, no.1, pp. 39–47, 2000.
 51. U. Cam, “A novel single-resistance-controlled sinusoidal oscillator employing single operational transresistance amplifier,” *Analog Integrated Circuits and Signal Processing*, vol. 32, no. 2, pp. 183–186, 2002.
 52. H. C. Chien, “New realizations of single OTRA based sinusoidal oscillator,” *Active and passive electronic components*, vol. 2014, pp. 1–12, 2014.
 53. G. Ashish, S. Raj, D. R. Bhaskar, and A. K. Singh, “OTRA-based grounded-FDNR and grounded- inductance simulators and their applications,” *Circuits, Systems and Signal Processing*, vol. 31, no. 2, pp. 489–499, 2012.
 54. R. Pandey, N. Pandey, R. Kumar, and G. Solanki, “A novel OTRA based oscillators with non-interactive control,” *in proceedings of International Conference on Computer and Communication Technology*, Allahabad, India, pp. 658–660, 2010.
 55. M. Kumngern and I. Kansiri, “Single-element control third-order quadrature oscillator using OTRAs,” *in proceedings of International Conference on ICT and Knowledge Engineering*, Bangkok, Thailand, pp. 24–27, 2014.

56. R. Pandey, N. Pandey, G. Komanapalli, and R. Anurag, "OTRA based voltage mode third order quadrature oscillator," *ISRN Electronics*, vol. 2014, pp. 1-5, 2014.
57. R. Pandey, N. Pandey, M. Bothra, and S. K. Paul, "Operational transresistance amplifier-based multiphase sinusoidal oscillators," *Journal of Electrical and Computer Engineering*, vol. 2011, pp. 1-8, 2011.
58. R. Pandey, N. Pandey, and S. K. Paul, "MOS-C third order quadrature oscillator using OTRA," in *proceedings of International Conference on Computer and Communication Technology*, Allahabad, India, pp. 77-80, 2012.
59. R. Pandey and M. Bothra, "Multiphase sinusoidal oscillators using operational Trans-Resistance Amplifier," in *proceedings of IEEE Symposium on Industrial Electronics and Applications*, October 4-6, Kuala Lumpur, Malaysia, pp. 371-376, 2009.
60. J. J. Chen, H. W. Tsao, and S. I. Liu, "Voltage -mode MOSFET –C filters using operational transresistance amplifiers(OTRAs) with reduced parasitic capacitance effect," *IEE Proceedings-Circuits, Devices and Syststems*, vol. 148, no. 5, pp. 242- 249, 2001.
61. W. Chiu, J. H. Tsay, S. I. Liu, H. W. Tsao, and J. J. Chen, "Single –capacitor MOSFET-C interator using OTRA," *Electronics letters*, vol. 31, no. 21, pp. 1796-1797, 1995.
62. A. Gokcen and U. Cam, "MOS-C single amplifier bi-quads using the Operational trans-resistance amplifier," *International Journal of Electronics and Communication (AEU)*, vol. 63, no. 8, pp. 660-664, 2009.
63. Y. S. Hwang, J. J. Chen, and W. T. Lee, "High order linear transformation MOSFET- C filters using operational transresistance amplifiers," in *proceedings of IEEE International Symposium on Circuits and Systems*, pp. 3275 – 3278, 2005.
64. G. Ahmet, S. Kilinc, and U. Cam, "Fully integrated universal biquads using operational transresistance amplifiers with MOS-C realization," *Turkish journal of electrical engineering and computer sciences*, vol. 19, pp. 363–372, 2011.
65. C. M. Chang, Y. Lin, T. Hsu, C. K. Hou, and J. W. Horng, "Generation of voltage-mode OTRA-based multifunction biquad filter," in *Proceeding of Recent Researches in Instrumentation, Measurement, Circuits and Systems*, Wisconsin, USA, pp. 21–27, 2011.

66. S. Kilinc, A. U. Keskin, and U. Cam, "Cascadable voltage-mode multifunction biquad employing single OTRA," *Frequenz*, vol. 61, pp. 84–86, 2007.
67. C. M. Chang, Y. J. Guo, Z. Y. Lin, Y. T. Hou, and J. W. Horng, "Generation of voltage-mode OTRA-R/MOS-C LP, BP, HP, and BR biquad filter," in *Proceedings of Recent Researches in Instrumentation, Measurement, Circuits and Systems*, Wisconsin, USA, pp. 28–34, 2011.
68. Y. S. Hwang, D. S. Wu, J. J. Chen, C. C. Shih, and W. S. Chou, "Realization of high order OTRA MOSFET-C active filters," *Journal of Circuits Systems Signal Processing*, vol. 26, no. 2, pp. 281-291, 2007.
69. S. Kilinc and U. Cam, "Operational trans-resistance amplifier based first- order all-pass filter with an application example," in *Proceedings of IEEE International Midwest Symposium on circuits and systems*, pp. I-65 -68, 2004.
70. S. Kilinc and U. Cam, "Cascadable all-pass and notch filters employing single perational transresistance amplifier," *Journal of Computers and Electrical Engineering*, vol. 31, pp. 391-401, 2005.
71. C. Cakir, U. Cam, and O. Cicekoglu, "Novel all-pass filter configuration employing single OTRA," *IEEE Transactions on Circuits and systems-II: Express briefs*, vol. 52, no. 3, pp. 122-125, 2005.
72. Y. S. Hwang, D. S. Wu, J. J. Chen, C. C. Shih, and W. S. Chou, "Design of current –mode MOSFET-C filters using OTRAs," *International Journal of Circuit, theory and Applications*, vol. 37, no. 3. pp. 397-411, 2009.
73. U. Cam, C. Cakir, and O. Cicekoglu, "Novel transimpedance type First order all pass filter using single OTRA," *International Journal of Electronics and Communications (AEU)*, vol. 58, no. 4, pp. 296-298, 2004.
74. M. Bothra, R. Pandey, N. Pandey, and S. K. Paul, "Operational trans-resistance amplifier based tunable wave active filter," *Radioengineering*, vol. 22, no. 1, pp. 159-166, 2013.
75. R. Pandey, N. Pandey, S. K. Paul, and M. Singh, Manish Jain "Voltage mode single OTRA based biquadratic filters," in *Proceedings of International Conference on Communication and Computer Technology (ICCCT'12)*, Allahabad, India, pp. 63-66, 2012.
76. R. Pandey, N. Pandey, S. K. Paul, M. Singh, and M. Jain, "Voltage mode biquadratic filter using single OTRA," in *Proceedings of IEEE International Conference on Power Electronics (IICPE'13)*, Delhi, India, pp. 1- 4, 2012.

77. R. Pandey, S. Chitransi, N. Pandey and C. Shekhar, "Single OTRA based PD controllers," *International Journal of Engineering Science and Technology*, vol. 4, no. 4, pp. 1426-1437, 2012.
78. R. Pandey, N. Pandey, and S. K. Paul, "Electronically tunable transimpedance instrumentation amplifier based on OTRA," *Journal of Engineering*, vol. 2013, pp. 1-5, 2013.
79. R. Pandey, N. Pandey, S. K. Paul, and B. Sriram, "Single OTRA based analog multiplier and its applications," *ISRN Journal of Electronics*, vol. 2012, pp. 1-7, 2012.
80. R. Pandey, N. Pandey, and S. K. Paul, "Voltage mode pulse width modulator using single operational transresistance amplifier," *Journal of Engineering*, vol. 2013, pp. 1-6, 2013.
81. S. Kilinc, and U. Cam, "Transimpedance type fully integrated bi-quadratic filters using operational transresistance amplifiers," *Analog Integrated Circuits and Signal processing*, vol. 47, pp. 193-198, 2006.
82. F. Kacar, U. Cam, O. Cicekoglu, H. Kuntman, and A. Kuntman, "New parallel immittance simulator realizations employing a single OTRA," in *Proceedings of 45th Midwest Symposium on Circuits and Systems*, pp. I303-6, 2002.
83. U. Cam, F. Kacar, O. Cicekoglu, H. Kuntman, and A. Kuntman, "Novel two OTRA based grounded immittance simulator topologies," *Analog Integrated Circuit and Signal Processing*, vol. 39, pp. 169–175, 2009.
84. R. Pandey, N. Pandey, S. K. Paul, A. Singh, B. Sriram, and K. Trivedi, "New topologies of lossless grounded inductor using OTRA," *Journal of Electrical and Computer Engineering*, vol. 2011, pp. 1–7, 2011.
85. R. Pandey, N. Pandey, S. K. Paul, A. Singh, B. Sriram, and K. Trivedi, "Novel grounded inductance simulator using single OTRA," *International Journal of Circuit Theory and Application*, vol. 42, no. 10, pp. 1069–1079, 2014.
86. R. Pandey, N. Pandey, S. K. Paul, A. Singh, B. Sriram, and K. Trivedi "Grounded immittance simulator using single OTRA with a signal processing application," in *Proceedings of International Conference on electronics and Computer Technology, (ICECT-2011)*, pp. 404- 406, 2011.
87. Ashish Gupta, Raj Senani, D. R. Bhaskar, and A. K. Singh, "New OTRA-based generalized impedance simulator" *ISRN Electronics*, vol. 2013, pp. 1–10, 2013.

88. S. Kilinc, K. N. Salama, and U. Cam, "Realization of fully controllable negative inductance with single operational transresistance amplifier," *Journal of Circuits Systems Signal Processing*, vol. 25, no.1, pp.47-57, 2006.
89. R. Pandey, N. Pandey, and M. Bothra, "Versatile voltage controlled relaxation oscillators using OTRA," in *Proceedings of International Conference on Electronics Computer Technology*, pp. 394-398, 2011.