Experimental Analogue Implementation of Memristor Based Chaotic Oscillators

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Abstract The theory of memristor was postulated in the year of 1971 by Leon O. Chua. The intensive interest on memristive systems is given by the researchers since after the physical realization of the hysteresis behavior in a nanoscale TiO_2 memristor in 2008 by a group of researchers at HP Labs lead by Stanley Williams. Research on memristive systems has been carried out on various capacities such as understanding the mathematics of memristor, finding new materials which have memristive properties, studying the underlying dynamics of memristive systems and revisiting the existing concepts with memristor as a nonlinear element. As a result, memristors have potential applications in various domains. It ranges from neural networks, memory devices, artificial intelligence, high speed computing, nano batteries and human skin modeling, etc. In the recent times, much attention is given to explore the nonlinear dynamics of memristor based circuits. In this chapter, we consider a smooth continuous cubic memristor as nonlinear element. It is applied to (a) an autonomous and (b) a non-autonomous dynamical systems namely, the Chua's circuit and Duffing Oscillator, to study the associated dynamics of these systems. The numerical simulation of the circuit systems as well as its hardware experimental studies are

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