Editorial Corner

Memristive Systems and Beyond

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In 1971, the circuit theory was broadened by L. Chua to cover the phenomenon of memristor, which completed the hitherto triad (resistor-capacitor-inductor) of passive elements. From the beginning, the memristor was used as a hypothetical element for modeling the processes in mechanics and chemistry or in biology. The discovery of a device, later to be known as the HP memristor, by Dr. R. S. Williams' group from the Hewlett-Packard labs in 2008 brought feverish worldwide interest in memristors. It was early recognized that the memristor, a memory version of the conventional resistor, was an ideal candidate for a fast nonvolatile digital or even analog memory. The recognition that the memristor can be used simultaneously as a memory and a computational element makes it a promising building cell for the future computer architecture. Other nanodevices, denoted as "unconventional circuit elements", come on the scene, the memcapacitors and meminductors being currently the most widely known.

The announcement in Nature in 2008 about the development of a nanodevice with the memristive behavior had both positive and negative consequences: It regenerated interest in the memristor concept from 1971, but this concept was commuted into a concrete device, manufactured in the HP labs. The force driving the progress in the field is intensive research into resistive memories that utilize assorted materials and various principles of operation with the aim of mass fabrication of reliable components. However, such a hasty drive towards commercialization is not accompanied by any intense build-up of the fundaments of the theory of memristive and related systems. The negative consequence of the absence of a compact theory of mem-systems can retrospectively be tracked back to the last century before 1971, when a lot of experimental results were published referring to the memristive behavior of the analyzed systems. Without a proper theory, the experimentally observed voltage-current pinched hysteresis loops, today's well-known fingerprint of the memristor, were considered as remarkable anomalies or they were misinterpreted. Another consequence resides in fatal mistakes involved in computer experiments, erroneously designed future applications, and disputes about the validity of the fundamental theoretical basis in most reputable journals.

The original concept of electrical engineering is going to be more closely associated with the materials science, physics, chemistry, and also progressive directions of signal processing in order to solve, from the multidisciplinary point of view, up-to-date problems of the semiconductor and computer industries, nanoelectronics, but also bio-inspired electronics and telecommunication systems utilizing recent results in the theory of chaos, cellular neural networks, and cellular automata. I sincerely believe that such current hot topics, potentially covered also by KMUTNB International Journal of Applied Science and Technology, would attract not only readers but also prospective authors of high-quality papers. The latter is a necessary condition for our journal to be considered highly influential in these fields.

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