Analogue Auto-Associative Memory using a Multi-Valued Memristive Memory Cell

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***Abstract*—Most brain-like computing systems build up from neural networks. While there are some essential problems with this approach, it is well-known that the brain functionally operates as an associative memory. Building associative memories using conventional CMOS technology has already been performed, but this approach suffers from a lack of scalability and information density. Additionally, for a long time, one of the differences between analogue and digital electronics was the fact that digital electronics allowed for easier data storage through a variety of different memory cell architectures. These memory designs make extensive use of transistors and generally trade area, performance and power. However, memristors can be used as high density, analogue, passive storage elements and this paper presents 2 memory cell designs that allow for such multi-valued storage. The noise resistance of these cells is tested and indicates a very good tolerance to external influences, while overall they provide for a very accurate storage of data with high information density. Following on from the description of the storage cells, the paper then continues to build them into an associative memory.**

Keywords*—*Memristive memory, Analogue memory, Associative memory, Memristors circuits, Memristive memory cell, Reliable memory, Multi-value memory, Non Volatile Memory