MODELLING HYSTHERESIS WITH MEMRISTORS

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ABSTRACT

In the realm of electronics, the foundational passive components—resistors, inductors, and capacitors—are well-established. However, in 1971, Leon Chua introduced a theoretical fourth element, the memristor, identified by its distinctive characteristic of memristance and its manifestation in a pinched hysteresis loop. This intriguing property suggests potential applications beyond conventional electronics, particularly in modeling hysteresis phenomena across various domains. This paper delves into the exploration of memristance as a mathematical framework for simulating hysteresis in electrical and mechanical systems. We commence by elucidating the theoretical underpinnings of memristance and its hysteresis behavior, followed by a comprehensive overview of existing hysteresis models. Subsequently, we propose a novel approach that leverages the memristor model to offer enhanced insights and predictive capabilities for hysteresis in these systems. Through analytical examination and simulation studies, we demonstrate the versatility and applicability of the memristor model, underscoring its potential as a universal tool for hysteresis modeling. This research not only broadens the understanding of memristive properties but also opens new avenues for cross-disciplinary applications, ranging from electronic circuit design to mechanical system analysis.

Keywords: memristor, hystheresis