

COGNITIVE APPROACH TO MEMRISTOR WHICH IS ABLE TO ASSOCIATIVE LEARNING

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Objective: We are at a time when electronic systems are structured in a manner similar to the human brain. The memristor, a neuromorphic circuit designed by Chua in 1971, is a modeling of synaptic learning and associative learning. Neuromorphic circuit elements and memristor can be used in artificial brain formation in the later periods and in the treatment of various lesions, psychiatric and neurological diseases. Scientific publications of memristor related neuroscientists, behavioral scientists, cognitive scientists and psychologists are scarce. The aim of this review is to examine the learning models built on the memristor by cognitive perspective.

Methods: In this study, the learning experiments on the memristor were investigated in the literature and the results were compared.

Results: In conditional learning experiments on the memristor, which is its own memory, the unconditional stimulus and the neutral stimulus represent different types of signals. Before the learning, the signals which are denoted as neutral stimuli cannot give output from the electronic angle. But just like Pavlov's dog experiment, when the signal representing the unconditioned stimulus was presented before learning, the output is taken. When both stimuli were presented in the order of the Pavlov experiment, the output was taken from the neutral stimulus. And after learning, the output can be taken when the neutral stimulus given alone. In this way, the memristors were able to learn conditionally and to achieve synaptic modeling.

Conclusion: It has been found that learning procedures can be applied to hardware devices other than algorithmic devices. The learning experiments on the memristor successfully support the synaptic learning and Pavlov type conditional learning procedures. In some experiments, however, the conditional responses in the memristor do not decrease over time. This can be described as a pathological learning and may reduce the efficiency of the memristor.

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