

Synchronization of Switching Phenomena in Two Chaotic Circuits Coupled with Memristors and a Resister

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1. Introduction

In the Mori-Shinriki circuit [1] containing multiple attractors, switching phenomena of attractors are observed by tuning up parameters. On the other hand, in recent years, a memristor is remarked as a new element. The memristor was predicted the existence by Chua in 1971 [2]. The memristor was implemented as a semiconductor element by Hewlett-Packard researchers in 2008 [3]. The memristor is used in many studies of chaos circuit. For example, the memristor was applied to coupling elements by Gambuzza et al. [4].

In this study, switching phenomenon was confirmed in chaotic circuits coupled with two memristors and a resistor. We compared the case where memristor and resistance were used for the coupling element and the case where only resistance was used. We investigate influences by the memristor to switching phenomena.

2. System Model

Figure 1 shows a system model. It is a model combining the nodes of the negative resistance of two Mori-Shinriki circuits with a resistor and two memristor coupled in antiparallel.

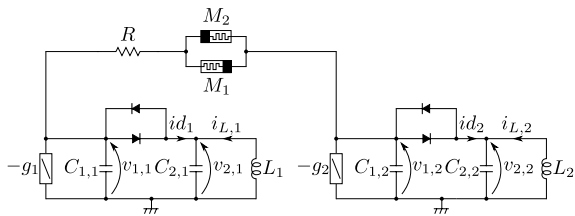


Figure 1: System model.

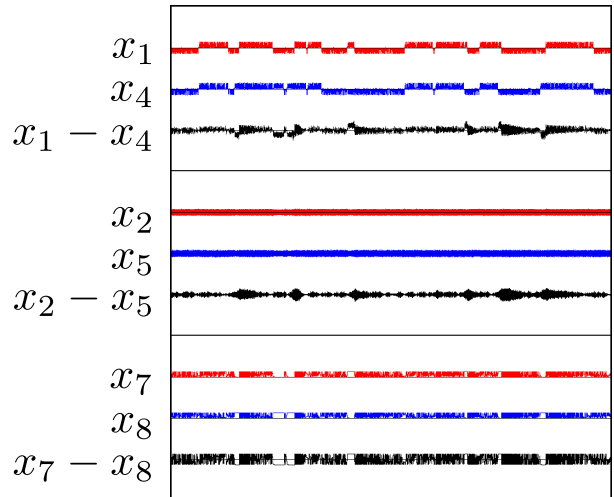
3. Simulation Results

In this study, simulations based on normalized circuit equations was carried out. Figure 2 shows one of the simulation results. The strange parameter for two circuits is λ .

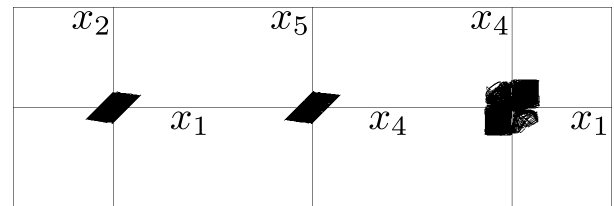
A synchronization of switching phenomena can be observed [5]. From Fig. 2, it can be seen that memristor affects the synchronization of the switching phenomenon.

4. Conclusions

In this study, switching phenomenon was confirmed in chaotic circuits coupled with two memristors and a resistor. We compared the case where memristor and resistance were used for the coupling element and the case where only resistance was used. We investigated influences by the memristor to switching phenomena, we clarified that memristor influences synchronization range of the switching phenomenon. In our future work, the mechanism of the memristor and switching phenomena will be investigated.



(1)



(2)

Figure 2: Synchronization of switching phenomena for parameter mismatch 2.0%. $\lambda = 350$. (1)Time series waveform, (2)Attractor.

Reference

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