

Thin-Film Memdevices and Neuromorphic Systems

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Abstract:

Artificial intelligences (AI) have been already utilized as a lot of applications and will be definitely essential technologies in future smart societies. However, the usual AIs are complicated and long software running on super-high-spec Neumann-type hardware and suffering from huge computer size and unbelievable energy consumption. Therefore, we have been trying research and development of "thin-film memdevices and neuromorphic systems". Thin-film memdevices can be formed in 3-D stacked structures over wide planes, whereas neuromorphic systems are bio-inspired systems mimicking living brains at the hardware level, and they can be compact, low energy consumption, and robust in practical operation like living brains. We aim to further enhance the intrinsic advantage of neuromorphic systems by using thin-film memdevices. Thin-film memristors can be employed as processing elements to ensure stable operation, whereas thin-film memcapacitors can be employed to realize ultimately low energy consumption. We are also considering the combination of thin-film memristors and memcapacitors, memriscapacitors, to get both benefit simultaneously. In this presentation, I would like to introduce our research, explain the detail, and propose our future expectations, as a pioneer of these research fields.

Biography:



Mutsumi Kimura received the B. E. and M. E. degrees in physical engineering from Kyoto University, Kyoto, Japan in 1989 and 1991, respectively, the Ph. D. degree in electrical and electronic engineering from Tokyo University of Agriculture and Technology, Koganei, Tokyo in 2001, and the Ph. D. degree in information science from Nara Institute of Science and Technology, Ikoma, Japan in 2018. He joined Matsushita Electric Industrial Co., Ltd. in 1991 and Seiko Epson Corp. in 1995. He is currently a Professor at Ryukoku University, Otsu, Japan and simultaneously an Affiliate Professor at

Nara Institute of Science and Technology, Ikoma, Japan. His research interests are brain-type integrated systems, neural networks, thin-film device applications, etc. In recognition of his contributions, he, his colleagues, and his students was honored with a lot of paper and presentation award. He is a Fellow of SID, and selected as a percentile rank of 2% or above in his scientific field by Elsevier in 2023