Title:	Harnessing tipping points for logic operations
Authors:	Sudeshna, Sinha (/jspui/browse?type=author&value=Sudeshna%2C+Sinha)
Keywords:	Harnessing tipping points
Issue Date:	2021
Publisher:	Springer Nature
Citation:	European Physical Journal: Special Topics, 230(16-17), 3403-3409.
Abstract:	We first review ideas of harnessing chaotic attractors to implement robust and flexible logic gates, and recast these concepts in the context of tipping points. The central idea is as follows: The presence of tipping points in complex systems endows it with the capability to switch between very different attractors under small changes in parameter, and this feature can be exploited to obtain reliable logic operations. The binary logic outputs can be efficiently mapped to dynamical attractors bounded in different phase space regions, and the logic inputs can be simply encoded through small changes in a parameter. We then go on to extend our central idea with new implementations of multiple-input logic operations. We show explicitly that the system jumps consistently in response to an external stream of multiple inputs, thus offering robust realizations of more complex multi-input logic gates. We demonstrate that the existence of tipping points offers the advantage that very low-amplitude inputs can yield highly amplified outputs. We also show that noise may play a constructive role, enhancing the reliability of the emergent multi-input logic operations, thus strengthening the concept of generalized Logical Stochastic Resonance. These results indicate that the tipping mechanism can serve to construct general purpose computing devices, which have the added capacity to reconfigure logic functionalities efficiently by small parameter changes.
Description:	Only IISERM authors are available in the record.
URI:	https://doi.org/10.1140/epjs/s11734-021-00014-2 (https://doi.org/10.1140/epjs/s11734-021-00014-2) http://hdl.handle.net/123456789/4632 (http://hdl.handle.net/123456789/4632)
Appears in Collections:	Research Articles (/jspui/handle/123456789/9)

Files in This Item:

File	Description	Size	Format	
Need To Add…Full Text_PDF. (/jspui/bitstream/123456789/4632/1/Need%20To%20Add%e2%80%a6Full%20Text_PDF.)		15.36 kB	Unknown	View/Open (/jspui/l