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in this thesis i study the dynamics of autonomous boolean networks which are networks of nodes that execute boolean functions in continuous time without external clocking in these systems link time delays heterogeneity and non ideal effects play an important role the autonomous boolean nodes form the xor ring oscillator which is an autonomous boolean network it includes n autonomous nodes that are assembled in a ring topology with bidirectional nearest neighbor coupling and feedback in this article i develop a model for quantum autonomous boolean networks that exhibits many of the same properties as the classical model while also demonstrating uniquely quantum properties within a rich landscape of behavior we present the design of an autonomous time delay boolean network realized with readily available electronic components through simulations and experiments that account for the detailed nonlinear response of each circuit element we demonstrate that a network with five boolean nodes displays complex behavior we realize autonomous boolean networks by using logic gates in their autonomous mode of operation on a field programmable gate array this allows us to implement time continuous systems with complex dynamical behaviors that can be conveniently interconnected into large scale networks with flexible topologies that consist of time delay links and boolean networks play an important role in modern biology as popular alternatives to traditional continuous models after a brief introduction we will analyze two main features that influence the dynamics network topology and the boolean functions introduction previous work on boolean networks autonomous boolean networks on electronic chips chaotic dynamics of autonomous boolean networks ultra fast physical generation of random numbers using hybrid boolean networks periodic dynamics in autonomous boolean networks chimera dynamics in networks of boolean phase oscillators in this chapter i apply autonomous boolean networks to one particularly popular topic of complex systems research deterministic chaos we undertake a systematic study of the dynamics of boolean networks to determine the origin of chaos observed in recent experiments networks with nodes consisting of in this chapter i discuss the experimental implementation of autonomous boolean networks on electronic chips specifically i describe the setup and non ideal characteristics of the used microelectronic chips in sect 3 1 and the design flow of implementing the rosin autonomous boolean network abn digital trng has been widely studied due to its nice properties such as low energy consumption high speed strong platform portability and strong randomness this thesis focuses on the dynamics of autonomous boolean networks on the basis of boolean logic functions in continuous time without external clocking these networks are realized with integrated circuits on an electronic chip as a field programmable gate array fpga with roughly 100 000 logic gates offering an extremely flexible model system we realize autonomous boolean networks by using logic gates in their autonomous mode of operation on a field programmable gate array this allows us to implement time continuous systems with complex dynamical behaviors that can be conveniently interconnected into large scale networks with flexible t buy dynamics of complex autonomous boolean networks by david p rosin online at alibris we have new and used copies available in 2 editions starting at 29 70 shop now introduction previous work on boolean networks autonomous boolean networks on electronic chips chaotic dynamics of autonomous boolean networks ultra fast physical generation of random numbers using hybrid boolean networks periodic dynamics in autonomous boolean networks chimera dynamics in networks of boolean phase oscillators the refractory period of the boolean neuron tref and its pulse width tpulse are determined by the integers nref and npulse respectively the voltages vin and vref are inputs to an and gate where the second input is inverted as indicated by a circle find that the predicted complex behavior is replaced by deterministic chaos in our exper imental systems and numerical simulations that take into account the non ideal behaviors described below this thesis focuses on the dynamics of autonomous boolean networks on the basis of boolean logic functions in continuous time without external clocking these networks are realized with integrated circuits on an electronic chip as a field programmable gate array fpga with roughly 100 000 logic ga in this chapter i have connected boolean neurons into a network with a topology consisting of interconnected rings and have used the resulting networks to study a breakdown and the possibility of control of cluster synchronization dynamics the author presents pioneering results on theoretical modeling experimental realization and selected applications in this regard three classes of novel dynamic behavior are investigated i chaotic boolean networks are proposed as high speed physical random number generators with high bit rates

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in this thesis i study the dynamics of autonomous boolean networks which are networks of nodes that execute boolean functions in continuous time without external clocking in these systems link time delays heterogeneity and non ideal effects play an important role

ultra fast physical generation of random numbers springer *Apr 11 2024*

the autonomous boolean nodes form the xor ring oscillator which is an autonomous boolean network it includes n autonomous nodes that are assembled in a ring topology with bidirectional nearest neighbor coupling and feedback

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in this article i develop a model for quantum autonomous boolean networks that exhibits many of the same properties as the classical model while also demonstrating uniquely quantum properties within a rich landscape of behavior

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we present the design of an autonomous time delay boolean network realized with readily available electronic components through simulations and experiments that account for the detailed nonlinear response of each circuit element we demonstrate that a network with five boolean nodes displays complex behavior

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we realize autonomous boolean networks by using logic gates in their autonomous mode of operation on a field programmable gate array this allows us to implement time continuous systems with complex dynamical behaviors that can be conveniently interconnected into large scale networks with flexible topologies that consist of time delay links and

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boolean networks play an important role in modern biology as popular alternatives to traditional continuous models after a brief introduction we will analyze two main features that influence the dynamics network topology and the boolean functions

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introduction previous work on boolean networks autonomous boolean networks on electronic chips chaotic dynamics of autonomous boolean networks ultra fast physical generation of random numbers using hybrid boolean networks periodic dynamics in autonomous boolean networks chimera dynamics in networks of boolean phase oscillators

chaotic dynamics of autonomous boolean networks Oct 05 2023

in this chapter i apply autonomous boolean networks to one particularly popular topic of complex systems research deterministic chaos

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we undertake a systematic study of the dynamics of boolean networks to determine the origin of chaos observed in recent experiments networks with nodes consisting of

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in this chapter i discuss the experimental implementation of autonomous boolean networks on electronic chips specifically i describe the setup and non ideal characteristics of the used microelectronic chips in sect 3 1 and the design flow of implementing

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the rosin autonomous boolean network abn digital trng has been widely studied due to its nice properties such as low energy consumption high speed strong platform portability and strong randomness

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this thesis focuses on the dynamics of autonomous boolean networks on the basis of boolean logic functions in continuous time without external clocking these networks are realized with integrated circuits on an electronic chip as a field programmable gate array fpga with roughly 100 000 logic gates offering an extremely flexible model system

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figure 69 from dynamics of complex autonomous boolean *Jan 28 2023*

the refractory period of the boolean neuron tref and its pulse width tpulse are determined by the integers nref and npulse respectively the voltages vin and vref are inputs to an and gate where the second input is inverted as indicated by a circle

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find that the predicted complex behavior is replaced by deterministic chaos in our exper imental systems and numerical simulations that take into account the non ideal behaviors described below

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this thesis focuses on the dynamics of autonomous boolean networks on the basis of boolean logic functions in continuous time without external clocking these networks are realized with integrated circuits on an electronic chip as a field programmable gate array fpga with roughly 100 000 logic ga

cluster synchronization in boolean neural networks *Oct 25 2022*

in this chapter i have connected boolean neurons into a network with a topology consisting of interconnected rings and have used the resulting networks to study a breakdown and the possibility of control of cluster synchronization dynamics

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the author presents pioneering results on theoretical modeling experimental realization and selected applications in this regard three classes of novel dynamic behavior are investigated i chaotic boolean networks are proposed as high speed physical random number generators with high bit rates

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