'Chaogates' hold promise for the semiconductor industry

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In a move that holds great significance for the semiconductor industry, a team of researchers has created an alternative to conventional logic gates, demonstrated them in silicon, and dubbed them "chaogates." The researchers present their findings in *Chaos*.

Simply put, they used chaotic patterns to encode and manipulate inputs to produce a desired output. They selected desired patterns from the infinite variety offered by a chaotic system. A subset of these patterns was then used to map the system inputs (initial conditions) to their desired outputs. It turns out that this process provides a method to exploit the richness inherent in nonlinear dynamics to design computing devices with the capacity to reconfigure into a range of logic gates. The resulting morphing gates are chaogates.

"Chaogates are the building block of new, chaos-based computer systems that exploit the enormous pattern formation properties of chaotic systems for computation," says William Ditto, an inventor of chaos-based computing and director of the School of Biological Health Systems Engineering at Arizona State University. "Imagine a computer that can change its own internal behavior to create a billion custom chips a second based on what the user is doing that second -- one that can reconfigure itself to be the fastest computer for that moment, for your purpose."

This program is already underway at ChaoLogix, a semiconductor company founded by Ditto and colleagues, headquartered in Gainsville,

Florida, into commercial prototypes that could potentially go into every type of consumer electronic device. It has some added advantages for gaming, Ditto explains, as well as for secure computer chips (it is possibly much more immune to hacking of information at the hardware level than conventional computer chips) and custom, morphable gaming chips.

And just as important, integrated circuits using chaogates can be manufactured using the same fabrication, assembly and test facilities as those already in use today. Significantly, these integrated circuits can incorporate standard logic, memory and chaogates on the same device.

More information: The article, "Chaogates: morphing logic gates designed to exploit dynamical patterns" by William L. Ditto, A. Miliotis, K. Murali, Sudeshna Sinha, and Mark L. Spano appears in the journal *Chaos*. See: link.aip.org/link/chaoeh/v20/i3/p037107/s1

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