



Southern Illinois University System

Applications

- Integrated circuit design
- Complex threshold logic circuits
- Circuit design software

Inventor(s)

Themistoklis Haniotakis, PhD
Dr. Haniotakis is an associate professor of electrical and computer engineering at SIU Carbondale. His research focuses on VLSI designs and fault-tolerant systems.

Spyros Tragoudas, PhD
Dr. Tragoudas is a professor of electrical and computer engineering at SIU Carbondale. He serves as the department chair and is site director for SIU's NSF Center for Embedded Systems.

Seyed Nima Mozaffari
Mr. Mozaffari is a graduate student researcher in SIU Carbondale's department of electrical and computer engineering.

Contact

Robert Patino, JD
Director
rpatino@siumed.edu
(217) 545-8168

Higher-Order Complex Threshold Logic Gates

Threshold logic gates are an increasingly popular option for digital circuit design due to attractive delay, power, and area characteristics. Boolean threshold logic functions can be implemented by coupling each of a series of inputs to a corresponding active weight, where input patterns generating a total weight in excess of a specified threshold evaluate to 1. The one-to-one relationship between inputs and weights, however, mean that the size and complexity of threshold logic circuits grows rapidly as function sophistication increases.

Invention

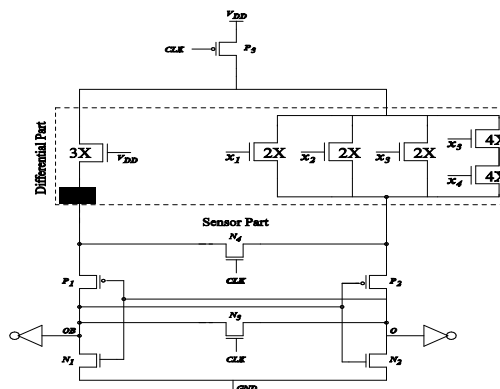
SIU researchers have developed a new paradigm for complex current-mode threshold logic gates wherein the number of input weights may exceed the number of binary inputs. As function/circuit complexity increases, this additional degree of freedom can allow for significant simplification and streamlining of circuit design.

Key Advantages

- Simplified circuits respond more quickly, draw less power, have reduced spatial requirements, and have fewer potential failure modes.
- Accompanying automation framework identifies relevant threshold functions and circuit design
- Physical parameters/tolerances of components incorporated in automation framework for to ensure reliable operation

Status

U.S. provisional patent application #62/642,366 was filed March 13, 2018. The technology is available for license.



Current-mode threshold gate implementation for $F_2 = x_4x_3 + x_3x_2 + x_3x_1 + x_2x_1$ with a second-order threshold gate.

Other opportunities related to this technology, included but not limited to sponsored and/or collaborative research, may be available. Please reach out to the designated contact identified at left for more information.