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## A Method of Obfuscating Digital Logic Circuits Using Threshold Voltage

Growing competition in the silicon industry has increased reverse engineering aimed at stealing hardware intellectual property. Due to the increase, hardware obfuscation, or concealing the functionality of a circuit design, has become vital. Digital circuits rely on a threshold logic gate function controlled by threshold voltages can be leveraged to hide a circuit's functionality. The threshold voltage characteristic is nearly impossible to obtain through reverse engineering which ultimately provides a reliable way for scientists to obfuscate a circuit's functionality.

Researchers at ASU have developed a method to completely hide the functionality of a digital circuit by using a unique aspect of threshold functions in threshold logic gate circuitry. The output of the circuit's threshold logic function is a function of multiple weighted inputs with a difference in threshold voltage high enough such that small weights for high threshold voltage values are removed from calculation. As threshold voltage is complex to determine, one cannot observe that some inputs are removed, creating a smaller design with a functionality that is complex to determine.

### Potential Applications

- Digital Intellectual Property Protection
- Digital Circuit and Semiconductor Manufacturing

### Benefits and Advantages

- Effective – The calculation removes certain inputs, making reverse engineering of the logic circuit nearly impossible
- Lower Cost – The hidden input values make it possible to hide functionality from a foundry, allowing makers to split manufacturing into separate, cheaper processes

For more information about the inventor(s) and their research, please see:

[Dr. Sarma Vrudhula's directory webpage](#)

