VLSI Design

Special Issue on **Reversible Logic**

Hindawi

CALL FOR PAPERS

In 2009, the Semiconductor Industries Association suggested that, by the end of the 2020s, it would be necessary to introduce new devices that would have properties beyond the ones of CMOS devices. These "beyond CMOS" devices could use particle spin for memory or logic functions or perform information processing using spin waves. This is of course referring to quantum technologies; however, the move to quantum would require significant paradigm shifts which have not yet made it into mainstream industry. Instead, many researchers are examining reversible logic as a stepping-stone approach. Quantum computing is inherently reversible, with no information being lost during processing. Moreover, Landauer proved that logical irreversibility implied physical irreversibility, which unavoidably leads to heat dissipation. Thus researchers are focusing more and more on designing logically reversible circuits, with a view to a future technology for their implementation and the savings that will accompany this.

Over the last two decades, reversible logic has been utilized in emergent applications such as low power design, testing, programming languages, quantum computation, and optical computing. There has also been focus on how existing benchmarks and applications can be efficiently implemented using logically reversible models, with particular emphasis on logic synthesis approaches based on libraries of gates such as Toffoli, Fredkin/CNOT, and NOT gates. More recently other domains such as reversible sequential circuit design, fault tolerant reversible circuits, ternary reversible circuits, synthesis for expanded gate libraries, and DNA computing has broadened the scope of research related to reversible logic.

For this special issue, we invite authors to contribute original research articles as well as review articles in one or more areas related to reversible logic. The goal is to offer a broad sample of work that illustrates and stimulates the continuing effort to understand the broad ranging implications and applications of reversible logic.

Potential topics include but are not limited to the following:

- Binary, ternary, and multivalued circuit design and synthesis approaches for reversible circuits
- Online and offline testing of reversible circuits
- DNA reversible circuits
- Fault tolerant reversible circuits
- Reversible hardware description languages
- Reversible logic synthesis
- Quantum circuits

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haghparast@iausr.ac.ir

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