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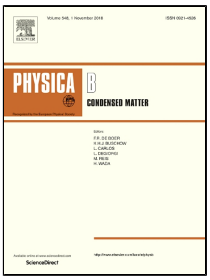

A revolution in nanostructure designs by proposing a novel QCA full-adder based on optimized 3-input XOR

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A revolution in nanostructure designs by proposing a novel QCA full-adder based on optimized 3-input XOR

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Abstract. Quantum-dot cellular automata is one of the best alternative technologies of CMOS at nano-scale. It is an emerging technology promising to design circuits with low power consumption, high density as well as high speed. In this paper, a novel 3-input XOR gate based on the cellular interaction is first proposed which consists of 10 cells and requires two clocks. To demonstrate the efficiency of the proposed XOR gate, an optimized single-layer full-adder is designed here which contains only 20 cells and requires three clock phases. In order to verify the function of the proposed full-adder, some physical proofs and computer simulations are provided. The simulations are carried out by QCADesigner2.0.3. The proposed full-adder shows 24% and 9.09% improvement in cell count in comparison to the best previous single-layer and multi-layer full-adder designs, respectively. In addition, the power consumption of the proposed full-adder is calculated by QCAPro tool. The results of power dissipation analysis show that the proposed full-adder has the lowest energy consumption compared to the previous designs.

Keywords: Nanotechnology; Quantum-dot Cellular Automata (QCA); Full-adder; QCADesigner

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