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Approximating Arithmetic Circuits for IoT Devices Data Processing

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Highlights

- A systematic framework is utilized to achieve approximate blocks.
- Approximate blocks are used in sustainable and secure computing in smart cities.
- The analysis is based on area, delay with considered error percentage.
- Designed blocks are faster & smaller exploited for components in smart cities.

Abstract

Smart cities require improved and new generation IoT devices, sensors, and technology so that a whole new digital environment can be created. The various aspects of the smart city can be improved through digital transformation, sustainability, resource management, improved quality of life, and security because of emerging applications such as voice recognition, image sensing, and so on. There is a massive deployment of smart devices and sensors, which sense, collect, and process a large amount of data. So there are many critical strategies and intelligent computing is required. The most popular way to solve computational issues with conventional blocks and structures to achieve exact, deterministic results is hard computing. However, emerging applications are tolerant towards errors, so the need for a precise result is diminishing. Approximate computing is a new paradigm in the field where error tolerance is applicable; it relaxes the need for an accurate and deterministic result while also providing advantages in terms of area, time, and delay. In this paper, we proposed a novel approximate computation based on a systematic approach that utilises the Look-Up-Table (LUT) with specific errors to achieve an approximate arithmetic circuit. Approximate adder circuit is designed so that this technique can be reused for different designs deployed in various applications or IoT devices. The analysis is based on area, delay with a considered error percentage. The proposed arithmetic circuit achieves a 68% reduction in chip area compared to the exact one with a delay of 6.159 ns. The results show that the designed approximate arithmetic circuit is smaller in size, and energy-efficient and can be exploited to implement circuits used in IoT devices.