A Low-Complexity Turbo Decoder Architecture for Energy-Efficient Wireless Sensor Networks

Abstract—Turbo codes have recently been considered for energy-constrained wireless communication applications, since they facilitate a low transmission energy consumption. However, in order to reduce the overall energy consumption, lookup table-log-BCJR (LUT-Log-BCJR) architectures having a low processing energy consumption are required. In this paper, we decompose the LUT-Log-BCJR architecture into its most fundamental add compare select (ACS) operations and perform them using a novel low-complexity ACS unit. We demonstrate that our architecture employs an order of magnitude fewer gates than the most recent LUT-Log-BCJR architectures, facilitating a 71% energy consumption reduction. Compared to state-of-the-art maximum logarithmic Bahl-Cocke-Jelinek-Raviv implementations, our approach facilitates a 10% reduction in the overall energy consumption at ranges above 58 m.

RTL Schematic of turbo decoder
Technology Schematic of Turbo decoder
Technology Schematic of Turbo Encoder
Output Wave forms of turbo encoder
RTL Schematic of SB/DB Modes of Turbo Decoder

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Technology Schematic of SB/DB Mode of Turbo Decoder
Simulation Results of SB/DB Modes