



TECHNOLOGY

Method of Error Correction in Non-Volatile Memories

OVERVIEW

Background

Solid state memory technologies, such as flash and newer phase change varieties, are fast becoming the storage solutions of choice for desktop computers, data centers, and particularly mobile electronics. To answer the demand for increased storage capacity, designs proposed in recent years have shifted from two-level memory cells, representing a digital 1 or 0, to multi-level cells in which the charge levels are quantized to more than two values. However, these charges drift over time causing errors in the stored data. Rank modulation is a relatively new scheme where data is stored not as an absolute charge, but the relative charge in a cell, thereby reducing exposure of the data to the charge drift (for flash memories) or resistance drift (for phase-change memories). However, errors can still occur in the data if the relative ranks of the cells change because of the non-uniform charge or resistance drift. The only known method to correct errors in the rank modulation scheme supports correction of a single error in a block of n cells (for instance, a memory page).

Innovative Technology

Researchers at the University of Maryland have developed three new, general constructions of error-correcting codes in permutations that cover a broad range of code parameters in the rank modulation scheme. The new constructions enable one to design methods that cover a broad range of possible values from a few errors to a large proportion of errors in a block of n cells. The proposed methods enable one to significantly increase the reliability of non-volatile memory devices based on flash or phase-change technology in the rank modulation scheme.

Advantages:

- Corrects a broader range of errors than current methods
- Increased data volume due to more efficient charge drift management

Applications:

- Solid-state memory
- Phase-change memory
- Memories based on rank modulation scheme

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Additional Information

INSTITUTION

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PATENT STATUS

Patent(s) pending

LICENSE STATUS

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CATEGORIES

- Information Technology

EXTERNAL RESOURCES

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