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Mapping structures for flash memories: techniques and open problems

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Paper
Citations2
Patent
Citations182
Full
Text Views

Abstract

Document Sections

1. Introduction
2. Block-Mapping Techniques
3. Beyond Block Mapping
4. Open Problems
5. Summary

Authors

Figures

References

Citations

Keywords

Metrics

Footnotes

Abstract:

Flash memory is a type of electrically erasable programmable read-only memory (EEPROM). Because flash memories are nonvolatile and relatively dense, they are now used to store files and other persistent objects in handheld computers, mobile phones, digital cameras, portable music players, and many other computer systems in which magnetic disks are inappropriate. Flash, like earlier EEPROM devices, suffers from two limitations. First, bits can only be cleared by erasing a large block of memory. Second, each block can only sustain a limited number of erasures, after which it can no longer reliably store data. Due to these limitations, sophisticated data structures and algorithms are required to effectively use flash memories. These algorithms and data structures support efficient not-in-place updates of data, reduce the number of erasures, and level the wear of the blocks in the device. This survey presents these algorithms and data structures as well as open theoretical problems that arise in this area.

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1. Introduction

Flash memory is a type of electrically erasable programmable read-only memory (EEPROM). Flash memory is nonvolatile (retains its content without power), so it is used to store files and other persistent objects in handheld computers and mobile phones, in digital cameras, and in portable music players.

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