Indonesian Journal of Electrical Engineering and Computer Science
Vol. 9, No. 3, March 2018, pp. 539~542
ISSN: 2502-4752, DOI: 10.11591/ijeecs.v9.i3.pp539-542

Improvement of Garbage Management for NAND Memory System

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Article Info

Article history:

Received Nov 25 2017
Revised Jan 30, 2018
Accepted Feb 19, 2018

Keywords:

Flash memory
NAND
RAM

ABSTRACT

Recent days increasing the use of flash memory device in embedded systems. Diverse qualities of NAND blaze recollections from hard circles include: a constrained square eradicate check, the inconceivability of set up refresh, and asymmetry in operation granularity. Along these lines different rubbish accumulation procedures for the NAND streak recollections have been proposed. In any case, existing rubbish accumulation procedures obstruct square wear leveling since they utilize a similar technique for both hot and icy information. In this paper, we propose effective junk accumulation and piece administration strategies to enhance piece wear leveling and trash gathering speed. Above all else, information is arranged into three sorts concurring to alteration recurrence - hot information, cool information, and warm data and distinctive sorts of information are put away in various pieces. The delete cost is figured considering information sort, and afterward junk gathering is performed for the hinders whose eradicate costs surpass the limit esteem. Furthermore, unique square records are made in RAM by information sort, and the squares are orchestrated in the request of their eradicate cost.

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1. INTRODUCTION

Streak recollections are utilized today in different installed frameworks, for example, cell phones, PDAs, and Digital Cameras. The blaze memory is rising as a typical stockpiling gadget that replaces hard circles since it has many preferences such as little size, high strength, and low power utilization. An adaptive striping architecture for flash memory storage systems of embedded systems and Locality-aware sector translations for NAND flash memory-based storage systems are explained by [1], [2]. Be that as it may, NAND streak recollections have a couple of confinements because of their physical qualities. In the first place, before new information can be composed in a range with information saved money on it, the region must be eradicated. Despite the fact that perusing and composing should be possible in page units, eradicating must be performed in square units. Composing mistakes happen in a square that has surpassed the permitted delete tally. Real-time garbage collection for flash-memory storage systems is discussed by [3]. Along these lines, all regions of the blaze memory ought to be uniformly utilized; something else, the accessible storage room can quickly be lessened. To conquer these points of confinement, NAND streak recollections compose new information in an alternate space and refute old information when modifying information. Endurance enhancement of flash-memory storage systems is described by [4].

Likewise, to secure adequate free pieces, when there are squares in which invalid and legitimate information are blended, the legitimate information are moved to exhaust pieces and existing pieces are erased and transformed into free squares. This procedure is called "rubbish gathering." Because streak recollections set aside more opportunity to eradicate than to peruse and keep in touch with, it is imperative to limit the eradicate number when performing rubbish accumulation. Priority-based garbage collection for data storage systems and Log-Block Management Scheme for MLC NAND Flash Memory Storage Systems are discussed by [5], [6]. Moreover, the pieces to be deleted ought to be chosen while considering square wear leveling and the cost of replicating substantial pages to another piece. Existing waste gathering strategies and piece administration techniques can't ensure piece wear leveling, since they don't consider information sort as far as alteration recurrence. To defeat these issues, this paper proposes a proficient refuse gathering and piece administration by taking into record information sort. An efficient design of serial and parallel memory and Smart memory alloys as structural composites are described by [7], [8].

1. Proposed NAND Flash memory management:

This paper proposes a rubbish accumulation and square administration technique that considers wear leveling while fundamentally utilizing the MODA Page Allocation Method. The proposed techniques instigate wear leveling of all squares by choosing hinders for junk accumulation in view of various criteria by information sort. Besides, a free square assignment technique that considers wear leveling by independently making free square records by information sort is exhibited.

a) Generate a free block allocation method

Hinders that store hot information, frosty information, and warm information (which don't have a place with hot or icy information) have distinctive probabilities of being eradicated. In this manner, diverse criteria for apportioning free squares are required when composing this information. The proposed strategy orchestrates free squares in the Smash in the rising request of their eradicate tally, and makes three arrangements of free pieces, i.e., Freelistl, Freelist2, and Freelist3 for hot information, warm information, and chilly information,individually. Since the obstructs that store hot information have the most elevated likelihood of being eradicated, when hot information are composed, a free square is dispensed from the principal free piece list with the most minimal delete tally; for warm information or new information, a free square is apportioned from the second rundown; and for cool information, a free piece is designated from the third rundown. On the off chance that there is no free square in a free piece list, a free square is dispensed from the following free piece list. Figure 1 shows the flow chart of block allocation.

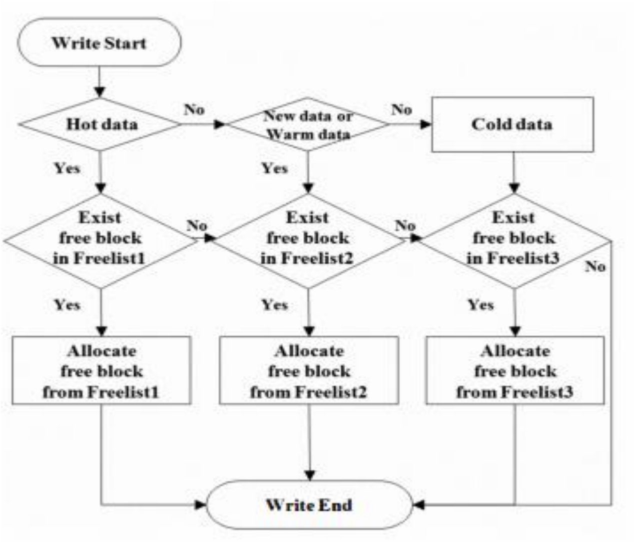

Figure 1. Flow chart of Block allocation method

b) Create data block list

At the point when arrangements of obstructs that contain information are made in RAM, isolate records are madefor hot information pieces, warm information squares, and cool information pieces. These three records are orchestrated in view of various criteria for proficient waste accumulation and free piece distribution. Due to visit adjustments, hot information pieces have a high rate of invalid pages. Free hinders that have the most reduced delete tally are designated for hot information. Thusly, hot information squares ought to be viewed as first when waste gathering is performed. Hot information squares are recorded in the dropping request of their invalid page proportion to limit the delete fetched amid junk accumulation. Since frosty information are definitely not refreshed oftentimes, chilly information pieces have a lower invalid page proportion and a higher delete number. Accordingly, they ought to be handled last amid trash accumulation.

2. GARBAGE GATHERING METHOD

YAFFS performs trash accumulation before information composing. Since this deferrals the compose operation, refuse gathering ought to be performed while the framework is out of gear status to keep the postponement of the compose operation. For this reason, two cases are considered. In the first place, based on the evidence that if the framework is sit out of gear for 2 seconds, the likelihood that the framework will keep on being inert for 4 seconds is 95%, the junk gathering is performed when the framework is sit out of gear for 2 seconds. As of now, the squares with just invalid pages are eradicated to limit the framework overhead. Second, if the framework keeps on running without sit out of gear time, refuse accumulation is performed when the quantity of free piece falls beneath T_f this is the quantity of hot information pieces. The trash gathering is completed in the request of the rundown whose information pieces have low eradicate numbers: hot information list, warm information rundown, and icy information list. To keep the extreme delete cost, the limit esteems are set. In the hot information list, the limit esteem T_h is the quantity of invalid pages in a piece. In the event that there are hot information obstructs with their number of invalid pages more noteworthy than T_h, refuse gathering is performed in the sliding request of the invalid page proportion in the hot information list. For the warm information list, refuse gathering is performed for hinders that have esteem in of which is more noteworthy than the edge T_w. Ultimately, in the harsh elements information list, rubbish accumulation is performed for the obstructs that have eradicate checks lower than the limit T_C. The flow chart of garbage collection is shown in Figure 2.

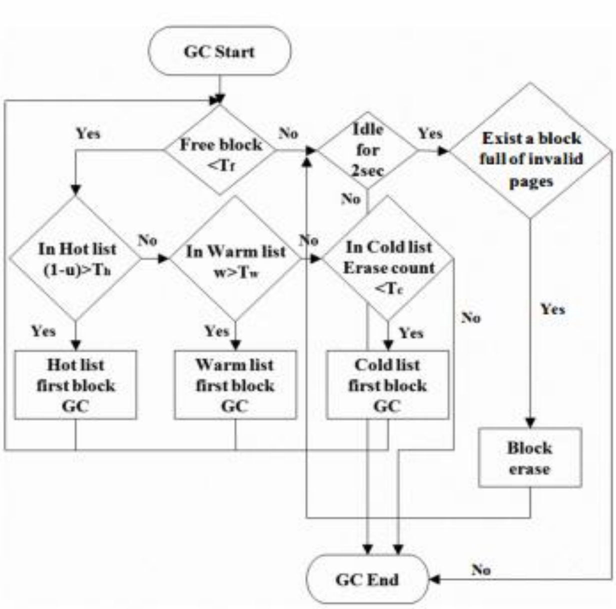

Figure 2. Flow chart of garbage collection system

3. RESULTS AND DISCUSSION

The proposed NAND based garbage collection system is estimated and mentioned in Table 1.

Table 1. Proposed NAND garbage collection system

Block count	150
Page count per block	40
File size	0.5-20KB
T_h	20

The Cost-Benefit calculation has the longest waste gathering time since it has more substantial pages to duplicate than alternate techniques. The Greedy calculation has less substantial pages to duplicate yet invest much energy scanning for the objective obstructs for the rubbish accumulation, so its trash gathering time is just somewhat shorter than that of the Cost-Benefit calculation. The comparison diagram of proposed and conventional NAND garbage based memory device is shown in Figure 3.

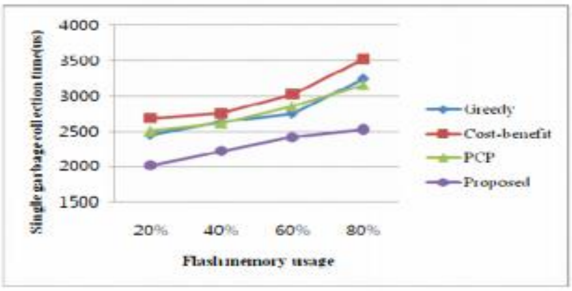

Figure 3. Comparison of garbage value

4. CONCLUSION

Existing trash gathering techniques need to look for hinders that have the ideal delete taken a toll in the wake of deciding the eradicate cost of each piece before erasing squares. In this manner, the refuse accumulation time increments in extent to the blaze memory estimate. Besides, they don't demonstrate great execution for wear leveling in light of the fact that the presence of hot furthermore, icy information can't be reflected. At last, a powerful free piece designation strategy in light of information sort is proposed for wear leveling of all squares. Try comes about demonstrate that the standard deviation of the delete tally is low paying little mind to the glimmer memory use. In expansion, the refuse accumulation time is abbreviated by decreasing the ideal opportunity for hunting down the objective pieces for the waste gathering.

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