基于数据访问计数的 NAND 闪存缓存管理算法

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摘 要： 针对现有的 NAND 闪存缓存管理算法对缓冲区替换页选择和替换代价考虑不足，以及算法时间开销大的问题，提出基于数据访问计数的 NAND 闪存缓存管理算法.该算法首先考虑 NAND 闪存读写代价的不同以及数据访问频度的差异，对数据页进行冷干净、冷脏、热干净、热脏划分并分别采用 LRU 队列进行管理.然后，根据提出的数据访问计数策略计算数据页的访问计数值.最后，结合队列长度和数据页访问计数值给出了新的数据页替换策略.基于 QEMU 和 Linux 的仿真实验结果表明，与 LRU、CF-LRU、LRU-WSR、CCF-LRU、LLRU 等现有算法相比，所提算法能够有效降低写闪存次数，减少程序运行时间.

关键词： NAND 闪存；缓存管理；替换页选择；替换代价；访问计数

Cache management algorithm for NAND flash memory based on data access counting

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Abstract： Abstract:In view of the problem that the existing NAND flash cache management algorithmconsidering insufficiently about the buffer replacement page selection and replacement cost and the algorithm time overhead is large,a NAND flash memory cache management algorithm based on data access counting is proposed.Considering the difference of read and write cost of NAND flash memory and the difference of data access frequency, the proposed algorithm divides data pages into cold clean, cold dirty, hot clean and hot dirty, and manages them by LRU queues.Then, according to the proposed data access count strategy, the access count value of the data page is calculated. Finally, based on queue length and data page access count, a new data page replacement strategy is proposed. The simulation results based on QEMU and Linux show that compared with LRU algorithm, CF-LRU algorithm, LRU-WSR algorithm, CCF-LRU algorithm and LLRU algorithm, the proposed algorithm can effectively reduce the number of writes and reduce the running time of the program.

Key words： NAND flash; cache management; replacement page selection; replacement cost; access counting

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