



A NEW ADAPTIVE GREY DECISION-ENERGY AWARE MANAGEMENT SYSTEM BASED ON THE OPTIMAL-READ ONLY- WRITE BUFFER ARCHITECTURE FOR FLASH MEMORY IN EMBEDDED AND MOBILE DEVICES

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ABSTRACT—It is generally accepted that the trends in ubiquitous and pervasive computing are rapidly increasing the diversity and heterogeneity of wireless technologies and their constituent devices. However, there are significant problems to overcome when integrating embedded and mobile devices into a ubiquitous and pervasive computing environment. One can consider that flash memory is an essential storage medium for embedded and mobile devices, because it is small, lightweight, nonvolatile, and vibration-resistant; and it has a high storage capacity. Lower energy consumption is an important consideration in the design, and one solution for reducing energy consumption is to include a buffer layer in a flash memory storage system. A buffer layer can let data be updated in situ, reduce energy consumption, and increase access performance. We developed an optimal-read only-write buffer architecture tailored to the properties of flash memory, since a traditional read/write buffer architecture is unsuitable for flash memory. Further, we propose an adaptive grey decision policy for considering temporal and spatial localities to obtain better results. Our proposed method shows that the number of flash memory write operations to reduce energy consumption is decreased from 15% to 35% compared to the least recently used and flash-aware buffer policies based on the optimal-read only-write buffer architecture.