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13. ABSTRACT

The relationship between the page size, program behavior, and page fetch frequency in storage hierarchy systems is formalized and analyzed. It is proven that there exist cyclic program reference patterns that can cause page fetch frequency to increase significantly if the page size used is decreased (e.g., reduced by half). Furthermore, it is proven in Theorem 3 that the limit to this increase is a linear function of primary store size. Thus, for example, on a typical current-day paging system with a large primary store, the number of page fetches encountered during the execution of a program could increase 200-fold if the page size were reduced by half.

The concept of temporal locality versus spatial locality is postulated to explain the relationship between page size and program behavior in actual systems. This concept is used to develop a technique called the "tuple-coupling" approach.

Consistent with the results above and by generalizing conventional two-level storage systems, a design for a general multiple level storage hierarchy system is presented. Particular algorithms and implementation technqiues to be used are discussed.