

CS 840 Assignment 1

Due February 2, 2010

Instructor: I. Munro

1. Consider the idea of using a hash function in the van Emde Boas “priority queue” to reduce the space requirements. Assume that hashing a key (or any other value) to a location takes $O(1)$ time and space for the hash table is proportional to the size of the data entries and keys. Take the scheme for hashing as a “black box”. How can you use such hashing to implement the van Emde Boas method efficiently?

- a. Outline your scheme, perhaps by showing how it differs from the standard version.
- b. Assuming the hashing works in constant time for an insert, delete or search, how much time is taken for each of the operations: insert, delete and successor.
- c. What is the space requirement of your method? Assume you have a universe of u elements and a word size of $\lg u$ bits. n elements are currently stored in the data structure. Clearly this should depend on u as well as n .

2. Read and write a review of ONE of the following papers that have been mentioned in class:

M. Dietzfelbinger, A. Karlin, K. Mehlhorn, F. Meyer auf der Heide, H. Rohnert, and R. E. Tarjan, Dynamic perfect hashing: upper and lower bounds, *SIAM J. Comput.* 23 (1994), 738-761.

Kurt Mehlhorn, Stefan Naeher, Helmut Alt: A Lower Bound on the Complexity of the Union-Split-Find Problem. *SIAM J. Comput.* 17 (6): 1093-1102 (1988)

Your review should be at most 3 pages and:

Outline the key contributions

- a. Point out the technically difficult aspects
- b. Suggest what other issues might be resolved from the ideas of this paper. (You might want to have a look at papers that refer to this one)

The last two points are the key ones, they deal with the “value added” from reading your review rather than just glancing through the paper.