

CS 840 Assignment 1

Due October 12, 2018, in class

(This is a Friday but a “logical” Wednesday)

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 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.
2. Read the Frigo et al paper and Erik Demaine’s survey of cache oblivious data structures. (Available through course website.) Pay particular attention to the Funnelsort algorithm or Brodal and Fagerberg’s “simplified” version. Describe, in your own words, one of these methods and comment of the difficulty of a clean implementation. (Especially in comparison with a more conventional method such multiway Mergesort)