Morass

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presented:

Integer structures - predecessor/successor problem

Lectures of Eric Demaine

http://courses.csail.mit.edu/6.851/spring12/lectures/

Definitions

Desired operations: predecessor/successor. **Variables**:

- W: Word Size
- U: Universe (2^W)
- N: Number of items

Emde Boas trees



Find, Predecessor, Successor, Insert, Delete: $O(\log \log U)$ Min, Max: O(1)

Simple Tree view

Another view of vEB **Predecessor, Successor:** $O(\log \log U)$ **Insert, Delete:** $O(\log U)$ **Indirection:** Reduce number of insertions/deletions

Space reduction

Simple: vEB with hashing O(N) w.h.p X-Fast Tree: Simple Tree view with hashing. Y-Fast Tree: X-Fast Tree with indirection

Fusion Tree

 $W^{1/5}\text{-}\mathrm{ary}$ B-Tree Static $\mathbf{Predecessor},\ \mathbf{Successor}:\ O(\log_W N)$

Sketching: Reducing to important bits **Approximate sketch:** Fast (but not optimal) sketching. Usage of multiplication. **Parallel Comparision:** Fast search for first lowest sketch. **Most Significant Bit:** O(1) with basic instructions