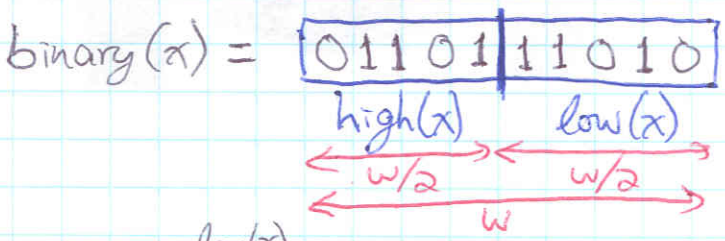
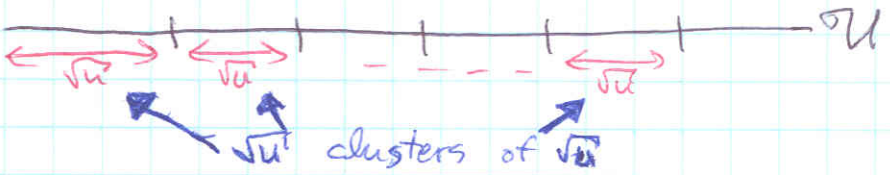
# van Emde Boas (vEB)

6.897
L 9.3
Mar. 3, 2005

- $O(\lg w)$ time means we "binary search" on bits of query word $x$



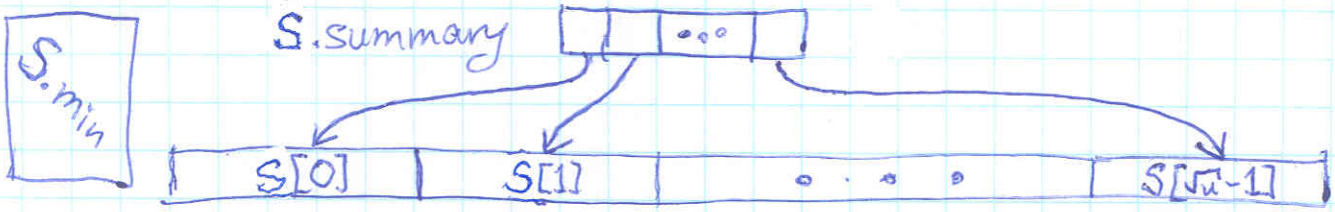

- low-order bits $\overset{low(x)}{\wedge}$ distinguish $2^{w/2} = \sqrt{u}$ consecutive items
- high-order bits high(x) distinguish $2^{w/2} = \sqrt{u}$ of these clusters:




- vEB structure follows this recursion:

vEB structure (S) of size $u$ =

- substructures $S[0], S[1], \ldots, S[\sqrt{u}-1]$ each of size $\sqrt{u}$ representing partition of universe (above)
- substructure $S.summary$ of size $\sqrt{u}$ where $x \in S.summary \Leftrightarrow S[x]$ is nonempty
- minimum element $S.min$
  - not stored recursively in an $S[i]$ (but still counts as making $S$ nonempty)
- $S.min = none \Leftrightarrow S$ is empty




- also augment to store $S.max$ (stored recursively)