RAM Algorithms 4

AVA Fall 2006
November 29

Content: Succinct Data Structures.

References.

- Guy Jacobson. "Space-efficient static trees and graphs." in Proceedings of Symposium on Foundations of Computer Science, pages 549–554, 1989.
- J. I. Munro, V. Raman and S. S. Rao. "Space efficient suffix trees." in Journal of Algorithms, 39(2): 205–222, 2001.
- J. I. Munro and S. S. Rao. "Succinct representation of data structures." Chapter 37 in Handbook of Data Structures and Applications, Chapman & Hall/CRC Computer and Information Science Series, 2004.

Exercises:

1. **Dynamic bit vector:** Given a bit vector B of length n, describe a data structure that uses $n + o(n)$ bits and supports each of the following three operations in $O(\lg n)$ time:
   - $rank(i)$: return the number of 1's upto position i in B,
   - $select(j)$: return the position of the j-th 1 in B, and
   - $flip(i)$: flip the i-th bit (i.e., $B[i] \leftarrow (1 - B[i])$).

   Can you improve the running times to $O(\lg n / \lg \lg n)$?