6.851 ADVANCED DATA STRUCTURES (SPRING'14)

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$\boxed{\text{Problem 3}}$ *Due: Monday, Mar. 3rd*

Be sure to read the instructions on the assignments section of the class web page.

Dynamic Dictionary with Working-Set Property

A binary search tree has the ***worst-case working-set property*** if every access x_i costs $O(\log t_i)$ worst-case time, where t_i is the number of distinct keys accessed since the last access to key x_i.

Describe and analyze a dynamic dictionary (not necessarily a BST) that has the working-set property. Your data structure should:

1. use $O(n)$ space, where n is the current number of items in the dictionary;

2. support searching for key x_i in $O(\log t_i)$ worst-case time, where t_i is the number of distinct keys accessed since the insertion or last access to the key x_i; and

3. support insertions and deletions in $O(\log n)$ amortized time.

Hint: Consider representing your dictionary as a list of binary search trees of increasing size.