

6.851 ADVANCED DATA STRUCTURES (SPRING'12)

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Problem 1 *Due: Thursday, Feb. 23*

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

Creationist successor. Given an ordered universe U of keys, develop and analyze a fully retroactive data structure that maintains $S \subseteq U$ and supports the following operations:

- **insert(k)** : Insert $k \in U$ into S
- **delete(k)** : Remove $k \in U$ from S
- **successor(k)** : Return $\min\{k' \in S \mid k' \geq k\}$

under the constraint that all **insert** operations must occur at time $-\infty$. All operations should run in time $O(\log m)$, where m is the total number of updates performed in the structure (retroactive or not). Observe that such a structure is sufficient to answer the “rightward ray shot” queries needed for the nonoblivious retroactive priority queue.

A simple reference to the logarithmic time data structure for general retroactive successor is not a valid solution to this problem. This is a special case of that problem, and a much simpler solution is desired.