Retroactive priority queues in Python

Parker Rule

May 18, 2021

Retroactivity

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Partially retroactive: updates in the past and present, (fast) queries in the present

Fully retroactive: updates in the past and present, (fast) queries in the past and present

Easy general transformation: rollback

Retroactivity

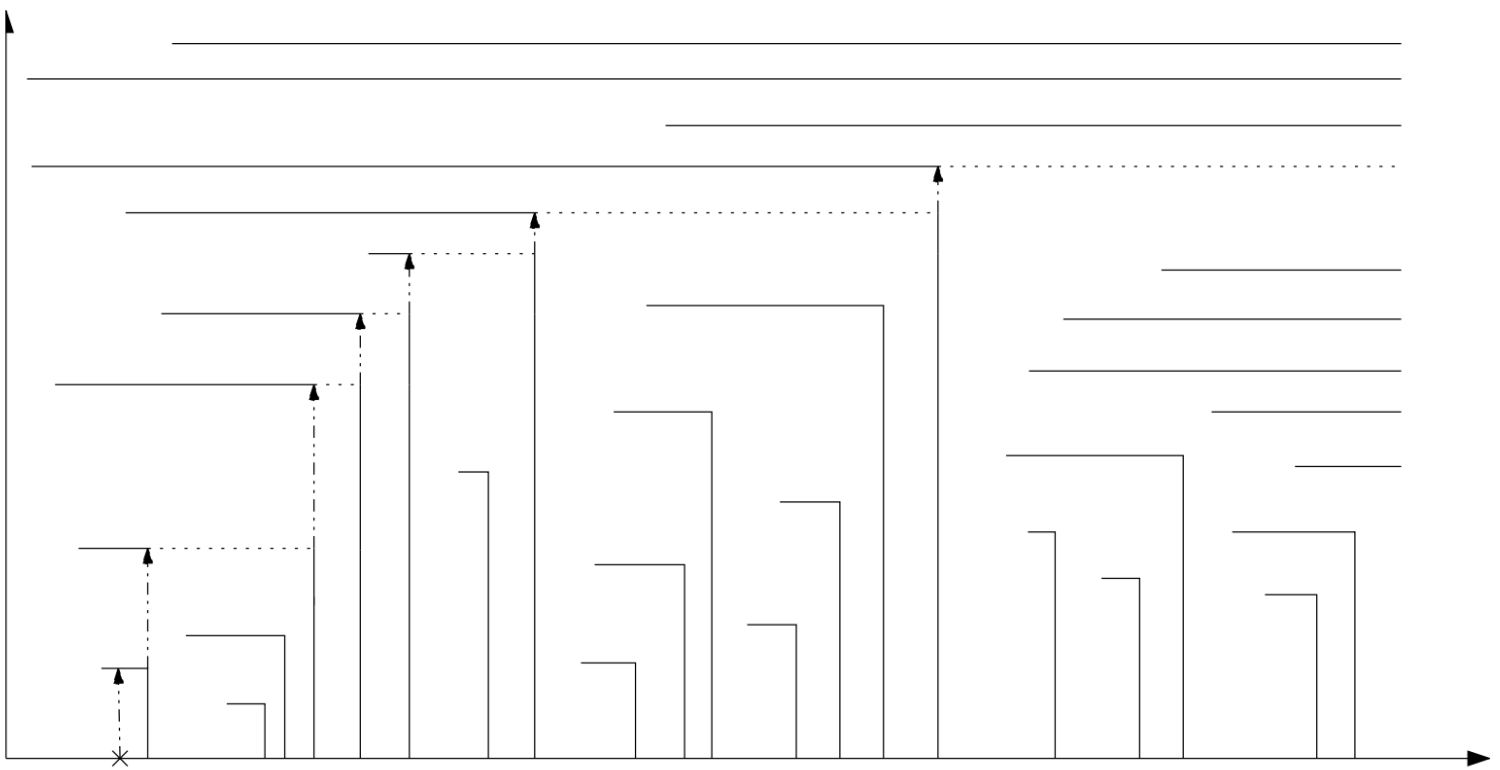

Fig. 4. The Insert(t, "delete-min()") operation causes a cascade of changes of deletion times, and one deletion in Q_{now}.

Source: Demaine et al. 2007

Full retroactivity

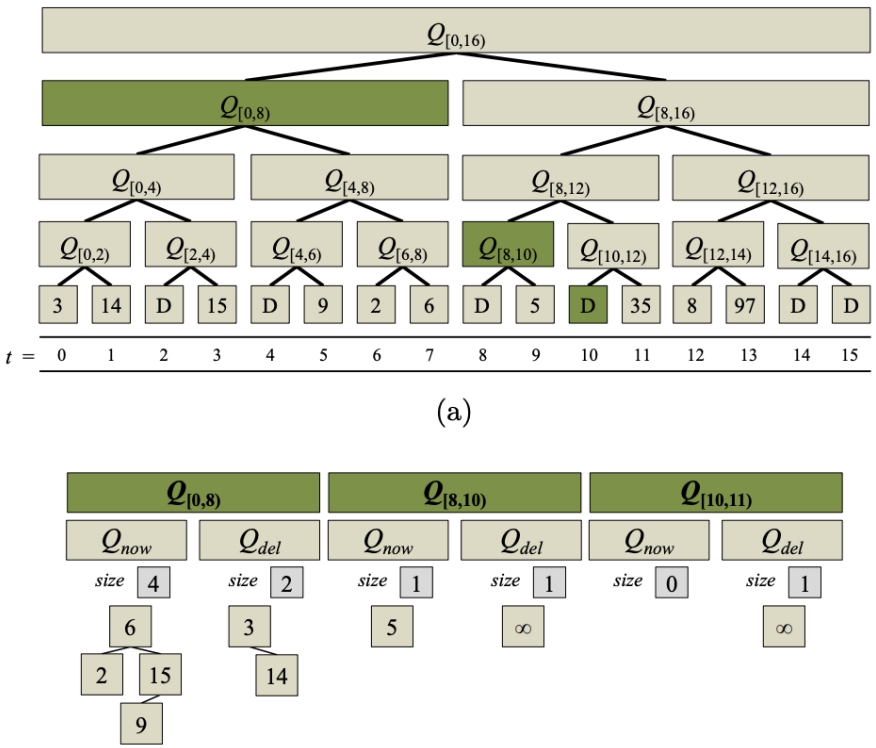

Fig. 2: Hierarchical checkpointing for fully retroactive priority queue. Illustration of the checkpoint tree for a fully retroactive priority queue with 16 operations.

Source: Demaine et al. 2015

What's in a queue?

Auxiliary data structures:

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Various BST augmentations (prefix sum, etc.)

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My implementation is mostly augmented scapegoat trees.

Code tour & demo

Future work

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Related partially retroactive data structures

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Fully retroactive priority queues—all the way

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Performance improvements

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Generalization

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retroactive, a popular 6.851 final project by Chelsea Voss

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rpqvis, a visualization project from this iteration of 6.851

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rpqvis, a visualization project from this iteration of 6.851

retroactive-priority-queue, a similar implementation project from this iteration of 6.851 with different underlying data structures (treaps)

Thank you!