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2/23/23

COEN 379 HW 6

1. Cormen 16.3-1
   Let us begin by defining the potential function $\Phi'(Di) = \Phi(Di) - \Phi(D0)$ for all i >=1.
   Then, $\Phi'(D_0) = \Phi(D_0) - \Phi(D_0) = 0$
   and $\Phi'(D_i) = \Phi(D_i) - \Phi(D_0) >= 0$
   Thus, the amortized cost c' is equal to the actual cost c plus the change in potential: $c_i' = c_i + \Phi'(D_i) - \Phi'(D_{i-1})$
   $= c_i + [\Phi(D_i) - \Phi(D_0)] - [\Phi(D_{i-1}) - \Phi(D_0)]$
   $= c_i + \Phi(D_i) - \Phi(D_{i-1})$
   Thus, we can see that the amortized cost using Φ and Φ' are the same.

2. Cormen 16.3-5
   As discussed in class, let us use one stack as the front and one stack as the rear. When performing ENQUEUE, we would simply push the new item onto the front stack. When performing DEQUEUE, if both stacks are empty, then we would error, but if only the rear stack is empty, then while the front stack isn't empty, we would push everything from that front stack to the rear stack, and then pop an element from the rear stack.
   To analyze the amortized cost of each ENQUEUE and DEQUEUE, let us use the "Funny" accounting method. Let's give each element 3 credits to be used as the following: one credit for when the item first gets on the front stack, one credit for when the item gets moved to the rear stack, and one credit for popping. Since each operation's cost is O(1), the amortized cost per operation is simply O(1).