Exercises IV

Labelled algorithms, figures, and chapters refer to the course book.

IV-1 (**CLRS 17.1-1**) If the set of stack operations included a MULTIPUSH operation, which pushes k items onto the stack, would the $O(1)$ bound on the amortized cost of stack operations continue to hold?

IV-2 (**CLRS 17.1-3**) Suppose we perform a sequence of n operations on a data structure in which the ith operation costs i if i is an exact power of 2, and 1 otherwise. Use aggregate analysis to determine the amortized cost per operation.

IV-3 (**CLRS 17.2-2** and **CLRS 17.3-2**) Redo the previous exercise using (a) an accounting method of analysis and (b) a potential method of analysis.

IV-4 (**CLRS 17.3-4**) What is the total cost of executing n of the stack operations PUSH, POP, and MULTIPOP, assuming that the stack begins with s_0 objects and finishes with s_n objects?

IV-5 (**CLRS 17.4-3**) Suppose that instead of contracting a table by halving its size when its load factor drops below $1/4$, we contract it by multiplying its size by $2/3$ when its load factor drops below $1/3$. Using the potential function $\Phi(T) = |2 \cdot N(T) - S(T)|$, show that the amortized cost of a TABLE-DELETE that uses this strategy is bounded above by a constant. Here $N(T)$ and $S(T)$ denote the number of items stored in table T and the size of T, respectively.