Topics to discuss

Accounting Method

Example 1 : Stack operation

Accounting Method :

In accounting Method of amortized analysis, we assign differing charges to different operations, with some operations charged more or less than they actually cost. We call the amount we charge an operation its amortized cost.

When an operation's amortized cost exceeds its actual cost, we assign the difference to specific objects in the data structure as credit.

Credit can help pay for later operations whose amortized cost is less than their actual cost.

If we denote the actual cost of the i^{th} operation by c_i and the amortized cost of the i^{th} operation by $\hat{c}_i$, we require

$$\sum_{i=1}^{n} \hat{c}_i \geq \sum_{i=1}^{n} c_i$$

for all sequences of n operations.

The total credit stored is the difference between the total amortized cost and total actual cost or,

$$\sum_{i=1}^{n} \hat{c}_i - \sum_{i=1}^{n} c_i$$

Example 1 : Stack operations :

We know, Actual costs of stack operations were

PUSH	1
POP	1
MULTIPOP	min(s, k)

Lets assign the following amortized cost.

PUSH	2
POP	0
MULTIPOP	0

Lets analyze a sequence of 4 push, pop operations on an initially empty stack.

Operations	Amortized cost	Actual cost	Credit
Push (A,S)	2	1	1
Push (B,S)	2	1	1+1 = 2
Pop (S)	0	1	2-1 = 1
Push (C,S)	2	1	1+1 = 2
Pop (S)	0	1	2-1 = 1
Pop (S)	0	1	1-1 = 0
Push (D,S)	2	1	0+1 = 1
Pop (S)	0	1	1-1 = 0

Analysis :

lets analyze a sequence for n push, pop and multipop operation on an empty stack.

Since stack is empty, so pushes must be done first and this builds a credit.

and all pops are charged against this credit.

Note: There can be never be more pops (of either type) than pushes.

Therefore, Total amortized cost = (2+2+0+2+0+0+2+0)

= 8 (for 4 push operation)

= 2 × 4

for n operation, = 2n

Amortized cost is O(n).

Follow Now

Start Practicing

i._am._arfin

Arfin Parween