HW-17

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1 a) Amorilized analysis of inserting n elements into a dynamic table using aggregate method.

ith operation causes an expansion when $i-1$ is a power of 2

$\therefore$ C_i : cost of ith operation $= \begin{cases} i & \log_2(i-1) \text{ is an integer} \\ 1 & \text{otherwise} \end{cases}$

$$\sum_{i=1}^{n} C_i = 1+2+3+1+5+1+1+1+9+1+1 \cdots \quad n \text{ terms}$$

$$= n + 1+2+4+8 \cdots \log_2(n)$$

$$\sum_{i=1}^{n} C_i = n + \sum_{i=0}^{\log_2(n-1)} 2^i = n + \frac{2^0(2 \cdot 2^{\log(n-1)} - 1)}{2-1}$$

$$= n + 2(n-1) - 1 = 3n-3$$

$3n-3 \approx O(n)$

$T(n) = 3n-3$

Ammoritized Cost $= \frac{T(n)}{n} = \frac{3n-3}{n} = 3 - \frac{3}{n}$

Ammoritized cost $= 3 - \frac{3}{n}$ for larger n cost ≈ 3

or $O(1)$

1b) Using accounting method.

We assign amortized cost of 3 to each isertion
1 unit for actual insertion
2 units for futiare resizing cost. as credits

2^i elements are copied when resizing from 2^i to 2^{i+1}

each of the 2^i elements have accumilated 2 credits.

$\therefore$ $2 \times 2^i = 2^{i+1}$ credits available.

Since the credits saved up are sufficient to pay for the doubling cost the amoritized cost per insertion is $O(1)$