Hands on -12

Swarani Bampally.
1002208330

1) Given a dynamic table (see section 17.4) that doubles in size when it needs more space. find the amoritized runtime for inserting n elements.

a) Use the aggregate method.

A) Given to find the amoritized runtime for inserting n elements when it needs more space to double in size

By using aggregate method we can calculate the total cost of ~~(permo)~~ performing a sequence by dividing with the number of operations.

let the table is 1 or be any constant size.

Let first cost of insertion be 1, and second cost of insertion be 2. And third cost of insertion be 1. we can assume fourth ~~cost~~ element inserting with a cost of 4.

Here we can observe that at even number index the cost is increasing by 2^n.

The cost of insertion of table can be change with the change in size of the table. for n insertions in table the total cost can be calculated as.

$$1+2+1+4+1+8+1+10 \cdots\cdots +1+2^n(\log(n)-1)$$

The resizing cost of table to its final size can be represented by $2^n(\log(n)-1)$

By using aggregate method defination let divide the above by number of operations to get amoritized cost per insertion.

$$O(\log n)-1 = \frac{(1+2+1+4+1+8+1+10)}{num} = O(1)$$

This can be calculated by arithmetic and logarithmic operations. ∴ the amoritized runtime is $O(1)$.

b) Use the accounting method.

A) By using accounting method to analyze the amortized runtime for inserting n elements into a dynamic table need to define potential function

Let table size initially be 1. so the size will become 1.

we have potential function as $\frac{2T}{num} = \phi(T)$.

first insert 1 element to the table. then the actual cost and potential cost be 1 & 2 respectively.

for 1 insertion amortized cost will be $= 1+2 = 3$.

then the total amortized cost for n insertions in ther table be 3n and per insertion the cost will be $\frac{3n}{n} = 3. = O(3)$.

∴ The amortized runtime for inserting n elements is $O(1)$.