DP - Part I

Complete Course on Algorithm for GATE - CS & IT

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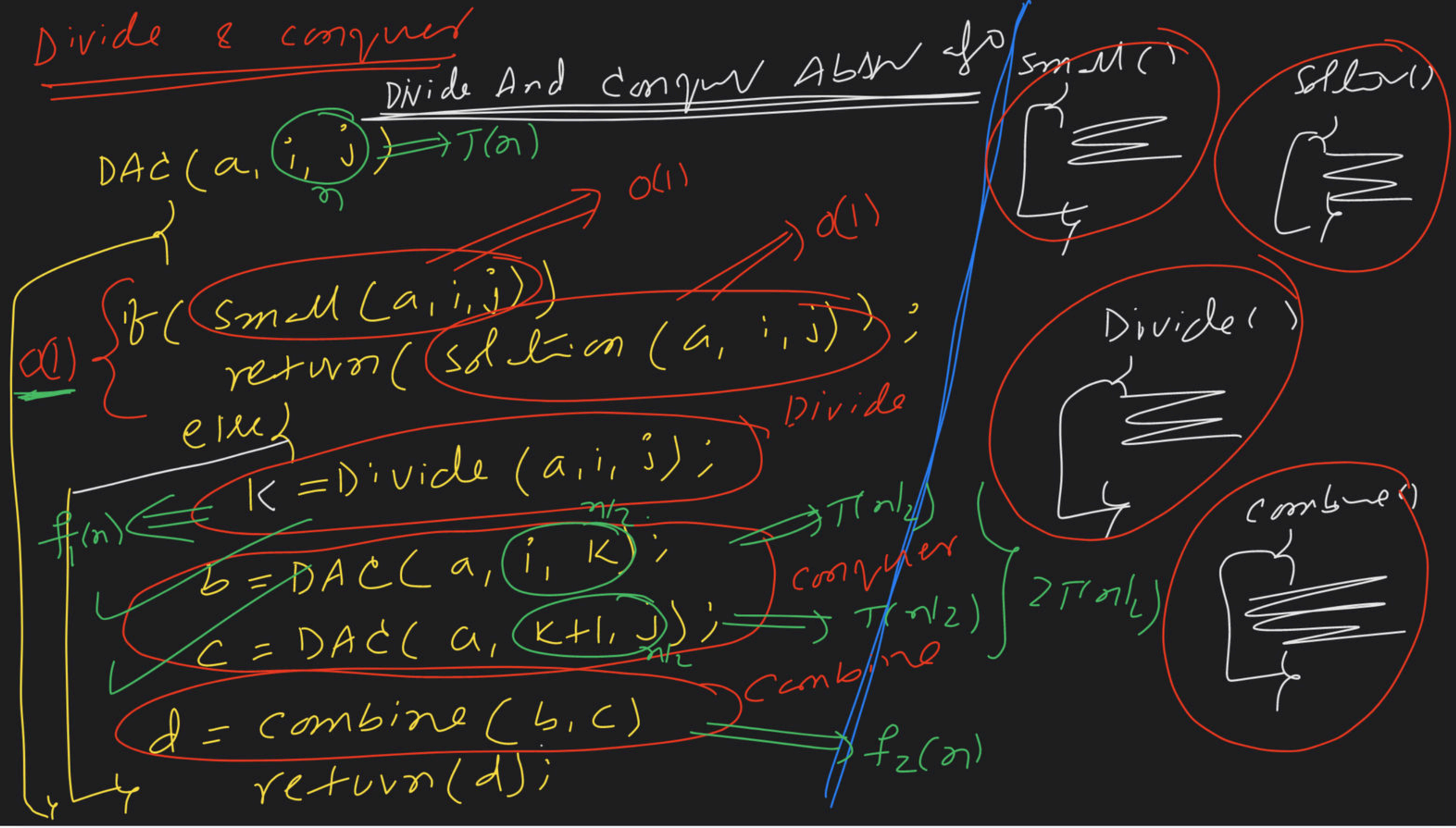
Divide & conquer

Divide And conquer Algorithm



DAC algo Time complexity finding

$$T(n) = \begin{cases} O(1) & \text{if } n \text{ is small} \\ f_1(n) + T(n/2) + T(n/2) + f_2(n) & \text{if } n \text{ is big} \end{cases}$$

$$\Downarrow$$

$$T(n) = 2T(n/2) + f_1(n) + f_2(n)$$

$$= 2T(n/2) + f(n)$$

$$= 5T(n/5) + f(n)$$

$$= aT(n/b) + f(n)$$

No. of Subproblem $a \geq 1$

Size of Subproblem $b > 1$

Time of one Subproblem

Time for both D & C

applications of DAC

1. Finding max & min
2. Power of an element
3. BinarySearch
4. MergeSort
5. QuickSort
6. Selection procedure
7. maximum contiguous Subarray sum
8. Finding no. of inversions
9. Strassen's matrix multiplication.

Finding Max & min

50 20 10 60 40 30 80 20 15

I/p: An array of n-distinct elements

O/p: returns maximum & minimum elements.

80 10

Straight maximin also

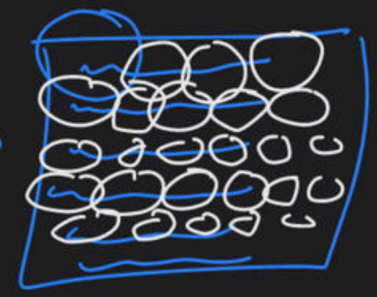
```
max = min = a[1]
for(i=2; i<=n; i++)
{
    if(max < a[i])
        max = a[i]
    else
        if(min > a[i])
            min = a[i]
}
```

$\theta(n)$

EC

max = 50 20 80

min = 50 10



500

Top = 50

Wi'k - DAC

0 1 2 3 4 5

0 1 1 2 3 5