



Other ways to solve economic velations manager's Theorem. L) formula for common - style recinition of which (a) Superfitution / Guess + Charle Mountain, using

- Other ways to solve Recurrence relations?

 (b) Master's Theorem

 L) Formula for common style
 recurrence relations

 (c) Substitution / Guess + Check
 - (c) Substitution / Guess + Check Induction, using the def. of big-0.

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How to solve recursions? (a) Recursion Tree GCn) TED = am # Steps to compute 1.0(n) MERGE SORT (A), where IAI=n = TRN(2) TRA12)= 2.0(1/2) TM4) TM4) TM4) TM4) 1 1 / constant time down hore! closed form of

Goal: We remember this $B\Theta(n \log n)$ $T(n) = \Theta(1) + \Theta(1) + T(n|2) + T(n|2) + \Theta(n)$ $T(n) = 2T(n|2) + \Theta(n) \quad \text{merge sort}$ $T(2n) = 2T(n|2) + \Theta(n) \quad \text{recurrence}$ $T(2n) = 2T(n|2) + O(n) \quad \text{recurrence}$

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Proof of Termination:
1) For a for loop, we must define a fen
D: { state } -> S, where: - S is a well-defined set
where: • S is a well-defined set
Loie, any subset has a minimum value.
· consider A := im (D)
$= \{D(x) \mid X = possible \}$ State
· loop terminates when
D(x) reaches min A.
· De decreases each time
through the loop.
2) For recursion, we need:
- base case(s) when D(x) reaches min A
· D(x) gets smaller down recuisive tree.
tree.
$n/2$ • $n/2$ $\log n$
merge sort: D=1A1 D:SS -> Nuiog merge sort: D=1A1

2251×1(1 (1) 1 (4) 2 ([MINA) ANSBORATIONS (430)1 (27,87) E009914 (100,10) DIS THE CORE SHEYS BIC John Bur Cysorica. MDINE TRICICIE

1) Divide into smaller problems. (2) Conquer the smaller problems 3 Combine problems together In) MERGE SORT (A) 12/A1 71 the floor (1) 1 return A m < LIAI/2] ← =" \ gets" in Latex 0(1) BE- MERNESORT (A[1...m]) T(n/2) CE MERCHESORT (A[m+1... IAI]) T(n/2) return MERGE (B,C) (n) given: two sorted arrays B, C return Buc, sorted disjoint union

Divide + longur

4 Sept 2019