



A tighter upper bound?

We shall prove that $T(n) = O(n^2)$.

Assume that $T(k) \leq ck^2$ for $k < n$:

$$\begin{aligned} T(n) &= 4T(n/2) + n \\ &\leq 4c(n/2)^2 + n \\ &= cn^2 + n \end{aligned}$$

~~$= O(n^2)$~~ **Wrong!** We must prove the I.H.

$$= cn^2 - (-n) \quad [\text{desired} - \text{residual}]$$

$$\leq cn^2 \quad \text{for } \textit{no} \text{ choice of } c > 0. \text{ Lose!}$$