HomeWork 4

Name: *Liangjian Chen*
ID*: #52006933*   *October 27, 2016*

Problem 5.1 Solution:

Assume that $A(i)$ means the ith smallest number in Database A, and $B(i)$ means the ith smallest number in Database B.

> **function** FIND_MEDIAN(n, L_A, L_B)
>   **if** $N == 1$ **then**
>   **return** Min$(A(L_A + 1), B(L_B + 1))$
>   **end if**
> $mid = \lceil \frac{n}{2} \rceil$
>   **if** $A(L_A + mid) \leq B(L_B + mid)$ **then**
>   FIND_MEDIAN$(mid, L_A + \lfloor \frac{n}{2} \rfloor, L_B)$
>   **else**
>   FIND_MEDIAN$(mid, L_A, L_B + \lfloor \frac{n}{2} \rfloor)$
>   **end if**
> **end function**

Initially, call function FIND_MEDIAN$(n, 0, 0)$

Every time, we call two median values in both database($mid = \lceil \frac{n}{2} \rceil$), we can see if $A(mid) \leq B(mid)$, then $A(1)..A(\lfloor \frac{n}{2} \rfloor)$ would not be the answer, $B(\lceil \frac{n}{2} \rceil)..B(N)$ would not be the answer. So, every time we eliminate half of the possible answer which leads the recurrence $T(n) = T(n/2) + O(1)$, solve this recurrence,we get $T(n) = O(log(n))$

Problem 5.3 Solution:

Problem 5.5 Solution: