B03902062 資工二 董文捷

Aggregated Analysis

第i位數翻$\left\lfloor \frac{n}{2^i} \right\rfloor$次　翻$\left\lfloor \frac{n}{4} \right\rfloor$次　翻n次

Counter	A[7]	A[6]	A[5]	A[4]	A[3]	A[2]	A[1]	A[0]	Cost
0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	1	1
2	0	0	0	0	0	0	1	0	3
3	0	0	0	0	0	0	1	1	4
4	0	0	0	0	0	1	0	0	7
5	0	0	0	0	0	1	0	1	8
6	0	0	0	0	0	1	1	0	10
7	0	0	0	0	0	1	1	1	11
8	0	0	0	0	1	0	0	0	15

翻$\left\lfloor \frac{n}{8} \right\rfloor$次　翻$\left\lfloor \frac{n}{2} \right\rfloor$次

As Class2's slide shows, the i-th digit will be flipped $\left\lfloor \frac{n}{2^i} \right\rfloor$ times,

and each flip takes 2^i

Assume the counter has k digits,

Total amortized cost : T(n) = $\sum_{i=0}^{k-1} \left\lfloor \frac{n}{2^i} \right\rfloor \times 2^i \leq$ ***O(kn)***

Amortized cost per increment : $\frac{T(n)}{n} \leqq \frac{kn}{n} = \boldsymbol{O}(\boldsymbol{k})$

Since n increments will increase the number to n, which is at most

$\log_2 n$ + 1 digits, so if k is unknown, we can represent the answer

Total amortized cost : ***O(nlogn)***

Amortized cost per increment : ***O(logn)***