cs124 Section 6

abhi shelat

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1 Midterm

The exam was straightforward. There is an online solution at `http://www.deas/courses/cs124`. The mean was a 62/80. I suspect that the final will be much more difficult.

2 Four Russian's Algorithm

The first time we analyze this, we will count each bit operation independently, the next time, we will assume we can perform *bit vector operations.* A bit vector operation is simply one that operates on all bits in a word independently. For example, a bit-wise OR operation performs the OR operation on each of the k bits in a word in one instruction cycle. This is the more realistic way to count instructions.

So lets consider the normal way to multiply two $n \times n$ matricies, $C = AB$. Well, $O(n^3)$ or sometimes a little better with Strassen or Winograd.

However, the first insight is to break up the matrix into $n \times \log n$ chunks.

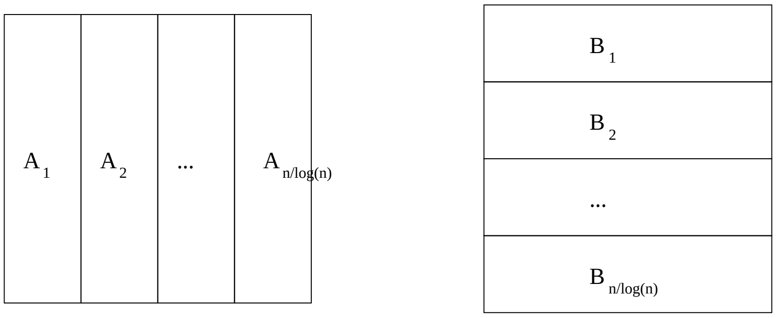

Figure 1: the split up

We must first convince ourself that we can express C as the sum of the products of these chunks:

$$C = \sum_{i=0}^{n/\log n} A_i B_i$$

Next we need to figure out a way to compute these products $A_i B_i$ efficiently. What is the obvious way and how long does that take?

The trick is to precompute a table of all possible combinations of rows of the B_i matrix. Here is how it goes:

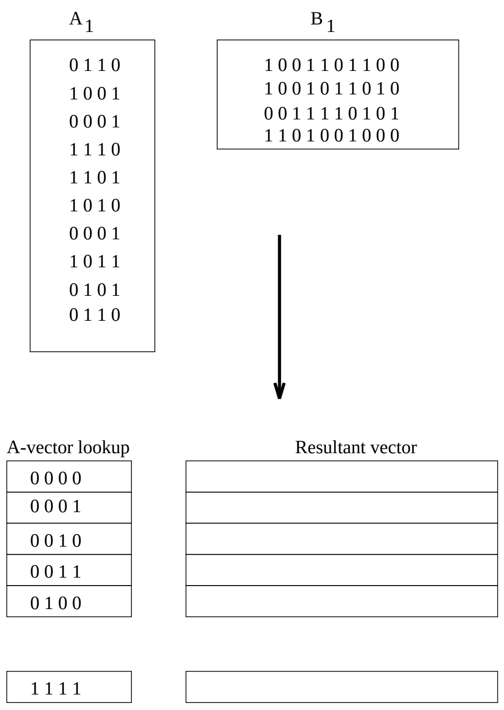

Figure 2: the split up

Now lets analyze how long it takes below: