TRINITY COLLEGE DUBLIN, SCHOOL OF MATHEMATICS

# Assignment #1, Module: MA5611

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# 1 PART 1: MATRIX MULTIPLICATION BY BLOCKS: THE PROBLEM

The block method for matrix multiplication is based in the following form of decomposition:

$$C_{\alpha\beta} = \sum_{\gamma=1}^{s} A_{\alpha\gamma} B_{\gamma\beta} \tag{1.1}$$

where $C_{\alpha\beta}$, $A_{\alpha\gamma}$ and $C_{\gamma\beta}$ are all matrices (sub-matrices of the original $A$ $(l \times m)$, $B$ $(m \times n)$ and $C$ $(l \times n)$ matrices).

For the implemented code for this part, the matrices $A_{\alpha\gamma}$ have dimensions $\left(\frac{l}{q} \times \frac{m}{s}\right)$, $B_{\gamma\beta}$ have dimensions $\left(\frac{m}{s} \times \frac{n}{r}\right)$, and $C_{\alpha\beta}$ dimensions $\left(\frac{l}{q} \times \frac{n}{r}\right)$.

# 2 PART 1: MATRIX MULTIPLICATION BY BLOCKS: CHANGE IN $B$

The implementation of the multiplication by blocks was performed using a "rotation" of matrix $B$; the actual transformation is not a rotation, but it's of a complicated form.

In terms of code, such a rotation is implemented as in lines from 84 to 87, in the file matmul_block.c.

That rotation of $B$ allows a much easier implementation of the multiplication. Specifically, the change is an in figure **??**.

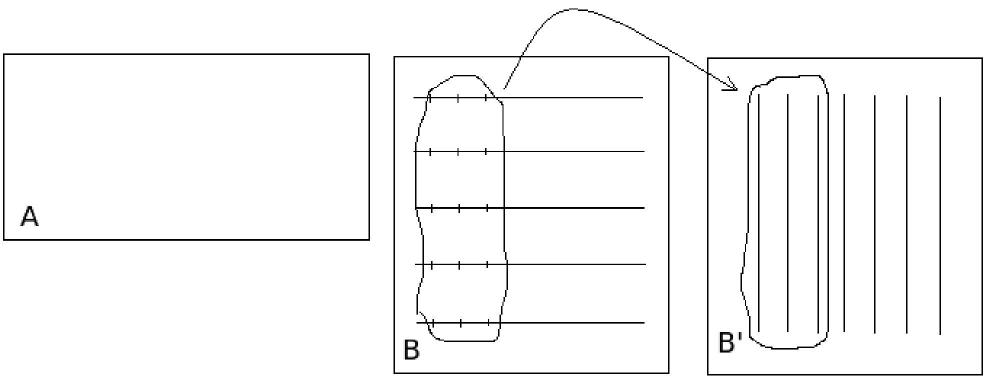


Figure 2.1: change in B.

# 3 PART 1: MATRIX MULTIPLICATION: PARALLEL

Due to the implementation of part 1, i.e. the multiplication by blocks, the parallelization of the code turned out being simple.
The only "problems" that emerged were in matching processes and cells in the 2D grid, and also in using MPI_Recv in some cases.