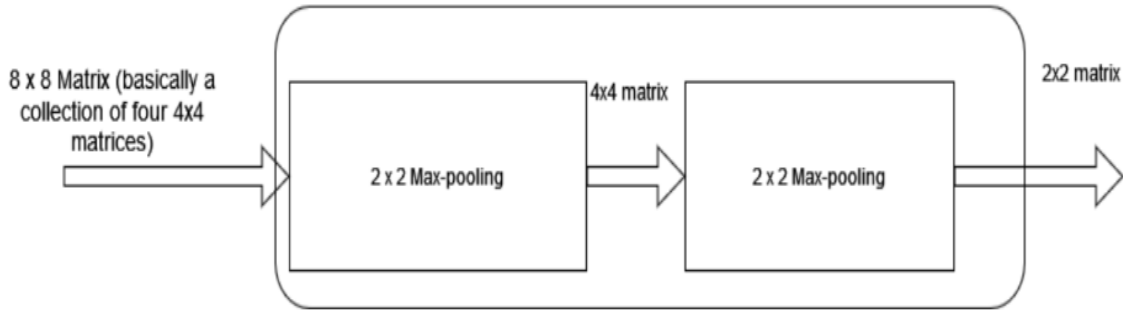
MAX POOLING

by
Muhammed sijah

OBJECTIVE

Given the above design, implement the below new design which targets two-level max pooling:

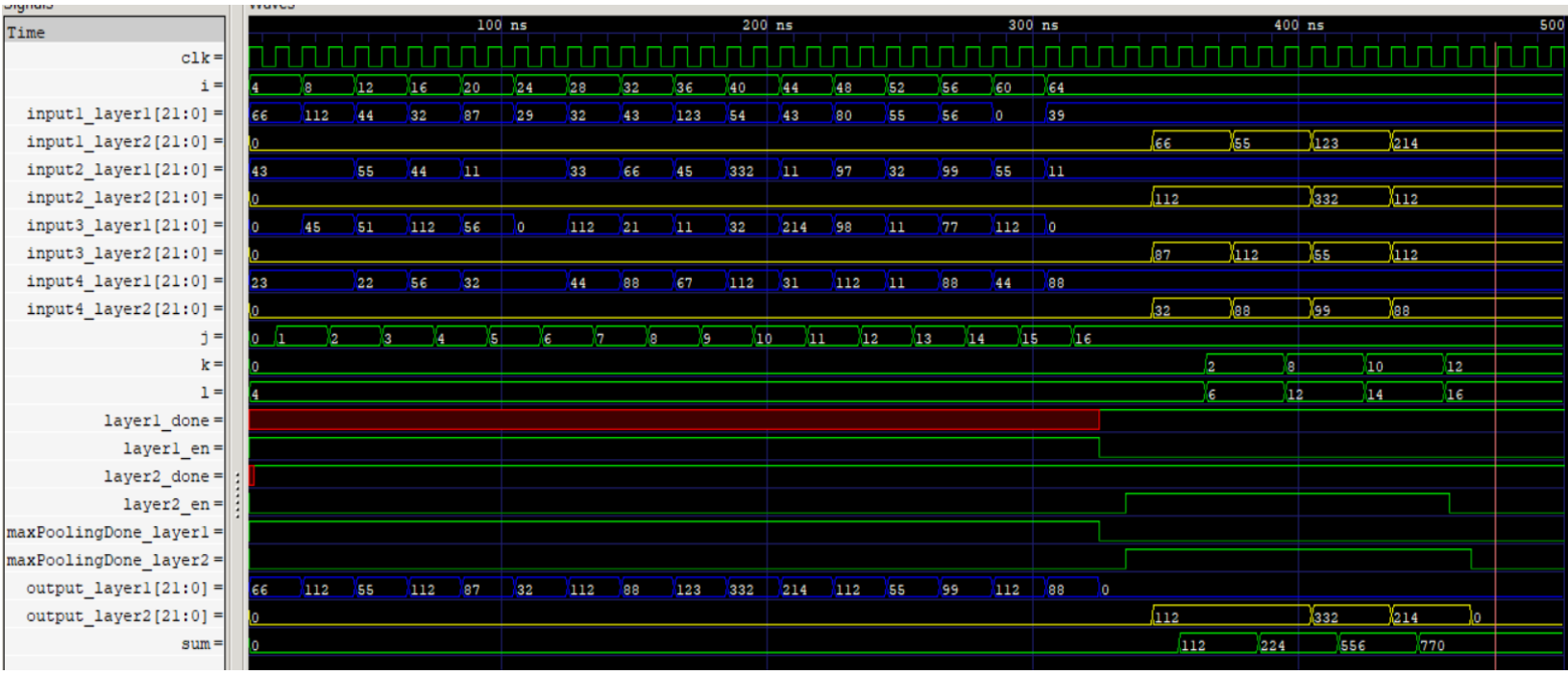


Input here is a 8x 8 matrix that can be thought of as a collection of four 4 x 4 submatrices or sixteen 2x2 submatrices . When you apply the first 2 x 2 max-pooling, you basically obtain a 4x4 matrix which when again filtered with 2x2 max-pooling yields a 2x2 matrix as the final output. Print/display the sum of the values in the final 2x2 matrix.

IMPLEMENTATION

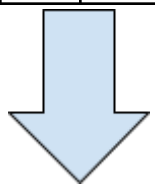
The given input is an 8x8 matrix. After applying a 2x2 max pooling operation, we reduce the matrix to a 4x4 dimension. This 4x4 matrix then undergoes another 2x2 max pooling operation. During this process, values from the first matrix are stored in an array, preserving their order. These values are subsequently rearranged to form a new 4x4 matrix, creating a structured representation of the pooled and reorganized data. Additionally, in the final step, the max-pooled values from the second operation are added together.

Test bench-1



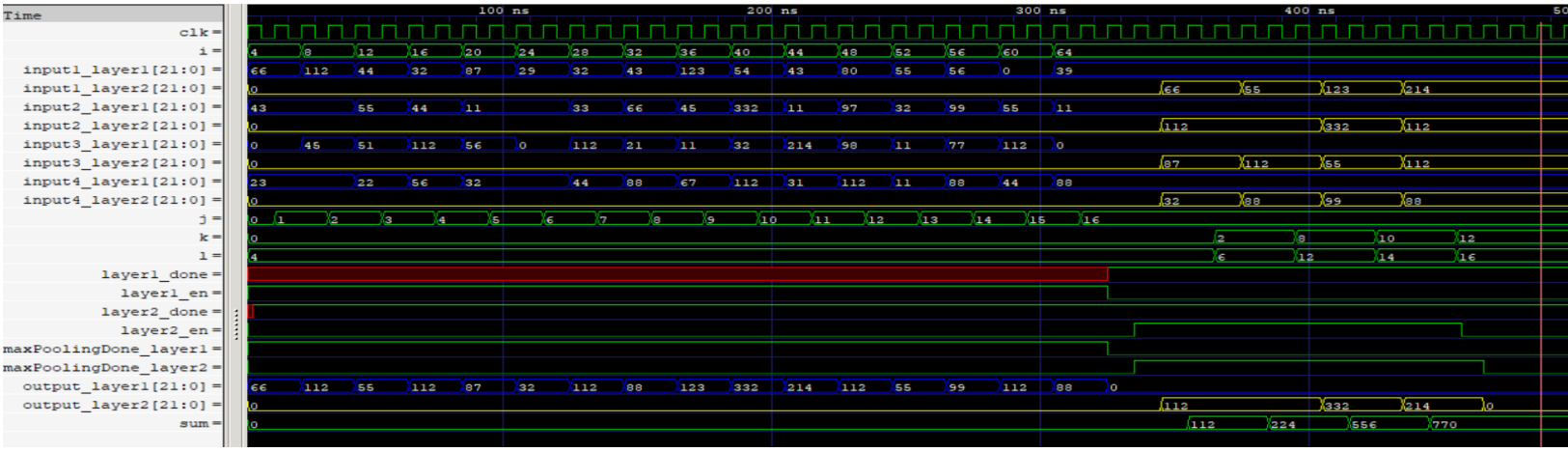
The output from layer1_output is initially stored in an array, facilitating the efficient handling of data in subsequent operations. To prepare this array for further processing, a conversion step is employed, transforming it into a structured 4x4 matrix. This transformation is achieved through a straightforward nested 'else if' loop, which iteratively organizes the data into the desired format. Once the array is successfully converted into a 4x4 matrix, it then undergoes a 2x2 max pooling operation.

0	1	2	3	4	5	6	7	8	9	10	11	12	12	14	15



0	1	4	5
2	3	6	7
8	9	12	13
10	11	14	15

Test bench-2



RESULT

A 2*2 max pooler is used to implement max pooling operation on 8*8 array. The design is tested and verified using an updated testbench.
Sum is obtained as 770 for both max pooler

```
VCD info: dumpfile maxpooler.vcd opened for output.
Final sum =         770
maxPooling_tb.v:220: $finish called at 1005000 (1ps)
PS D:\IITJ\LAB\LAB3\lab3_og _1> gtkwave.exe maxpooler.vcd
```

```
PS D:\IITJ\LAB\LAB3\lab3_og> vvp.exe file
VCD info: dumpfile maxpooler.vcd opened for output.
Final sum =         770
maxPooling_tb.v:220: $finish called at 1005000 (1ps)
```