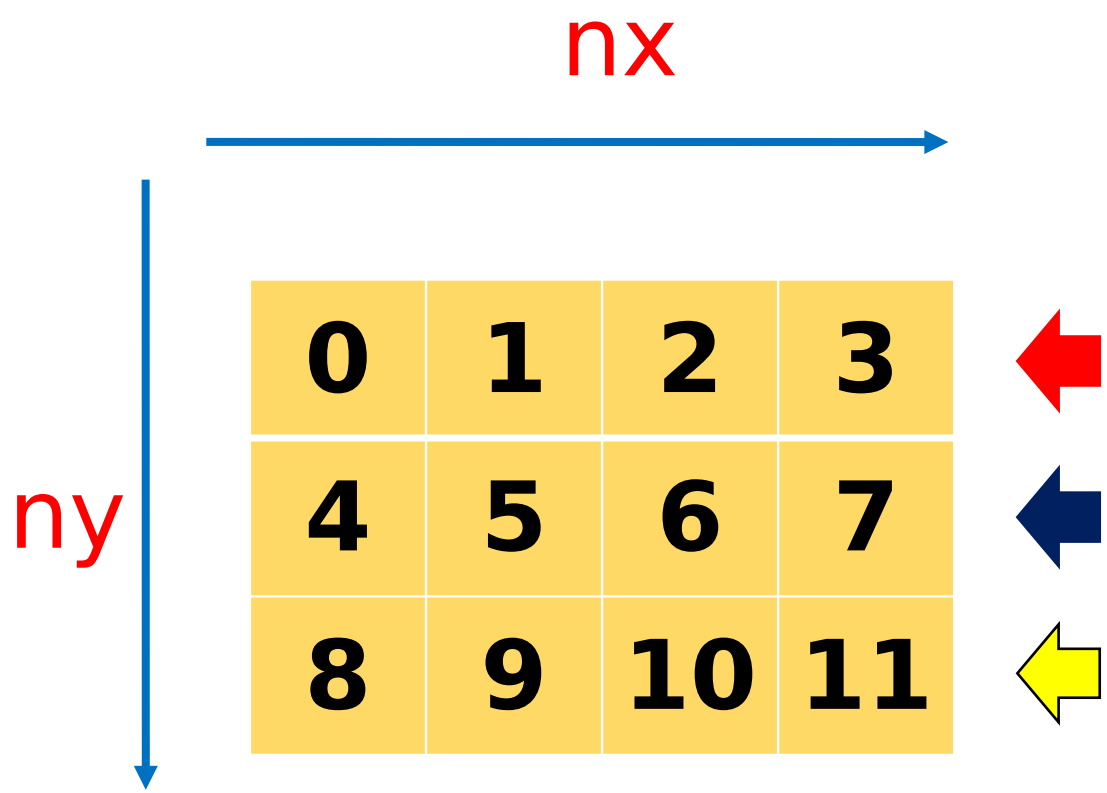
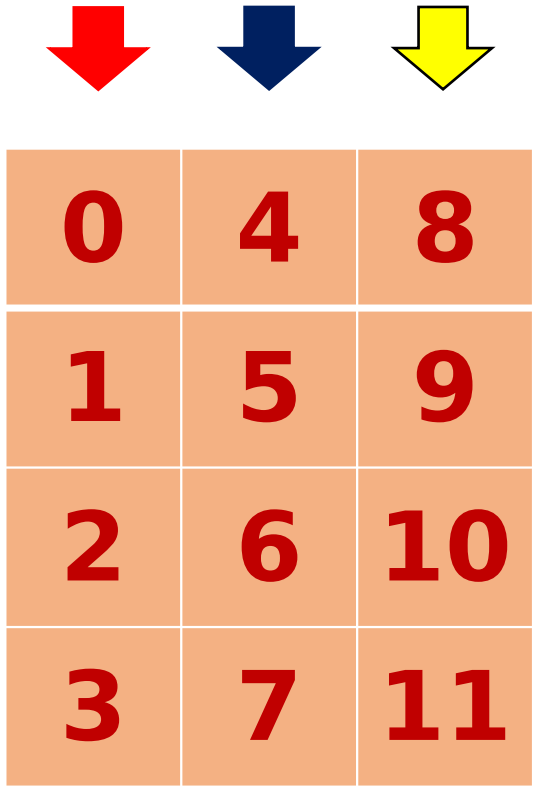
Matrix transpose

the **transpose** of a matrix is an operator which flips a matrix over its diagonal, that is it switches the row and column indices of the matrix by producing another matrix denoted as A^T.





(ix, iy)

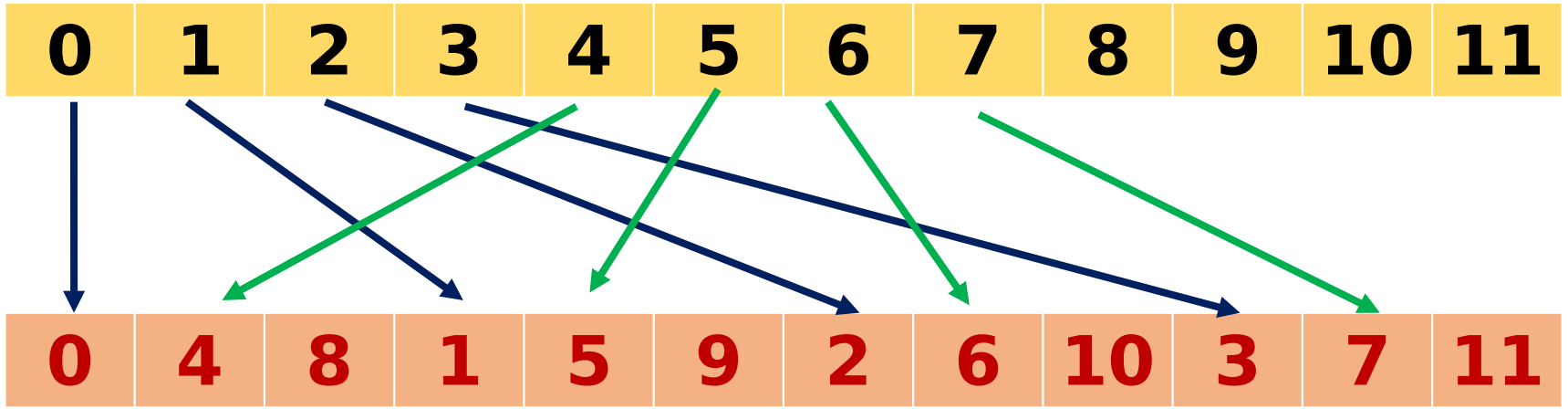
(2, 1)

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

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

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

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

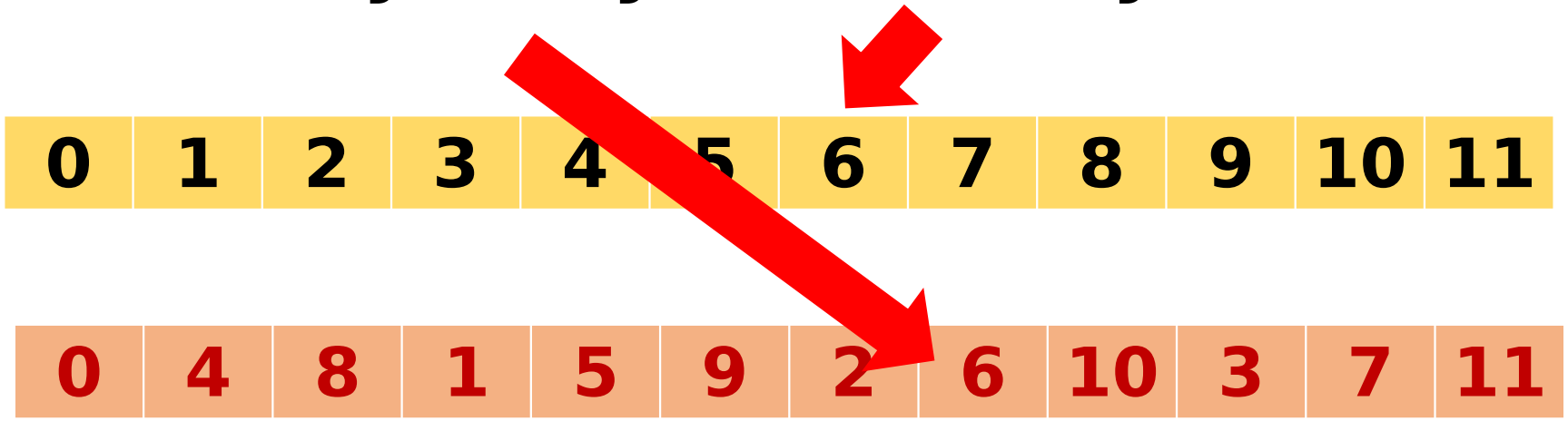



```
out[ ix * ny + iy ] = in[ iy * nx + ix ];
```

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

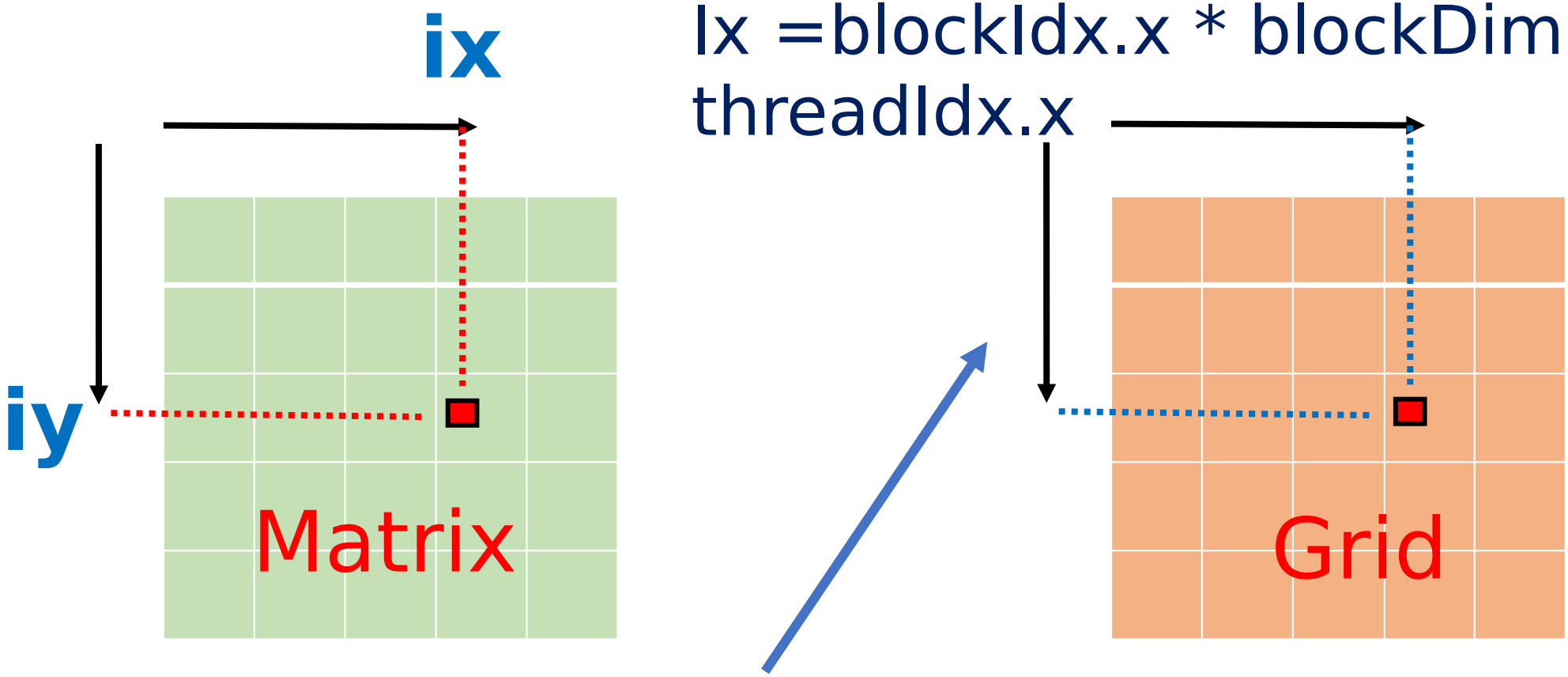
nx = 4
ny= 3
ix =2
iy = 1

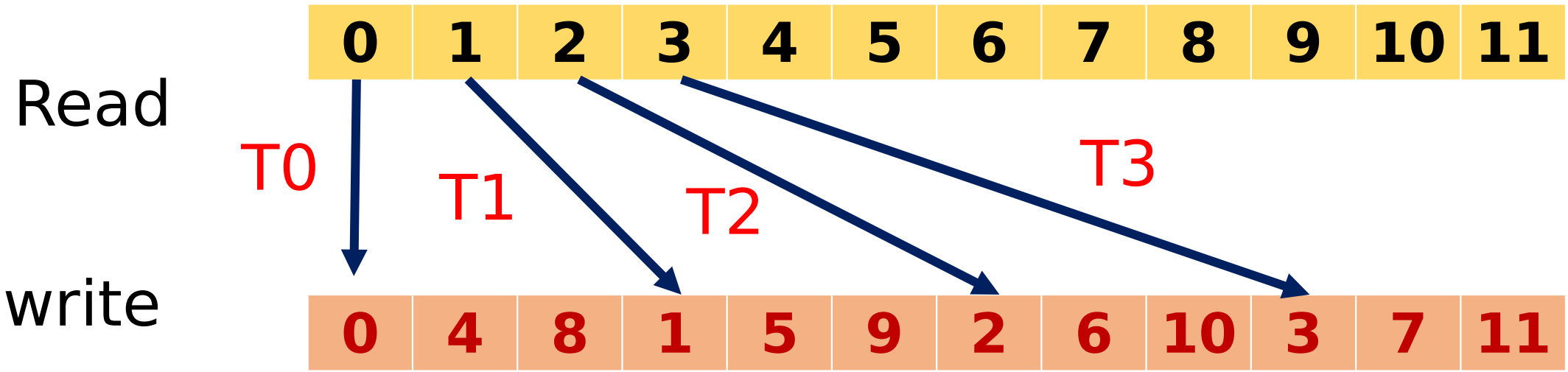
```
out[ ix * ny + iy ] = in[ iy * nx + ix ];
```

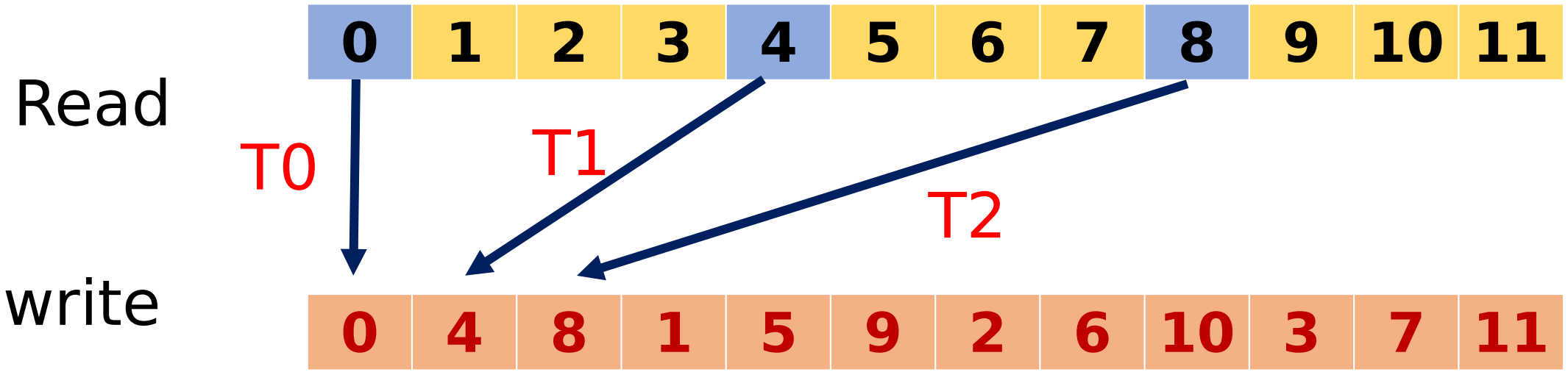


CPU implementation

```
void transpose_mat( float * out, float * in, const int nx,
const int ny)
{
        for (int iy = 0; iy < ny ; ++iy)
        {
          for (int ix = 0; ix < nx ; ++ix)
          {
                out[ ix * ny + iy ] = in[ iy * nx + ix ];
          }
        }
}
```


ix
iy
Matrix
Ix =blockIdx.x * blockDim.x +
threadIdx.x
Grid
Iy =blockIdx.y * blockDim.y +
threadIdx.y


Read
write
0 1 2 3 4 5 6 7 8 9 10 11
0 4 8 1 5 9 2 6 10 3 7 11
T0
T1
T2
T3


Read
write
0 1 2 3 4 5 6 7 8 9 10 11
T0
T1
T2
0 4 8 1 5 9 2 6 10 3 7 11