

Benchmark Demo

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Exchange Sort

```
int a[10] = {10, 3, 7, 2, 8, 9, 4, 5, 11, 1};

int len = sizeof(a) / sizeof(a[0]);

for(int i = 0; i < len - 1; i++) {
    for(int j = i + 1; j < len; j++) {
        if(a[i] > a[j]) {
            int temp = a[i];
            a[i] = a[j];
            a[j] = temp;
        }
    }
}
```

Matrix Multiplication

```
int a = 2;
int b = 2;
int c = 2;
int lM[2][2] = {{1,2},{3,4}};
int rM[2][2] = {{5,6},{7,8}};
int res[2][2] = {{0,0},{0,0}};
for(int i = 0; i < a; i++) {
    for(int j = 0; j < c; j++) {
        for(int k = 0; k < b; k++) {
            res[i][j] += lM[i][k]*rM[k][j];
        }
    }
}
```

$$\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} \times \begin{pmatrix} 5 & 6 \\ 7 & 8 \end{pmatrix} = \begin{pmatrix} 19 & 22 \\ 43 & 50 \end{pmatrix}$$

Matrix multiplication with SIMD

$\text{res}[i][j] = \text{sum}(\text{row}[i] * \text{col}[j])$

$$\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} \times \begin{pmatrix} 5 & 6 \\ 7 & 8 \end{pmatrix} = \begin{pmatrix} 19 & 22 \\ 43 & 50 \end{pmatrix}$$

$\$v1 = [1, 2, 1, 2, 3, 4, 3, 4]$

$\$v2 = [5, 7, 6, 8, 5, 7, 6, 8]$

$\$v3 = \$v1 * \$v2 = [5, 14, 6, 16, 15, 28, 18, 32]$

$\text{res}[i][j] = \$v3[(i*2+j)*2] + \$v3[(i*2+j)*2+1]$