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Representation of Problems

I/O dimension	$d = (n, i, o)$	(length, input stride, output stride)
I/O tensor	$t = (d_1, d_2 \cdots, d_\rho)$	A set of I/O dimensions
Rank	$\rho = \lvert t \rvert$	

$$d = (n, i, o)$$

DFT (1)

$$Y[k] = \sum_{j=0}^{n-1} X[j]\omega_n^{jk} \qquad \omega_n = e^{-j2\pi/n} \qquad n = n_1 n_2 \qquad 0 \le k < n \qquad 0 \le j < n$$

$$k = k_1 + k_2 n_1 \qquad 0 \le k_1 < n_1 \qquad 0 \le k_2 < n_2$$

$$j = j_1 n_2 + j_2 \qquad 0 \le j_1 < n_1 \qquad 0 \le j_2 < n_2$$

$$Y[k_1 + k_2 n_1] = \sum_{j_2=0}^{n_2-1} \sum_{j_1=0}^{n_1-1} X[j_1 n_2 + j_2]\omega_{n_1 n_2}^{(k_1 + k_2 n_1)(j_1 n_2 + j_2)}$$

$$(k_1 + k_2 n_1)(j_1 n_2 + j_2) = k_1 j_1 n_2 + k_2 j_1 n_1 n_2 + k_1 j_2 + k_2 j_2 n_1$$

$$\omega_{n_1 n_2}^{(k_1 + k_2 n_1)(j_1 n_2 + j_2)} = \omega_{n_1 n_2}^{k_1 j_1 n_2} \cdot \omega_{n_1 n_2}^{k_2 j_1 n_1 n_2} \cdot \omega_{n_1 n_2}^{k_1 j_2} \cdot \omega_{n_1 n_2}^{k_2 j_2 n_1}$$

$$= \omega_{n_1}^{k_1 j_1} \cdot 1 \cdot \omega_n^{k_1 j_2} \cdot \omega_{n_2}^{k_2 j_2}$$

$$Y[k_1 + k_2 n_1] = \sum_{j_2=0}^{n_2-1} \left[\left(\sum_{j_1=0}^{n_1-1} X[j_1 n_2 + j_2]\omega_{n_1}^{k_1 j_1} \right) \omega_n^{k_1 j_2} \right] \omega_{n_2}^{k_2 j_2}$$

DFT (2)

$$Y[k_1 + k_2 n_1] = \sum_{j_2=0}^{n_2-1} \left[\left(\sum_{j_1=0}^{n_1-1} X[j_1 n_2 + j_2] \omega_{n_1}^{k_1 j_1} \right) \omega_n^{k_1 j_2} \right] \omega_{n_2}^{k_2 j_2}$$

n_2 DFT of size n_1

n_1 DFT of size n_2

Message Aggregation

References

[1] http://en.wikipedia.org/
[2] http://static.msi.umn.edu/tutorial/scicomp/general/MPI/mpi_coll_new.html
[3] https://computing.llnl.gov/tutorials/mpi/
[4] https://computing.llnl.gov/tutorials/mpi/
[5] Hager & Wellein, Introduction to High Performance Computing for Scientists and Engineers
[6] http://www.mpi-forum.org/docs/mpi-11-html