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NASA TECH BRIEF

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Fast Fourier Transformation Computer Using Fast Counters

Special-purpose computing machines implementing the fast Fourier transform (FFT) algorithm have revolutionized the field of data processing. They make it possible to obtain the discrete Fourier transform (DFT) of a sequence of data points in a method which is both economical and fast.

When the speed of transformation obtainable through a serial application of the FFT algorithm is still not sufficiently high, one has to resort to series-parallel implementations with their attendant cost increase. It is shown that for small batch sizes ($N \leqslant 32$), a more cost-effective design can be based on transforming the basic DFT matrix into a Hankel (or Toeplitz) matrix. This leads to a realization in which the main hardware investment is in a large array of "full-adders" employed as elementary counters.

Two different designs have been developed, one applicable to N prime and one applicable to all N. For low N, both designs have a cost advantage over the equal-speed implementation of the FFT algorithm. The limiting N value (32) mentioned above is a function of the ratio of the cost of memory to that of logic elements and will increase with this ratio.

Note:

Requests for further information may be directed to:

Technology Utilization Officer
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Patent status:

NASA has decided not to apply for a patent.

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