Discuss the relationship

-among FT, DTFT, DFT, and z-transform

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A N point of discrete time series spectrum by Fourier transform (DTFT) is a (2 \* PI) as a cycle for the continuation of the continuous function, by sampling theorem as we know, the time domain sampling, frequency domain cycle continuation; By the same token, if sampling in frequency domain, time domain will cycle continuation. Discrete Fourier transform (DFT) is based on the theory of sampling in frequency domain, a cycle by N point (the same as the sequence points), which will signal spectrum discretization, get a important correspondence: a N points in discrete time signal in the frequency domain can be used to uniquely identify a N point sequences, this is the content of the DFT expression reveals. As for the discrete Fourier transform (DFT, is also to digital signal transformation to the frequency domain analysis, the effect of it on the digital signal processing is considerable. Digital signal processing from the simulation time is totally dependent on by the signal processing device, can be directly calculated for signal processing. Such as digital filter, the coefficient of just using the system to enter the calculation, the digital signal of the signal is processed after the system data in time domain. Discrete Fourier transform on the understanding and the Fourier transform of continuous signal is not too same, mainly is the Fourier transform in the discrete signal involves periodic continuation, and circular convolution.

FT is the Fourier transform, it is mainly used in the analysis of continuous non periodic signal, because the signal is periodic, it shall include the various frequency signal, so has the time-domain continuous aperiodic continuous nonperiodic characteristics corresponding to the frequency domain.

DTFT is a discrete time Fourier transform, which is used to discrete non-periodic sequence analysis, according to the requirements of continuous Fourier transform continuous signal in time must be the necessary and sufficient condition of integrable, so for discrete time Fourier transform, above it is used to discrete sequence must also satisfy the convergence condition of the timeline superior Numbers; Because the signal is a periodic sequence, it will contain the various frequency signal, so DTFT to discrete non periodic signal transform the spectrum of the continuous, namely a continuous cycle time discrete aperiodic corresponding frequency domain characteristics.

When the discrete signal is periodic sequence, strictly speaking, there is no such thing as Fourier transform, because it does not meet the signal sequence series and absolute convergence (absolute) and the Fourier transform of the sufficient and necessary condition, but using DFS (discrete Fourier series) this analysis tool can still carries on the Fourier analysis.

We know by an infinite number of the same cycle discrete signal is periodic sequence on the timeline, assuming cycle for N, namely each cycle sequence has N elements, and such a periodic sequence is infinite, infinitely many periodic sequence due to all the same, so I can only take one cycle is enough to express the whole sequence, the pumped out to represent the cycle according to the characteristic of the sequence value cycle, the said principal values sequences. Then to N corresponds to the frequency as the base frequency needed to constitute the Fourier series expansion of complex exponential sequence ek (N) = exp (j \* 2 \* PI \* k N/N), with main value sequence and complex exponential sequence correlation (by operation), each main value in each frequency spectrum component, thus show the spectrum characteristics of periodic sequence. According to DTFT, for finite length sequences for Z transform or sequence of Fourier transform is feasible, or limited long sequences of frequency domain and complex frequency domain analysis in theory has been resolved; But for the digital system, Z transformation or sequence of Fourier transform for there exist some problems in the respects of important because the continuity of frequency variable nature (DTFT transform a continuous spectrum), is not convenient to digital computation and storage.

Reference DFS, similar DFS analysis method can be used to solve the above problems. Can take the finite length non-periodic sequence hypothesis for an infinitely long periodic sequence of a primary period, namely the limited long cycle continuation non-periodic sequence, after the continuation of sequence is completely DFS can be used for processing, using complex exponential sequence of fundamental frequency, the limited take long time series and draw each principal value on each frequency spectrum component to show the "principal value cycle" spectrum information.

Because of DFT borrowed DFS, thus assuming the sequence cycle is limitless, but when processing to range limit (main value range), to comply with limited long characteristics, which makes DFT with the cyclical. In addition, the DFT is only a week period in the representation of a finite number of discrete frequency, so it is discrete in frequency, the equivalent of DTFT transform into a continuous spectrum again after the sampling, the sampling frequency is equal to the sequence after the continuation of cycle N, or main value sequence number.

Z transform, is in the time domain analysis. The function of Z transformation mainly is through the analysis of the zero and pole of signal or impulse response, to know its stability and time domain features.

Z transform (Z - transformation), is a kind of mathematical transformation of discrete sequences. DTFT is discrete time Fourier transform, which is on the unit circle Z transform, Fourier transform is the special case of Z transform! Fourier transform that are derived from the Fourier series. DTFT is a discrete time Fourier transform, is for the continuous signal and spectrum.

DFT is discrete Fourier transform, is for the discrete signal and spectrum.

Variation of the DFT is DTFT that is actually a continuous time t into nT. Why do you do that, because the computer is working in the digital environment, it can't see a continuous signal or deal with reality, can only discrete calculation, on the authenticity of approximate continuous signal as possible. So the DFT is in order to we can go to use the tool to analysis the signal created, usually we directly use DTFT opportunity seldom.

DFT and DTFT are on the frequency domain analysis, as for Z transform, is in the time domain analysis, we used to call the Z domain. Z transformation mainly is based on the analysis of the effect of signal or impulse response of the zero and pole, know to its stability and time domain features.

Some basic grammar errors. The presentation is not clear. Not well organized.

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