

[Accelerate](#) / Fast Fourier transforms

API Collection

Fast Fourier transforms

Transform vectors and matrices of temporal and spatial domain complex values to the frequency domain, and vice versa.

Overview

Tip

Where possible, use discrete Fourier transforms (DFTs) instead of fast Fourier transforms (FFTs). DFTs provide a convenient API that offers greater flexibility over the number of elements the routines transform. vDSP's DFT routines switch to FFT wherever possible.

For more information about DFTs, see [Discrete Fourier transforms](#).

Topics

Essentials

 Understanding data packing for Fourier transforms

Format source data for the vDSP Fourier functions, and interpret the results.

 Performing Fourier transforms on interleaved-complex data

Optimize discrete Fourier transform (DFT) performance with the vDSP interleaved DFT routines.

 Finding the component frequencies in a composite sine wave

Use 1D fast Fourier transform to compute the frequency components of a signal.

`{}` Halftone descreening with 2D fast Fourier transform
Reduce or remove periodic artifacts from images.

Objects that Simplify FFTs

`class FFT`

A 1D single- and double-precision fast Fourier transform.

`class FFT2D`

A 2D single- and double-precision fast Fourier transform.

`enum FourierTransformDirection`

Fast Fourier transform directions.

`enum Radix`

Fast Fourier transform radices.

FFT Setup

`vDSP_create_fftsetup`

Returns a setup structure that contains precalculated data for single-precision FFT functions.

`vDSP_create_fftsetupD`

Returns a setup structure that contains precalculated data for double-precision FFT functions.

`vDSP_destroy_fftsetup`

Deallocates an existing single-precision FFT setup structure.

`vDSP_destroy_fftsetupD`

Deallocates an existing double-precision FFT setup structure.

`vDSP_DFT_CreateSetup`

`typedef FFTSetup`

An opaque type that contains setup information for a single-precision FFT transform.

`typedef FFTSetupD`

An opaque type that contains setup information for a double-precision FFT transform.

`typealias FFTRadix`

The radix of the FFT decomposition.

Functions for 1D Real FFT

- ⌵ In-Place Functions for 1D Real FFT
Perform fast Fourier transforms in place on 1D real data.
- ⌵ Out-of-Place Functions for 1D Real FFT
Perform fast Fourier transforms out of place on 1D real data.

`vDSP_DFT_zop`

Functions for 1D Multiple-Signal Real FFT

- ⌵ In-Place Functions for 1D Multiple-Signal Real FFT
Perform fast Fourier transforms in place on multiple-signal 1D real data.
- ⌵ Out-of-Place Functions for 1D Multiple-Signal Real FFT
Perform fast Fourier transforms out of place on multiple-signal 1D real data.

Functions for 1D Complex FFT

- ⌵ In-Place Functions for 1D Complex FFT
Perform fast Fourier transforms in place on 1D complex data.
- ⌵ Out-of-Place Functions for 1D Complex FFT
Perform fast Fourier transforms out of place on 1D complex data.

Functions for 1D Multiple-Signal Complex FFT

- ⌵ In-Place Functions for 1D Multiple-Signal Complex FFT
Perform fast Fourier transforms in place on multiple-signal 1D complex data.
- ⌵ Out-of-Place Functions for 1D Multiple-Signal Complex FFT
Perform fast Fourier transforms out of place on multiple-signal 1D complex data.

Functions for 2D Real FFT

⋮ In-Place Functions for 2D Real FFT
Perform fast Fourier transforms in place on 2D real data.

⋮ Out-of-Place Functions for 2D Real FFT
Perform fast Fourier transforms out of place on 2D real data.

Functions for 2D Complex FFT

⋮ In-Place Functions for 2D Complex FFT
Perform fast Fourier transforms in place on 2D complex data.

⋮ Out-of-Place Functions for 2D Complex FFT
Perform fast Fourier transforms out of place on 2D complex data.

Constants

`typealias FFTDirection`

Constants that specify whether to perform a forward or inverse FFT.

`var FFT_FORWARD: Int`
Forward FFT.

`var FFT_INVERSE: Int`
Inverse FFT.

`var FFT_RADIX2: Int`

`var FFT_RADIX3: Int`

`var FFT_RADIX5: Int`

`var kFFTDirection_Forward: Int`

`var kFFTDirection_Inverse: Int`










`var kFFTRadix2: Int`

`var kFFTRadix3: Int`

`var kFFTRadix5: Int`

See Also

Fourier and Cosine Transforms

-  Understanding data packing for Fourier transforms
Format source data for the vDSP Fourier functions, and interpret the results.
-  Finding the component frequencies in a composite sine wave
Use 1D fast Fourier transform to compute the frequency components of a signal.
-  Performing Fourier transforms on interleaved-complex data
Optimize discrete Fourier transform (DFT) performance with the vDSP interleaved DFT routines.
-  Reducing spectral leakage with windowing
Multiply signal data by window sequence values when performing transforms with noninteger period signals.
-  Signal extraction from noise
Use Accelerate's discrete cosine transform to remove noise from a signal.
-  Performing Fourier Transforms on Multiple Signals
Use Accelerate's multiple-signal fast Fourier transform (FFT) functions to transform multiple signals with a single function call.
-  Halftone descreening with 2D fast Fourier transform
Reduce or remove periodic artifacts from images.
-  Discrete Fourier transforms
Transform vectors of temporal and spatial domain complex values to the frequency domain, and vice versa.
-  Discrete Cosine transforms
Transform vectors of temporal and spatial domain real values to the frequency domain, and vice versa.