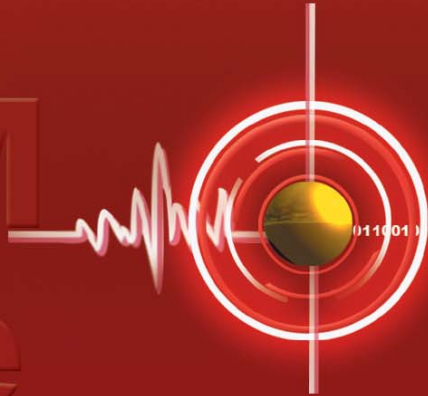




# SIMPLIFYING THE DSP



## Mentor-DSP

Mentor-DSP is an easy to use, interactive software tool cum comprehensive learning resource for various signal processing techniques, DSP functions, communication methods, statistical analysis, speech synthesis, and Image processing. The software includes real-time features such as sound processing, image capture and interface with a specific DSP hardware platform. It is simple, intuitive and straightforward to use, targeted to students in the field of digital signal processing.

Mentor-DSP achieves the perfect balance between theory and practice, making DSP accessible to beginners without ever over complicating it. Comprehensive in scope and gentle in approach, keeping the math at a tolerable level, Mentor-DSP helps engineers thoroughly grasp the basics and quickly move on to more sophisticated techniques.

### Who Can Use ?

Mentor-DSP targets engineering students and learning professionals to pilot them right from basic fundamentals of DSP like sampling theorem, data conversion, aliasing effects, quantization, signal generation etc. to various signal processing techniques viz, convolution, correlation, filtering, FFT & IFFT, modulation schemes etc. and finally paves the way towards advance DSP techniques like DCT, speech synthesis and Image processing.

### Why Mentor-DSP ?

Strong foundations..! Mentor-DSP is intended for DSP learners at any stage from beginners to veterans, to smoothen the learning curve and progress their designs from inspiration to implementation.

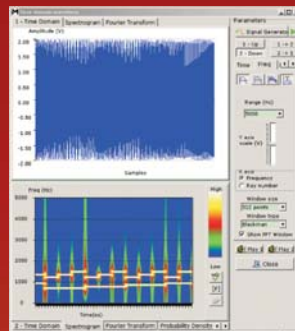
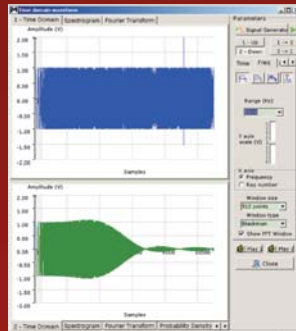
Mentor-DSP will also prove very helpful for teachers to use it during classroom teaching. Teachers can use it Mentor-DSP for in depth explanation of DSP functions & techniques along with practical implementation.

**THE  
POWER OF  
DSP  
IN YOUR HAND**



# DSPpro

## DSP Functions



DSPpro has a wide range of DSP and arithmetic functions which can be applied to, or between, signals. Standard DSP functions include FFT analysis, convolution, correlation and filtering. The simple and intuitive flow of Mentor-DSP helps engineers to learn all major DSP functions with ease. The GUI has been design with statistically placed buttons and various windows for displaying results. Mentor-DSP offers best possible training features for all major DSP functions and techniques with its unique and interactive flow.

### Highlights:

- ⊖ Fast Fourier Transform (FFT) calculation with size up to 4096 points.
- ⊖ Real time FFT for Microphone audio input.
- ⊖ Can find Inverse Fourier Transform with facility to change sine and cosine harmonics.
- ⊖ Support for design of FIR, IIR Filters and can write our own recurrence equations.
- ⊖ Support designs for Low pass, High pass, Band pass and Notch filters.
- ⊖ Import/Export of coefficient for filters.
- ⊖ Generate Coefficients for FIR, IIR and recurrence equations.
- ⊖ FIR Filtering supports rectangular, hamming and Blackman Windows.
- ⊖ IIR Filtering supports Bessel, Chebyshev and Butterworth.
- ⊖ Can do Convolution and Correlation operations on two signals.
- ⊖ Performs Correlation on noisy signal to extract original signal.
- ⊖ Support DTMF Tone identification.
- ⊖ Real time 2-D Spectrogram with Microphone input.

# NUMpro

## Data Formats



This section helps engineers to understand the various data formats used for signal processing. Engineers can understand the concept of coding schemes and their requirements in various applications.

### Highlights:

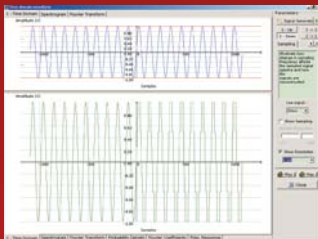
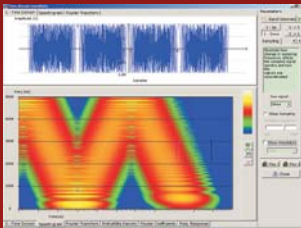
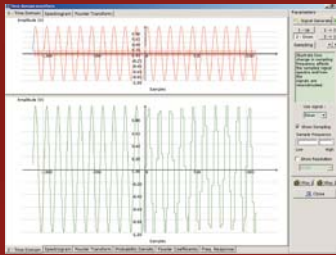
- ⊖ Different type of coding schemes(Real, Hexadecimal, Fixed point, Floating point and conversion among these).
- ⊖ Precision may be set from 4 to 32-bits.
- ⊖ Data in signed format supports between -1.0 and +1.0
- ⊖ Output result can be seen with or without saturation for fixed point numbers.



## DSPbase

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### Basic Theory



This section introduces the engineers with basic DSP fundamentals and their importance in further signal processing applications. As DSP starts from here; sampling of analog signals, quantization, calculating energy and power in signals; this section helps engineer to learn basics with ease.

#### Highlights:

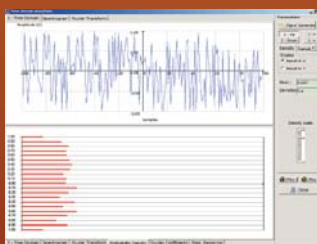
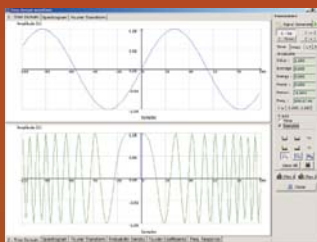
- ☞ Engineers can start with realization of sampling theorem and observe Aliasing effects on signals.
- ☞ Effect on output signal by changing resolution of ADC (up to 32-bit supported).
- ☞ Learn statistics of DSP by calculating Energy, Power, Average, Period and Frequency of required signals.
- ☞ Facility to adjust Energy Scale.
- ☞ Learn plotting of Probability density function.



## MATHstat

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### Statistical Properties



Mentor-DSP offers a simple and intuitive way to calculate statistical figures of signals. Most of DSP applications are concerned with statistics of signals, by calculating energy, power, average, deviation, probability density function etc. These calculations help engineers to know about signals and are very helpful esp. in communication or RF applications. With this engineers can easily learn and practice the mathematics involved behind statistical calculations of signal.

#### Highlights:

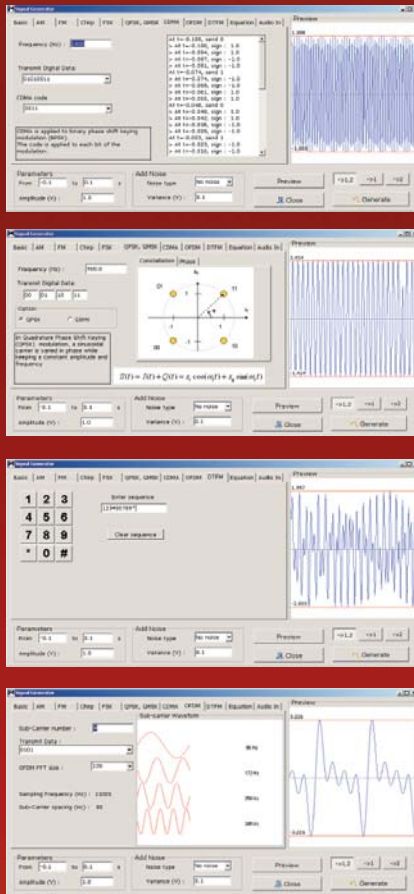
- ☞ Shows the Mean and Standard deviations of signals.
- ☞ Shows Probability Density Function (PDF) of signals.
- ☞ Facility to adjust density scale.
- ☞ Can show Probability Distribution, Density Function, Period, Frequency, Average, Standard Deviation of signals.



# SIGgen

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## Signal Generation



Mentor-DSP supports an extensive set of signal generators for various DSP applications. The signal generation is categorized for different domains of DSP like audio, communication, analysis, etc. Engineers can learn various signals types and their properties. More than that signal generator helps engineers to understand which kind of signals to be used for various DSP applications.

### Highlights:

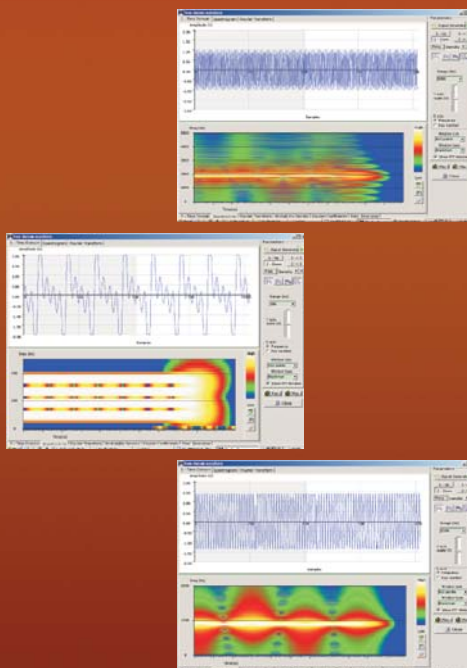
- ☞ Basic signal generators including sine, cosine, square, sawtooth and triangle waves, but also less commonly available functions such as unit step, unit impulse, and noise functions.
- ☞ Signal generation facility for Amplitude modulation (AM), Frequency Modulation (FM), Frequency Shift keying (FSK), QPSK, GMSK, OFDM, DTMF signals, etc.
- ☞ Noise, with specified distributions (white, Gaussian) can be added to signals.
- ☞ Equation window in which we can create our own signals by writing equations (for e.g. Exp, White (1), Gauss (0.5) etc.)
- ☞ It also supports audio signal input through windows wave file format.



# COMpro

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## Communication



Mentor-DSP also covers communication area where DSP plays an important role. Mentor-DSP can illustrate various modulation techniques available for communication. It can perform modulation on signals giving access to the key parameters such as the modulation amplitude and signal frequencies.

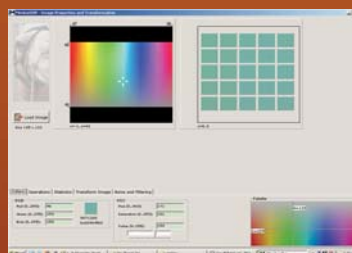
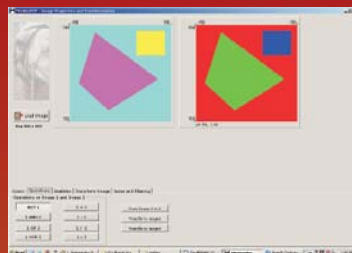
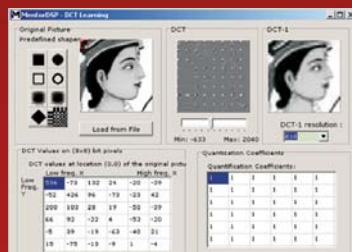
### Highlights:

- ☞ Performs Amplitude Modulation (AM) and Demodulation.
- ☞ Performs Frequency Modulation (FM) and Demodulation.
- ☞ Performs Quadrature Phase Shift Keying (QPSK) Modulation and Demodulation.
- ☞ Performs Gaussian Modulated Shift Keying (GMSK) Modulation and Demodulation.
- ☞ Performs Code Division Multiple Access (CDMA) Modulation and Demodulation.
- ☞ Performs Orthogonal Frequency Division Multiplexing (OFDM) Modulation and Demodulation.

# IMAGEsee

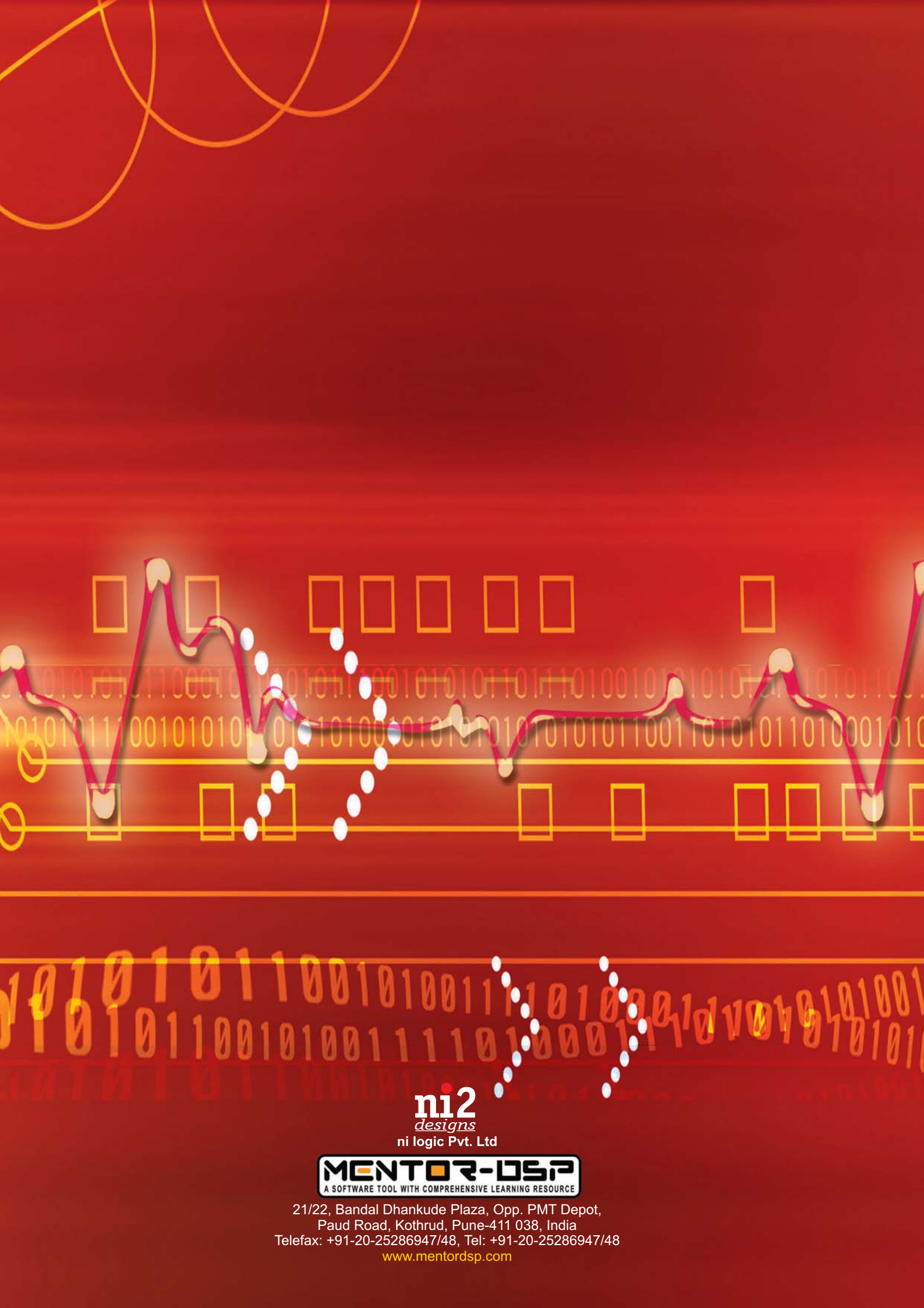
## Imaging

Understanding Image Processing(IP) fundamentals is no more night mare. Mentor-DSP has exhaustive list of image processing learning resources. It starts with familiarization of image properties, and moves upwards to know completely about Discrete Cosine Transform(DCT), image transformation and image filtering. This section will give engineers an interactive platform to learn image processing.



### Highlights:

- ☞ Display of image properties like Hue, Saturation, Value, RGB values, etc.
- ☞ Image statistics with help of color histogram, visualize sampled spectra of colors in image.
- ☞ Perform binary (NOT, AND, OR and XOR) and arithmetic (ADD, SUB, MULTIPLY and DIVIDE) operations on images.
- ☞ Perform Discrete Cosine Transform (DCT) on images with various resolutions.
- ☞ Understand the link between image pixels and frequency.
- ☞ Visualize the impact of quantization resolution and image compression factor on the resulting image quality.
- ☞ Provides image transformation with user defined equation. With this you can stretch, skew, rotate & translate images.
- ☞ Facility to add anchors on image.
- ☞ Finds object position in a picture by image correlation technique.
- ☞ Facility to add RGB plane noises to image.
- ☞ Filtering facility for noisy images with user defined parameters.
- ☞ Various commands for image handling like copy, transfer, etc.



**ni2**  
*designs*  
ni logic Pvt. Ltd

**MENTOR-DSP**  
A SOFTWARE TOOL WITH COMPREHENSIVE LEARNING RESOURCE

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