查看各窗函数特性软件“多功能虚拟新号分析仪”，链接 http://www.crsky.com/soft/18883.html

1、rectangle

$$w(k)=\begin{cases}1 & 0\le k\le N\\ 0 & \text{其他}\end{cases}$$

2、bartlett

$$w(k)=\begin{cases}\dfrac{2k}{n-1} & 0\le \mathrm{k}\le \dfrac{1}{2}(n-1)\\ 2-\dfrac{2k}{n-1} & \dfrac{1}{2}(n-1)\le \mathrm{k}\le n-1\end{cases}$$

3、triangular

The triangular window is very similar to a Bartlett window. The Bartlett window always ends with zeros at samples 1 and n, while the triangular window is nonzero at those points.

奇数:

$$w(k)=\begin{cases}\dfrac{2k}{n+1} & 1\le \mathrm{k}\le \dfrac{\mathrm{n}+1}{2}\\ \dfrac{2(n-k+1)}{n+1} & \dfrac{\mathrm{n}+1}{2}\le \mathrm{k}\le n\end{cases}$$

偶数:

$$w(k)=\begin{cases}\dfrac{2k-1}{n} & 1\le \mathrm{k}\le \dfrac{\mathrm{n}}{2}\\ \dfrac{2(n-k+1)}{n} & \dfrac{\mathrm{n}}{2}+1\le \mathrm{k}\le n\end{cases}$$

4、cosine

$$w(k)=\cos\left(\frac{\pi k}{n-1}-\frac{\pi}{2}\right)$$

5、Hanning

$$w(k)=0.5*\left(1-\cos\frac{2\pi k}{n-1}\right)$$

6、bartlett_hanning

this window has a mainlobe at the origin and asymptotically decaying sidelobes on both sides. It is a linear combination of weighted Bartlett and Hann windows with near sidelobes lower than both Bartlett and Hann and with far sidelobes lower than both Bartlett and Hamming windows. The

mainlobe width of the modified Bartlett-Hann window is not increased relative to either Bartlett or Hann window mainlobes.

$$w(k) = 0.62 - 0.48\left|\frac{k}{n-1} - \frac{1}{2}\right| - 0.38\cos\left(\frac{2\pi k}{n-1}\right)$$

7、Hamming

$$w(k) = 0.54 - 0.46 * \cos\frac{2\pi k}{n-1}$$

8、Blackman

Blackman windows have slightly wider central lobes and less sideband leakage than equivalent length Hamming and Hann windows.（Blackman 窗拥有略宽的主瓣和相对于同等长度 Hamming and Hann 窗，更少的盘瓣泄漏。）

$$w(k) = 0.42 - 0.5\cos\frac{2\pi k}{n-1} + 0.08\cos\frac{4\pi k}{n-1}$$

9、blackman_Harris

The window is minimum in the sense that its maximum sidelobes are minimized.（**4-term Blackman-harris 在最大盘瓣上讲，是最小化的。**）

$$w(k) = 0.35875 - 0.48829\cos\frac{2\pi k}{n-1} + 0.14128\cos\frac{4\pi k}{n-1} - 0.01168\cos\frac{6\pi k}{n-1}$$

10、Tukey

The tukey window also known as the tapered cosine window, can be regarded as a cosine lobe of width $\frac{\alpha n}{2}$ that is convolved with a rectangle window fo width $\left(1-\frac{\alpha}{2}\right)n$ .At $\alpha = 0$ it becomes rectangular, and at $\alpha = 1$ it becomes a Hanning Window.

$$w(k) = \begin{cases} 0.5(1+\cos((\frac{2k}{\alpha n} - 1)\pi) & 0 \le \mathrm{k} \le \frac{\alpha n}{2} \\ 1 & \frac{\alpha n}{2} \le \mathrm{k} \le \left(1-\frac{\alpha}{2}\right)n \\ 0.5(1+\cos((\frac{2k}{\alpha n} - \frac{2}{\alpha} + 1)\pi) & \left(1-\frac{\alpha}{2}\right)n \le \mathrm{k} \le n \end{cases}$$

11、Nuttall

The window is minimum in the sense that its maximum sidelobes are minimized. The coefficients for this window differ from the Blackman-Harris window coefficients computed with blackmanharris and produce slightly lower sidelobes

$$w(k) = 0.3635819 - 0.4891775\cos\frac{2\pi k}{n-1} + 0.1365995\cos\frac{4\pi k}{n-1} - 0.0106411\cos\frac{6\pi k}{n-1}$$

12、FlatTop

查看各窗函数特性软件“多功能虚拟新号分析仪”，链接 http://www.crsky.com/soft/18883.html

Flat Top windows have very low passband ripple (< 0.01 dB) and are used primarily for calibration purposes. Their bandwidth is approximately 2.5 times wider than a Hann window.
Flat Top 有非常低的通带波纹(< 0.01 dB)，主要用于校准的目的。他的带宽大约是 Hann 窗 2.5 倍多。

$$w(k) = 0.21557895 - 0.41663158\cos\frac{2\pi k}{n-1} + 0.277263158\cos\frac{4\pi k}{n-1} - 0.083578947\cos\frac{6\pi k}{n-1}$$
$$+ 0.006947368\cos\frac{8\pi k}{n-1}$$

13、Bohman

A Bohman window is the convolution of two half-duration cosine lobes. In the time domain, it is the product of a triangular window and a single cycle of a cosine with a term added to set the first derivative to zero at the boundary. Bohman windows fall off as 1/w4.

$$w(k+1) = \left[1.0 - \frac{k-\frac{n}{2}}{\frac{n}{2}}\right]\cos\left[\pi\frac{k-\frac{n}{2}}{\frac{n}{2}}\right] + \frac{1}{\pi}\sin\left[\pi\frac{k-\frac{n}{2}}{\frac{n}{2}}\right]$$

14、Parzen

Parzen windows are piecewise cubic approximations of Gaussian windows. Parzen window sidelobes fall off as $1/w^4$.

$$w(k) = 1.0 - 6[\frac{k}{n/2}]^2\left[1.0 - \frac{|k|}{n/2}\right] \qquad 0 \le |\mathrm{n}| \le \frac{N}{4}$$

$$w(k) = 2\left[1.0 - \frac{|k|}{n/2}\right]^3 \qquad \frac{N}{4} \le |\mathrm{n}| \le \frac{N}{2}$$

15、Lanczos

$$w(k) = \sin c(\frac{2k}{n-1} - 1)$$

16、Kaiser

$$w_k(k) = \frac{I_0(\beta)}{I_0(\alpha)} \qquad 0 \le \mathrm{k} \le \mathrm{n}$$

$$\beta = \alpha\sqrt{1 - (\frac{2k}{n-1} - 1)^2}$$

查看各窗函数特性软件“多功能虚拟新号分析仪”，链接 http://www.crsky.com/soft/18883.html

$I_0(x)$是零阶第一类修正贝塞尔函数，可用下面级数计算：

$$I_0(x)=1+\sum_{k=1}^{\infty}\left(\frac{1}{k!}\left(\frac{x}{2}\right)^k\right)^2$$

17、Gauss

$$w(k)=e^{-\frac{1}{2}\left(\alpha\frac{k-\frac{n}{2}}{n/2}\right)^2} \qquad 0\le k\le n \quad \alpha\ge 2$$

18、dolph_chebyshev

参数 at，指定设计的窗的最大衰减。

注意：N 必须为奇数。