
Subject: Re: Normal Distributed Random Numbers
Posted by [Craig Markwardt](#) on Tue, 04 Sep 2001 21:04:13 GMT
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"Kay Bente" <KBente@lycos.de> writes:

> Hi
> I have to create arrays with normal distributed random numbers, but with
> variable FWHM (Full width half max/standard deviation sigma?).
> I want to add normal distributed noise to an image, so that the values
> differ around a mean value.

> has.

From the IDL Reference Guide:

> The RANDOMN function returns one or more normally-distributed,
> floating-point, pseudo-random numbers with a mean of zero and a
> standard deviation of one.

So there you go, the deviates produced by RANDOMN have a gaussian sigma of 1, like this:

```
S = RANDOMN(SEED, 1000)
```

And then it's well established for a gaussian distribution that if you want a new mean, MU, and new gaussian sigma, SIG, then you would apply the following formula:

$$\text{SPRIME} = S * \text{SIG} + \text{MU}$$

And, knowing that gaussian sigma is approximately $\text{SIG} = \text{FWHM} / 2.35$, you are set. The key here is that SIG can be an array, not just a scalar, so you can have a different value of SIG (and hence FWHM) for each pixel.

Good luck,
Craig

--

Craig B. Markwardt, Ph.D. EMAIL: craigmnet@cow.physics.wisc.edu
Astrophysics, IDL, Finance, Derivatives | Remove "net" for better response

Subject: Re: Normal Distributed Random Numbers
Posted by [James Kuyper](#) on Tue, 04 Sep 2001 21:24:07 GMT
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Kay Bente wrote:

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> In IDL there is a procedure to create such arrays RandomN, but you can't
> change the FWHM and I can't find what FWHM the normal distribution there
> has.

For a normal distribution, $\text{FWHM} = 2 \cdot \sqrt{\log(2)} \cdot (\text{standard deviation})$

RandomN produces a distribution with a mean of 0 and a standard deviation of 1.0. Therefore, to create an array with a desired mean value and a desired value for FWHM, use:

```
array = mean + fwhm*RandomN(Seed, N)/(2*sqrt(log(2)))
```

Subject: Re: Normal Distributed Random Numbers
Posted by [thompson](#) on Tue, 04 Sep 2001 21:34:40 GMT
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> change the FWHM and I can't find what FWHM the normal distribution there
> has.

> So I would be glad If someone can tell me how to create such arrays (maybe
> outof uniform distributed arrays created with RandomU, I have no idea.
> I'm using IDL 5.4

The RANDOMN() function creates a Gaussian distribution with an average of 0, and a standard deviation of 1. Mathematically, this is written as

$$\text{EXP}(-0.5 \cdot X^2)$$

If you want a different distribution, e.g. a different average or a different standard deviation, all you need to do is something

$$\text{RanVals} = \text{AvgVal} + \text{Sigma} * \text{RANDOMN}(\text{Seed}, \text{Num})$$

For example,

$$\text{RanVals} = 500 + 3 * \text{RANDOMN}(\text{Seed}, 10000)$$

would produce a bunch of random numbers with an average value of 500, and a standard deviation of 3. In other words, most of the numbers would be between 497 and 503.

(The FWHM of this distribution is $2 * \text{Sigma} * \text{SQRT}(2 * \text{ALOG}(2))$, or about $2.35 * \text{Sigma}$, but I suspect you're really thinking about the standard deviation Sigma rather than the FWHM.)

William Thompson
