
Subject: Re: Is there an automated way to estimated FWHM on 2-D image
Posted by [Jeremy Bailin](#) on Sun, 20 Sep 2009 12:10:23 GMT

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On Sep 19, 9:02 pm, John Shaw <jds...@udel.edu> wrote:

> Hi,
>
> Longtime reader, first time question:
>
> I was wondering if anyone had a routine for estimating the full-width-
> at-half-maximum (FWHM) of possible point sources in a 2-D array. Most
> of the routines I have found and examined request the FWHM for a
> guassian to be convolved to find the sources.
>
> What I'd like to do, is provide the source positions and get back the
> FWHM.
>
> I.e., I have many images and need to determine the s/n (signal-to-
> noise) and FWHM without interactively working out the values for each
> image (or point source). I can easily determine the background value
> and the flux values for each point, if I provide the FWHM initially,
> but since the FWHM can change significantly from image to image, this
> is a problem.
>
> My overall goal is to get accurate positions of the point sources with
> accuracy estimates (i.e. (s/n) / (FWHM)). My sticking point seems to
> be the FWHM.
>
> Any help would be appreciated.
>
> Thanks - John

Would PKFIT in the IDL astronomy library give you what you need? You
can get the Gaussian dispersion out, which is easy to convert into a
FWHM.

-Jeremy.

Subject: Re: Is there an automated way to estimated FWHM on 2-D image
Posted by [wlandsman](#) on Sun, 20 Sep 2009 13:12:26 GMT

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On Sep 20, 8:10 am, Jeremy Bailin <astroco...@gmail.com> wrote:

> On Sep 19, 9:02 pm, John Shaw <jds...@udel.edu> wrote:
>
>
>

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> FWHM.
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I would just use any Gaussian-2d fitting routine, such as
gauss2dfit.pro in the ITTVIS library, or (preferably) the Gaussian
option of the mp2dfitfun.pro function in Craig Markwardt's fitting
library (<http://www.physics.wisc.edu/~craigm/idl/fitting.html>).

One thing to be careful of is the choice of the fitting region
size. We don't observe Gaussians in real life, and for example,
star images have very extended wings. If your fitting region
includes the far wings, then your derived FWHM will be strongly biased
(especially since there are many more pixels in the wings). A
general rule is that the fitting region should be the size of the
FWHM. Since the FWHM is what you are trying to determine, you
might have to iterate. (So if using a 5x5 box gives you a FWHM =
1.8, then you might want to recompute it using a 3x3 box.

The pkfit.pro procedure does have some advantages: (1) it fits a
Gaussian convolved with the pixel size rather than just a Gaussian,
and (2) it gives lower weight to pixels far from the centroid, and (3)
it iterates to choose the best (circular) fitting radius, among 3, 5,
and 7 pixels. But it is very old and ugly code (circa 1988), and
does a lot of extraneous calculations since it is part of a larger
fitting package.

Finally, note that if you are only using the FWHM as input to a source
detection algorithm, then it does not need to be very accurate. --
Wayne

Subject: Re: Is there an automated way to estimated FWHM on 2-D image
Posted by [Jeremy Bailin](#) on Mon, 21 Sep 2009 02:41:53 GMT
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On Sep 20, 9:12 am, wlandsman <wlands...@gmail.com> wrote:
> On Sep 20, 8:10 am, Jeremy Bailin <astroco...@gmail.com> wrote:
>
>> On Sep 19, 9:02 pm, John Shaw <jds...@udel.edu> wrote:
>

```

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> fitting package.
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> Finally, note that if you are only using the FWHM as input to a source
> detection algorithm, then it does not need to be very accurate. --
> Wayne

```

Of course, another issue is what if your PSF doesn't even remotely look Gaussian, even within the FWHM. The nice thing about the FWHM is that it's pretty well-defined for any declining profile... so you could do something like this (UNTESTED):

```

; we want to find FWHM of image within a box of size "width" around
"x0", "y0":
pixelvalues = image[x0-0.5*width:x0+0.5*width,
y0-0.5*width,y0+0.5*width]
nbox = n_elements(pixelvalues)
pixelcoords = array_indices(pixelvalues, lindgen(nbox)) + rebin
([x0,y0],2,nbox)-0.5*width

```

```
pixelradii2 = total(pixelcoords^2, 1)
```

```
; get a smoothed version of pixelvalues to get the average profile.
```

```
use a boxcar
```

```
; of width 5 as a wild guess. this part of the code could be a lot  
smarter.
```

```
sortedradii = sort(pixelradii2)
```

```
smoothed_pixelvalues = smooth(pixelvalues[sortedradii], 5)
```

```
; find the half-max point
```

```
maxvalue = max(pixelvalues)
```

```
halfmaxpoint = sqrt(interpol(pixelradii2, smoothed_pixelvalues,  
0.5*maxvalue))
```

```
fwhm = 2. * halfmaxpoint
```

-Jeremy.

Subject: Re: Is there an automated way to estimated FWHM on 2-D image

Posted by [jdshaw](#) on Wed, 23 Sep 2009 19:47:37 GMT

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Thanks, this gives me some good ideas of where to start.

- John
