Subject: Re: Minimum area ellipse - quadratic optimisation?
Posted by Paolo Grigis on Thu, 16 Feb 2006 15:15:30 GMT
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well, since you said that the center is fixed:

find the minimum area circle (which has the radius equal the distance
from the farthest point to the center, very easy) and squeeze it progressively
(along the direction perpendicular to the line connecting the center
to the farthest point) until you get a point outside the ellipse.
Trace one step back, and you're done!

Ciao,
Paolo

Olivia wrote:
> Dear All,
>
> My aim is to fit an ellipse with a known center onto a distribution of
> points, where all points have to be inside or on the ellipse, and the
> ellipse chosen is of the minimum area.
>
> I thought a brute force and not very clever way of doing this would be
> to calculate the area taking each set of 3 points to solve the 3
> remaining unknowns, (a, b, and orientation angle), in the ellipse
> equation, and finding which one had the smallest area. But this
> wouldn't work obviously as there would be no condition that all the
> other points have to be inside the ellipse. I have read up on quadratic
> optimization but have to admit I do not really understand the maths.
>
> I posted on this topic before, but it is important that my ellipse
> fitting method does not rely on convex hulls. I wrote a program which
> does fit ellipses to the point distributions, but not the ellipses with
> the minimum area.
>
> I am sure the problem can't be as hard as I am finding it, and I am
> feeling right now like drawing the 600 or so ellipses my program needs
> myself! Any suggestions really would be very helpful. Thanks,
>
> Olivia
>

Subject: Re: Minimum area ellipse - quadratic optimisation?
Posted by Olivia on Thu, 16 Feb 2006 16:41:29 GMT
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That's a really good idea! I had another idea which was to find the

distance from all the points to the center, then find the minimum area triangle, and fit an ellipse to that, but your idea sounds much more straightforward. Thanks, you've really helped me a lot,

Olivia

Subject: Re: Minimum area ellipse - quadratic optimisation?
Posted by jeyadev on Thu, 16 Feb 2006 20:11:27 GMT
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In article <1140099547.933485.155540@g43g2000cwa.googlegroups.com>,
Olivia <olivia.roberts@merton.ox.ac.uk> wrote:
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>
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 ^^

Is there a special reason for this?

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> feeling right now like drawing the 600 or so ellipses my program needs
> myself! Any suggestions really would be very helpful. Thanks,

Perhaps

http://geometryalgorithms.com/Archive/algorithm_0107/algorit hm_0107.htm

could be of some help
--

Surendar Jeyadev jeyadev1@wrc.xerox.com

The 1 in the email address is fake

Subject: Re: Minimum area ellipse - quadratic optimisation?

Posted by Olivia on Fri, 17 Feb 2006 17:28:27 GMT
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>> I posted on this topic before, but it is important that my ellipse
>> fitting method does not rely on convex hulls.

> Is there a special reason for this?

There is a special reason. I am doing a project on galaxy cluster shapes, comparing the shapes of the clusters as determined by voronoi tesselations, and by the minimum area ellipses. So fitting ellipses to convex hulls would give a false comparison.

> Perhaps
> http://geometryalgorithms.com/Archive/algorithm_0107/algorit hm_0107.htm
> could be of some help

This looks like just the thing I am after. I don't think finding the center point and then finding the minimum area ellipse is a valid method, after experimenting with it today. I understand the idea of this fitting algorithm, but after reading the paper by Gaertner and Schoenherr I doubt if I would be able to right a program to fit the ellipses myself. Do you know of anyone who might have written one of these types of programs for IDL? Thanks very much for your idea, and help.

Olivia

Subject: Re: Minimum area ellipse - quadratic optimisation?
Posted by greg michael on Mon, 20 Feb 2006 13:01:26 GMT
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Hi Olivia,

One step simpler than Paolo's method would be, after finding the long radius, to evaluate directly the required short radius for each point and pick the maximum. No iteration required. The maths should be easy if you're at Merton!

Greg
