Subject: Re: Is there a simple way to plot field lines?
Posted by Mark Hadfield on Wed, 28 May 2003 01:12:11 GMT
View Forum Message <> Reply to Message

"Steve" <so@cp.dias.ie> wrote in message
news:178496d6.0305271647.468088fa@posting.google.com...
> I would like to plot field lines but there coesn't seem to be an
> intrinsic function which can do it. This seems hard to believe, am I
> mistaken?

What do you mean by "plot field lines". If you have (x,y) coordinates defining your lines, then PLOT them. Or do you want to plot isolines for a scalar field? Or lines in 3D space? Or cows walking along lines in fields?

--

Mark Hadfield "Ka puwaha te tai nei, Hoea tatou"
m.hadfield@niwa.co.nz
National Institute for Water and Atmospheric Research (NIWA)

Subject: Re: Is there a simple way to plot field lines?
Posted by David Fanning on Wed, 28 May 2003 02:53:31 GMT
View Forum Message <> Reply to Message

Mark Hadfield (m.hadfield@niwa.co.nz) writes:

> What do you mean by "plot field lines". If you have (x,y) coordinates
> defining your lines, then PLOT them. Or do you want to plot isolines for a
> scalar field? Or lines in 3D space? Or cows walking along lines in fields?

I think you might have to code the latter up. I once had a railroad engine running across a plot. If you screw up your nose and cross your eyes it sorta looks like a cow. I'd be happy to send you the code.

I think "plot field lines" might be code for "velovect". If so, I would get the one Martin Schultz modified for overplotting, etc. It can be found under "Modified IDL Routines -> Plotting Routines" on Ronn Kling's web page:

http://www.rlkling.com/

Cheers,

David

--

David W. Fanning, Ph.D.
Fanning Software Consulting, Inc.
Phone: 970-221-0438, E-mail: david@dfanning.com
Coyote's Guide to IDL Programming: http://www.dfanning.com/
Toll-Free IDL Book Orders: 1-888-461-0155

Subject: Re: Is there a simple way to plot field lines?
Posted by so on Wed, 28 May 2003 13:22:00 GMT
View Forum Message <> Reply to Message

"Mark Hadfield" <m.hadfield@niwa.co.nz> wrote in message
news:<bb12dfqan1@newsreader.mailgate.org>...
> "Steve" <so@cp.dias.ie> wrote in message
> news:178496d6.0305271647.468088fa@posting.google.com...
>> I would like to plot field lines but there coesn't seem to be an
>> intrinsic function which can do it. This seems hard to believe, am I
>> mistaken?
>
> What do you mean by "plot field lines". If you have (x,y) coordinates
> defining your lines, then PLOT them. Or do you want to plot isolines for a
> scalar field? Or lines in 3D space? Or cows walking along lines in fields?

Ouch. Well I guess I should have been more explicit to. I mean field
lines which are everywhere tangent to a vector field (2d is fine
thanks), also known as streamlines for velocity fields. I don't want
arrows anywhere. Or cows.

Subject: Re: Is there a simple way to plot field lines?
Posted by David Fanning on Wed, 28 May 2003 13:30:01 GMT
View Forum Message <> Reply to Message

Steve (so@cp.dias.ie) writes:

> Ouch. Well I guess I should have been more explicit to. I mean field
> lines which are everywhere tangent to a vector field (2d is fine
> thanks), also known as streamlines for velocity fields. I don't want
> arrows anywhere. Or cows.

Oh, well then. STREAMLINE might do the trick. :-)

Cheers,

David
--
David W. Fanning, Ph.D.

Fanning Software Consulting, Inc.
Phone: 970-221-0438, E-mail: david@dfanning.com
Coyote's Guide to IDL Programming: http://www.dfanning.com/
Toll-Free IDL Book Orders: 1-888-461-0155

Subject: Re: Is there a simple way to plot field lines?
Posted by so on Wed, 28 May 2003 13:54:53 GMT
View Forum Message <> Reply to Message

David Fanning <david@dfanning.com> wrote in message
news:<MPG.193dd29796c88430989bb3@news.frii.com>...
> Mark Hadfield (m.hadfield@niwa.co.nz) writes:
>
>> What do you mean by "plot field lines". If you have (x,y) coordinates
>> defining your lines, then PLOT them. Or do you want to plot isolines for a
>> scalar field? Or lines in 3D space? Or cows walking along lines in fields?
>
> I think you might have to code the latter up. I once
> had a railroad engine running across a plot. If you
> screw up your nose and cross your eyes it sorta looks
> like a cow. I'd be happy to send you the code.
>
> I think "plot field lines" might be code for "velovect".
> If so, I would get the one Martin Schultz modified for
> overplotting, etc. It can be found under "Modified IDL
> Routines -> Plotting Routines" on Ronn Kling's web page:
>
> http://www.rlkling.com/
>
> Cheers,
>
> David

Thanks. I've had a look and I reckon the easiest way of doing this is
to write a field line plotter (sorry,
 code-that-takes-a-vector-field-and-traces-lines-which-are-ta
ngent-to-the-vector-field-from-a-number-of-seed-points)
in C. I can't see much point in having to hack a huge expensive
package like IDL to do something simple slowly.
Thanks again though!

Subject: Re: Is there a simple way to plot field lines?
Posted by so on Wed, 28 May 2003 20:36:53 GMT
View Forum Message <> Reply to Message

David Fanning <david@dfanning.com> wrote in message
news:<MPG.193e67c621b7edc6989bb4@news.frii.com>...
> Steve (so@cp.dias.ie) writes:
>
>> Ouch. Well I guess I should have been more explicit to. I mean field
>> lines which are everywhere tangent to a vector field (2d is fine
>> thanks), also known as streamlines for velocity fields. I don't want
>> arrows anywhere. Or cows.
>
> Oh, well then. STREAMLINE might do the trick. :-)
>
> Cheers,
>
> David

There is a script called streamline.pro on
http://www.metvis.com.au/graphics.html with nice examples of its
output. It uses particle_trace and by commenting out the arrow
commands and judiciously tweaking the number of seedpoints, step size,
and max iterations it produces perfectly acceptable field line plots.

I am plotting dipole fields which look a bit iron-filing like I guess
because of the 1/r3 dependence but I am guessing if the seed points
were chosen over a central sphere with uniform angular separation it
would be smoother.

Hope this helps somebody else sometime.

Cheers, Stephen

Subject: Re: Is there a simple way to plot field lines?
Posted by wmconnolley on Wed, 28 May 2003 21:41:44 GMT
View Forum Message <> Reply to Message

Steve <so@cp.dias.ie> wrote:
> David Fanning <david@dfanning.com> wrote in message
news:<MPG.193e67c621b7edc6989bb4@news.frii.com>...

>> Oh, well then. STREAMLINE might do the trick. :-)

> There is a script called streamline.pro on
> http://www.metvis.com.au/graphics.html

> Hope this helps somebody else sometime.

It helped me. I've been wondering about this for some time. Thanks.

-W.

--
William M Connolley | wmc@bas.ac.uk | http://www.nerc-bas.ac.uk/icd/wmc/
Climate Modeller, British Antarctic Survey | Disclaimer: I speak for myself
I'm a .signature virus! copy me into your .signature file & help me spread!

Subject: Re: Is there a simple way to plot field lines?
Posted by mvukovic on Wed, 28 May 2003 23:29:28 GMT
View Forum Message <> Reply to Message

so@cp.dias.ie (Steve) wrote in message
news:<178496d6.0305280522.5db923d4@posting.google.com>...
> "Mark Hadfield" <m.hadfield@niwa.co.nz> wrote in message
news:<bb12dfqan1@newsreader.mailgate.org>...
>> "Steve" <so@cp.dias.ie> wrote in message
>> news:178496d6.0305271647.468088fa@posting.google.com...
>>> I would like to plot field lines but there coesn't seem to be an
>>> intrinsic function which can do it. This seems hard to believe, am I
>>> mistaken?
>>
>> What do you mean by "plot field lines". If you have (x,y) coordinates
>> defining your lines, then PLOT them. Or do you want to plot isolines for a
>> scalar field? Or lines in 3D space? Or cows walking along lines in fields?
>
> Ouch. Well I guess I should have been more explicit to. I mean field
> lines which are everywhere tangent to a vector field (2d is fine
> thanks), also known as streamlines for velocity fields. I don't want
> arrows anywhere. Or cows.

This seems to me a problem to which there is no magic bullet. What
you seem to be looking for really, is to obtain a function of your
coordinates, such that contours of that function are the streamlines
from your data.

Another (more defined) approach would be to set-up a PDE for your
streamlines, with the right hand side being derived from your data
(interpolated at the points where the PDE is being solved for)

dx/ds = cos(alpha)
dy/ds = sin(alpha)

where alpha is the angle of the streamline with respect to x and s is
the arclength.

Then you would solve the PDE for some starting point, and follow it to
obtain a streamline. The PDE may be re-cast as on ODE

dx/dy = tan(alpha)

However, this may fail if you have looping streamlines.

Summarizing, this is more of a problem of data analysis and number crunching than just plotting. But it sure sounds fun!

Mirko

Subject: Re: Is there a simple way to plot field lines?
Posted by so on Thu, 29 May 2003 14:58:44 GMT
View Forum Message <> Reply to Message

wmc@bas.ac.uk wrote in message news:<3ed52d18@news.nwl.ac.uk>...
> Steve <so@cp.dias.ie> wrote:
>> David Fanning <david@dfanning.com> wrote in message
news:<MPG.193e67c621b7edc6989bb4@news.frii.com>...
>
>>> Oh, well then. STREAMLINE might do the trick. :-)
>
>> There is a script called streamline.pro on
>> http://www.metvis.com.au/graphics.html
>
>> Hope this helps somebody else sometime.
>
> It helped me. I've been wondering about this for some time. Thanks.
>
> -W.

No problem. I have found the best way to close the field lines so they don't look broken is to define a second identical vector field with components of opposite sign and trace lines from the same seed points. Then the tracing is carried out in both directions.

Subject: Re: Is there a simple way to plot field lines?
Posted by jeyadev on Fri, 30 May 2003 19:02:01 GMT
View Forum Message <> Reply to Message

In article <d96c8f7c.0305281529.6bd3bc9d@posting.google.com>,
Mirko Vukovic <mvukovic@taz.telusa.com> wrote:
> so@cp.dias.ie (Steve) wrote in message
news:<178496d6.0305280522.5db923d4@posting.google.com>...
>> "Mark Hadfield" <m.hadfield@niwa.co.nz> wrote in message
news:<bb12dfqan1@newsreader.mailgate.org>...

>>> "Steve" <so@cp.dias.ie> wrote in message
>>> news:178496d6.0305271647.468088fa@posting.google.com...
>>>> I would like to plot field lines but there coesn't seem to be an
>>>> intrinsic function which can do it. This seems hard to believe, am I
>>>> mistaken?
>>>
>>> What do you mean by "plot field lines". If you have (x,y) coordinates
>>> defining your lines, then PLOT them. Or do you want to plot isolines for a
>>> scalar field? Or lines in 3D space? Or cows walking along lines in fields?
>>
>> Ouch. Well I guess I should have been more explicit to. I mean field
>> lines which are everywhere tangent to a vector field (2d is fine
>> thanks), also known as streamlines for velocity fields. I don't want
>> arrows anywhere. Or cows.

Cows add little of value here, but arrows do!
>
> This seems to me a problem to which there is no magic bullet. What

Very true .... !!

> you seem to be looking for really, is to obtain a function of your
> coordinates, such that contours of that function are the streamlines
> from your data.
>
> Another (more defined) approach would be to set-up a PDE for your
> streamlines, with the right hand side being derived from your data
> (interpolated at the points where the PDE is being solved for)
>
> dx/ds = cos(alpha)
> dy/ds = sin(alpha)
>
> where alpha is the angle of the streamline with respect to x and s is
> the arclength.
>
> Then you would solve the PDE for some starting point, and follow it to
> obtain a streamline. The PDE may be re-cast as on ODE
>
> dx/dy = tan(alpha)
>
> However, this may fail if you have looping streamlines.

This is the way I plot electric field lines, but as you said, it
depends on the geometry and the field. The above method not only
has problems with looping lines (not a problem with electrostatic
fields) but also when the field is "vertical", as tan(alpha)
blows up and so the code should take care to test this and
account for it. This is big problem if the boundary condition is

such that the field is "vertical" at the starting boundary value
of the ODE.

> Summarizing, this is more of a problem of data analysis and number
> crunching than just plotting. But it sure sounds fun!

That is the nub of it. The way I do it is the just get a lot of
(x,y) pairs and then use PV Wave to plot the lines. One particular
issue here is that of constant flux between the lines. Traditional
field line plotting is such the the flux between any pair of lines
is the same, so that the lines come close together where the fields
are high and are far apart where the fields are weak. This aspect
is the trickiest part of the problem. It comes down to finding
points at the boundary from which you want to integrate that are
so placed that the flux between any pair of them is the same.
Determining the starting points of the field lines is a numerical
problem that has to be solved before integrating the ODEs.

I do not know of any generic package that does this.

--

Surendar Jeyadev jeyadev@wrc.xerox.bounceback.com

Remove 'bounceback' for email address