Subject: plotting vectors in 3D
Posted by M Carmen Gonzalez on Fri, 03 Nov 2000 12:05:35 GMT
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Dear all,

I am new in IDL programming and I'm still a bit lost, so may be some of you can help me...

I am trying to plot the measured wind speed (2 components) by a balloon in vertical ascension. At each point of the trajectory i want to plot a vector indicating the wind direction at that point.

Does someone know how could I do it?

Thanks a lot,

Subject: Re: plotting vectors in 3D
Posted by Pavel A. Romashkin on Mon, 06 Nov 2000 08:00:00 GMT
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Carmen,

I would not fall for that David's

> You have at least an hour of IDL consulting sitting
> in your account here. :-)

Just ask him to implement all that he wrote before:

> First, I would do this in the object graphics
> system, because at the end of the day, you will
> want to rotate this plot to get the maximum
> amount of information out of it. It is unlikely
> to be saliently "visible" otherwise.
>
> I would probably create some kind of an "arrow"
> object for myself, which would be subclassed on
> a model object for ease of rotation and scaling.
> The arrow would probably consist of a cylindrical
> "shaft" and some kind of an arrow "head", both
> constructed from filled polygon objects that I could
> shade them with one or more light objects, to give the
> scene some depth.

I think that for David that'll be about that promised hour worth of
work, as he seems to have a pretty clear idea about it :-)

Cheers,
Pavel

Subject: RE: plotting vectors in 3D
Posted by davidf on Mon, 06 Nov 2000 08:00:00 GMT
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M Carmen Gonzalez (mcgonzal@uv.es) writes:

> First of all I'd like to thank everybody for the answers. I'm eager to start
> working....(by the way, I think this is going to be a cold long long
> winter...). I didn't get ofended, but from now on, I'd rather be addressed
> as Mrs, :)),

Whoops! I knew I had a 50% chance of getting that
wrong, but since 80% of the programmers I see in
Europe are men, I thought perhaps my first instincts
were wrong. My sincerest apologies, Mrs. Gonzalez.
You have at least an hour of IDL consulting sitting
in your account here. :-)

Best Regards,

David

P.S. Let's just say things must be changing in
Europe. I gave a lecture last week to 100+ first
year science students in Copenhagen and I would
say nearly 50% were women. This is always a good
sign, since they are sometimes the only ones who
laugh at my poorer jokes. :-)

--
David Fanning, Ph.D.
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Toll-Free IDL Book Orders: 1-888-461-0155

Subject: RE: plotting vectors in 3D
Posted by M Carmen Gonzalez on Mon, 06 Nov 2000 08:00:00 GMT
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Best regards,
Carmen

MPG.14708d2cf441a9a7989c6d@news.frii.com...
> Martin Schultz (martin.schultz@dkrz.de) writes:
>
>> Oh, come on, David, Haloween is over and you don't have to scare
>> people any longer ;-) As far as I can see, you can already get a
>> decent visualization of that data with a 2-D plot - either longitude
>> vs. latitude, neglecting the altitude, or e.g. altitude vs. time
>> neglecting lon and lat (or conveying this information in the form of
>> an additional x axis). Then, the problem is really as simple as using
>> the arrow procedure and figuring out how to position and scale the
>> arrows correctly.
>
> I don't think it's quite *that* easy, but I have
> to admit I'm impressed with the quality of the
> responses. I have hope now that this problem can
> be completely solved by Mr. Gonzalez in an elegant
> manner by the time of the winter solstice. :-)
>
> Cheers,
>
> David
> --
> David Fanning, Ph.D.
> Fanning Software Consulting
> Phone: 970-221-0438 E-Mail: davidf@dfanning.com
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Subject: Re: plotting vectors in 3D
Posted by davidf on Mon, 06 Nov 2000 08:00:00 GMT
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Martin Schultz (martin.schultz@dkrz.de) writes:

> Oh, come on, David, Haloween is over and you don't have to scare
> people any longer ;-) As far as I can see, you can already get a

> decent visualization of that data with a 2-D plot - either longitude
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Cheers,

David
--
David Fanning, Ph.D.
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Subject: Re: plotting vectors in 3D
Posted by John Boccio on Mon, 06 Nov 2000 08:00:00 GMT
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In article <8tu9l1uhb1@peque.uv.es>, M Carmen Gonzalez
<mcgonzal@uv.es> wrote:

> mcgonzal@uv.es

Hi,

Here is a very, very crude program that we use.
No fancy vector objects (just a polyline with
small sphere on end for each vector).

No complaints please from all the experts on the list!

It is an object-based program so that you can
use the mouse to find best view. Requires routine
xobjview in V5.3.

The example is a simple radial field emanating from
the corner of the box.

John Boccio
boccio@swarthmore.edu

---------- cut here ----------

```
function fx,x,y,z
xc=-0.2
yc=-0.2
zc=-0.2
r=sqrt((x-xc)^2+(y-yc)^2+(z-zc)^2)
return,(x-xc)/r^2
end

function fy,x,y,z
xc=-0.2
yc=-0.2
zc=-0.2
r=sqrt((x-xc)^2+(y-yc)^2+(z-zc)^2)
return,(y-yc)/r^2
end


function fz,x,y,z
xc=-0.2
yc=-0.2
zc=-0.2
r=sqrt((x-xc)^2+(y-yc)^2+(z-zc)^2)
return,(z-zc)/r^2
end

pro vectfield3d
;Create model to contain surface
omodel    = OBJ_NEW('IDLgrModel')
;create vector field
n=6
range=1.0
fac=0.05
step=range/(n-1)
x=step*findgen(n)
y=x
z=x
vx=fltarr(n,n,n)
vy=vx
vz=vx
v=vx
x1=vx
y1=vx
z1=vx
```

```
m=n-1
for i=0,m do begin
 for j=0,m do begin
  for k=0,m do begin
    vx(i,j,k)=fx(x(i),y(j),z(k))
    vy(i,j,k)=fy(x(i),y(j),z(k))
    vz(i,j,k)=fz(x(i),y(j),z(k))
  endfor
 endfor
endfor
for i=0,m do begin
 for j=0,m do begin
  for k=0,m do begin
    x1(i,j,k)=x(i)+fac*vx(i,j,k)
    y1(i,j,k)=y(j)+fac*vy(i,j,k)
    z1(i,j,k)=z(k)+fac*vz(i,j,k)
  endfor
 endfor
endfor
; normalize field
mnx=min([min(x),min(x1)])
mxx=max([max(x),max(x1)])
mny=min([min(y),min(y1)])
mxy=max([max(y),max(y1)])
mnz=min([min(z),min(z1)])
mxz=max([max(z),max(z1)])
max1=max([mxx,mxy,mxz])
min1=min([mnx,mny,mnz])
x1=-1.0+2.0*(x1-min1)/(max1-min1)
y1=-1.0+2.0*(y1-min1)/(max1-min1)
z1=-1.0+2.0*(z1-min1)/(max1-min1)
x=-1.0+2.0*(x-min1)/(max1-min1)
y=-1.0+2.0*(y-min1)/(max1-min1)
z=-1.0+2.0*(z-min1)/(max1-min1)
; create field vectors
for i=0,m do begin
 for j=0,m do begin
  for k=0,m do begin
    xs=[x1(i,j,k),x(i)]
    ys=[y1(i,j,k),y(j)]
    zs=[z1(i,j,k),z(k)]
    opolyline = OBJ_NEW('IDLgrPolyline', xs,ys,zs, $
                  color=[255,0,0],thick=1,shading=0)
    omodel  -> ADD, opolyline
    mesh_obj,4,verts,conn,Replicate(0.01 ,6,6)
    T3d,/Reset
    T3d, Translate=[x1(i,j,k),y1(i,j,k),z1(i,j,k)]
    verts=Vert_T3d(verts)
```

```
    oSphere=OBJ_NEW('IDLgrpolygon', verts,poly=conn,
COLOR=[255,0,0],style=0)
    omodel  -> ADD, oSphere
  endfor
 endfor
endfor
;create box
opolyline = OBJ_NEW('IDLgrPolyline',
[-1.0,1.0],[-1.0,-1.0],[-1.0,-1.0], $
                color=[0,255,0],thick=1,shading=0)
omodel  -> ADD, opolyline
opolyline = OBJ_NEW('IDLgrPolyline',
[-1.0,-1.0],[-1.0,-1.0],[-1.0,1.0], $
                color=[0,255,0],thick=1,shading=0)
omodel  -> ADD, opolyline
opolyline = OBJ_NEW('IDLgrPolyline', [-1.0,1.0],[-1.0,-1.0],[1.0,1.0], $
                color=[0,255,0],thick=1,shading=0)
omodel  -> ADD, opolyline
opolyline = OBJ_NEW('IDLgrPolyline', [1.0,1.0],[-1.0,-1.0],[-1.0,1.0], $
                color=[0,255,0],thick=1,shading=0)
omodel  -> ADD, opolyline
opolyline = OBJ_NEW('IDLgrPolyline', [1.0,1.0],[-1.0,1.0],[-1.0,-1.0], $
                color=[0,255,0],thick=1,shading=0)
omodel  -> ADD, opolyline
opolyline = OBJ_NEW('IDLgrPolyline', [1.0,1.0],[1.0,1.0],[-1.0,1.0], $
                color=[0,255,0],thick=1,shading=0)
omodel  -> ADD, opolyline
opolyline = OBJ_NEW('IDLgrPolyline', [-1.0,-1.0],[-1.0,1.0],[1.0,1.0], $
                color=[0,255,0],thick=1,shading=0)
omodel  -> ADD, opolyline
opolyline = OBJ_NEW('IDLgrPolyline',
[-1.0,-1.0],[-1.0,1.0],[-1.0,-1.0], $
                color=[0,255,0],thick=1,shading=0)
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opolyline = OBJ_NEW('IDLgrPolyline', [-1.0,-1.0],[1.0,1.0],[-1.0,1.0], $
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                color=[0,255,0],thick=1,shading=0)
omodel  -> ADD, opolyline
opolyline = OBJ_NEW('IDLgrPolyline', [-1.0,1.0],[1.0,1.0],[-1.0,-1.0], $
                color=[0,255,0],thick=1,shading=0)
omodel  -> ADD, opolyline

;Create a fixed light
```

```
ofixedlight = OBJ_NEW('IDLgrLight', TYPE = 1, $
   LOCATION = [-1,-1,1], COLOR = [128,128,128])
omodel -> ADD, ofixedlight
;Create another fixed light
ofixedlight1 = OBJ_NEW('IDLgrLight', TYPE = 1, $
   LOCATION = [-1,1,1], COLOR = [128,128,128])
omodel -> ADD, ofixedlight1
;Create movable light that goes with surface
olight = OBJ_NEW('IDLgrLight', TYPE = 2, LOCATION = [-1,-1,-1])


omodel -> ADD, olight
xobjview,omodel
end
```

Subject: Re: plotting vectors in 3D
Posted by John-David T. Smith on Mon, 06 Nov 2000 08:00:00 GMT
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M Carmen Gonzalez wrote:
>
> Dear all,
>
> I am new in IDL programming and I'm still a bit lost, so may be some of you
> can help me...
>
> I am trying to plot the measured wind speed (2 components) by a balloon in
> vertical ascension. At each point of the trajectory i want to plot a vector
> indicating the wind direction at that point.
>
> Does someone know how could I do it?
>
> Thanks a lot,
>
> Mï¿½ Carmen

You might look at
http://www.astro.washington.edu/deutsch-bin/getpro/library09 .html?VECFLD
for inspiration. I always search for routines there first before
setting out into the darkest days of snow-blinded wandering through the
dense forest of IDL graphics. I also found
http://www.colorado.edu/ITS/docs/scientific/idl/idlvf.html, with a bonus
Runge-Kutta integrator built in. Oh my. Not very advanced though.

In any case, if you take David's advice and spend the better part of the
next year coding up a generic OG 3-D vector field plotter, look at
http://www.math.armstrong.edu/mmacalc/gallery/vecfld.gif for

motivation. I especially like the 3-D arrow tips.

JD

--
J.D. Smith | WORK: (607) 255-6263
Cornell Dept. of Astronomy | (607) 255-5842
304 Space Sciences Bldg. | FAX: (607) 255-5875
Ithaca, NY 14853 |

Subject: Re: plotting vectors in 3D
Posted by Martin Schultz on Mon, 06 Nov 2000 08:00:00 GMT
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David Fanning wrote:
>
> M Carmen Gonzalez (mcgonzal@uv.es) writes:
>
>> am new in IDL programming and I'm still a bit lost, so may be some of you
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>> vertical ascension. At each point of the trajectory i want to plot a vector
>> indicating the wind direction at that point.
>>
>> Does someone know how could I do it?
>
> Oh, oh. I think there are probably a number of us
> would know *how* to do this. The problem comes about
> in trying to convey that information to a novice
> IDL programmer in 10,000 words or less. :-)
>
Oh, come on, David, Haloween is over and you don't have to scare
people any longer ;-) As far as I can see, you can already get a
decent visualization of that data with a 2-D plot - either longitude
vs. latitude, neglecting the altitude, or e.g. altitude vs. time
neglecting lon and lat (or conveying this information in the form of
an additional x axis). Then, the problem is really as simple as using
the arrow procedure and figuring out how to position and scale the
arrows correctly.

Cheers,
Martin

PS: But if you really want to have everything in 3D and illuminated
from within, it might be easier to fly this balloon again, attach some
nice colored stripes to it and take pictures ;-)

--
[[[[[[[[[
[[Dr. Martin Schultz   Max-Planck-Institut fuer Meteorologie   [[
[[Bundesstr. 55, 20146 Hamburg   [[
[[phone: +49 40 41173-308   [[
[[fax: +49 40 41173-298   [[
[[martin.schultz@dkrz.de   [[
[[[[[[[[[

Subject: Re: plotting vectors in 3D
Posted by davidf on Mon, 06 Nov 2000 08:00:00 GMT
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M Carmen Gonzalez (mcgonzal@uv.es) writes:

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>
> Does someone know how could I do it?

Oh, oh. I think there are probably a number of us
would know *how* to do this. The problem comes about
in trying to convey that information to a novice
IDL programmer in 10,000 words or less. :-)

But here is a general outline. I don't think
this is a particularly difficult problem for
an experienced IDL programmer. Perhaps a couple of
days work. But for an inexperienced programmer, it
could be an excellent way to pass the darks days
of winter. :-)

First, I would do this in the object graphics
system, because at the end of the day, you will
want to rotate this plot to get the maximum
amount of information out of it. It is unlikely
to be saliently "visible" otherwise.

I would probably create some kind of an "arrow"
object for myself, which would be subclassed on
a model object for ease of rotation and scaling.

The arrow would probably consist of a cylindrical "shaft" and some kind of an arrow "head", both constructed from filled polygon objects that I could shade them with one or more light objects, to give the scene some depth.

You could look at a program like FSC_SURFCE for information on how to create and rotate a 3D coordinate system in object graphics, but placing the objects in the 3D environment (if you get this far) will be trivial.

Hope this gives you some ideas. This is, unfortunately, a fairly advanced "beginner" project. Good luck! :-)

Cheers,

David

P.S. Another approach, which I don't think is as likely to give good results, but which might be faster to implement, would be to do this in direct graphics. Set up a 3D coordinate system with something like SCALE3D, then modify the ARROW procedure in the lib subdirectory to work in 3D space. (If you can live with "flat" arrows, then this may be no more complicated than adding a Z value to the PLOTS command that draws the arrows.)

--
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Subject: Re: plotting vectors in 3D
Posted by Mark Hadfield on Mon, 06 Nov 2000 21:15:15 GMT
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"M Carmen Gonzalez" <mcgonzal@uv.es> wrote in message news:8tu9l1uhb1@peque.uv.es...
>
> I am trying to plot the measured wind speed (2 components) by a balloon in
> vertical ascension. At each point of the trajectory i want to plot a

vector
> indicating the wind direction at that point.

Well, I'm not suggesting this is better or worse than the other responses to your post, but you might want to check out my MGHgrBarbPlot object. If so, you'll need to go to

http://katipo.niwa.cri.nz/~hadfield/gust/software/idl/

fetch MARKS_ROUTINES.zip, unpack it somewhere on your IDL path, then look at the MGH_EXAMPLE_BARB routine for examples.

Mark Hadfield
m.hadfield@niwa.cri.nz http://katipo.niwa.cri.nz/~hadfield/
National Institute for Water and Atmospheric Research
PO Box 14-901, Wellington, New Zealand