Subject: 2D Array with a different value for every country
Posted by c.betancourt on Wed, 01 Mar 2017 15:11:31 GMT
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I would like to fold plumes of air pollutants with emissions of these pollutants (“fold” = hadamard product in this case). My plumes are 2D Arrays, with longitudes and latitudes as coordinates. Since I have emission factors for specific countries, I would like to make another 2D array with the known emission factors. For example all dots within France would have the value 0.55.

Do you have an idea how to do that?
Thank you,
Clara

Subject: Re: 2D Array with a different value for every country
Posted by Matthew Argall on Wed, 01 Mar 2017 19:07:12 GMT
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One option is to use an array of structures for this (or another complex datatype)

```
;Create an array of structures
data = { country:   '', $
         latitude:  0.0, $
         longitude: 0.0, $
         emission:  0.0 }
data = Replicate(data, 100)

;Sample data point
data[0].country   = 'france'
data[0].latitude  = 48.8566
data[0].longitude = 2.3522
data[0].emission  = 0.55
```

Then you can search like this:

```
iFrance = Where(data.country eq 'france', nFrance)
```

Subject: Re: 2D Array with a different value for every country
Posted by c.betancourt on Thu, 02 Mar 2017 07:52:45 GMT
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OK. Where can I find an array with info on the countries' longitudes and latitudes?

Since I use a spatial resolution of 0.25° x 0.25°, my "data" - array would contain 720 x 1440 = 1036800 elements. It would take too long to fill in the information one by one.

Subject: Re: 2D Array with a different value for every country
Posted by Helder Marchetto on Thu, 02 Mar 2017 08:20:44 GMT
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Hi,
I have no idea on how to do that, but I think you're not describing your problem/question deeply enough.

I'll interpret your question, to try to understand where you are getting stuck.

```
;plumes of air pollutants matrix of 720x1440 elements
pap = fltarr(720,1440)
;the scale is 0.25x0.25. Take this into account when plotting.
;now fill the pap array...
...
;now generate the emission array:
emiss = fltarr(720,1440)
;must have the same dimensions and scale of the pap array.
;now fill the emiss array with the emission values
...
;the idea is that all the pixels (indices) having coordinates in France will have a value of 0.55 and so on.
;now do the hadamard product of two
result = pap * emiss
```

So, where do you get stuck/need help?

Cheers,
Helder

Subject: Re: 2D Array with a different value for every country
Posted by c.betancourt on Thu, 02 Mar 2017 08:55:57 GMT
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> ;plumes of air pollutants matrix of 720x1440 elements
> pap = fltarr(720,1440)
> ;the scale is 0.25x0.25. Take this into account when plotting.
> ;now fill the pap array...
> ...
> ;now generate the emission array:
> emiss = fltarr(720,1440)
-> -> -> emis = ???
> ;must have the same dimensions and scale of the pap array.
> ;now fill the emiss array with the emission values
> ...
> ;the idea is that all the pixels (indices) having coordinates in France will have a value of 0.55 and so on.

> ;now do the hadamard product of two
> result = pap * emiss

Sorry to confuse you. My only problem is that I don´t have an emission array yet. I need something like a world map as an array. A similar problem would be: I would like to plot a world map where france is green, italy is yellow and germany is red. Hope this is precise enough...?

Subject: Re: 2D Array with a different value for every country
Posted by Helder Marchetto on Thu, 02 Mar 2017 09:27:47 GMT
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On Thursday, March 2, 2017 at 9:56:00 AM UTC+1, c.beta...@fz-juelich.de wrote:
>> ;plumes of air pollutants matrix of 720x1440 elements
>> pap = fltarr(720,1440)
>> ;the scale is 0.25x0.25. Take this into account when plotting.
>> ;now fill the pap array...
>> ...
>> ;now generate the emission array:
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> -> -> -> emis = ???
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>> ;the idea is that all the pixels (indices) having coordinates in France will have a value of 0.55 and so on.
>> ;now do the hadamard product of two
>> result = pap * emiss
>
>
>
>
> Sorry to confuse you. My only problem is that I don´t have an emission array yet. I need something like a world map as an array. A similar problem would be: I would like to plot a world map where france is green, italy is yellow and germany is red. Hope this is precise enough...?

This is not my field, but here you might start looking for an answer:

http://www.harrisgeospatial.com/docs/mappingcontinents.html

The second example seems pretty close to what you want:

```
; Define a map of Europe.
map = MAP('STEREOGRAPHIC', FILL_COLOR = 'Light Blue', $
   LIMIT = [30.0, -15.0, 68.0, 55.0])
```

; Add the country outlines and fill color.
mc = MAPCONTINENTS(/COUNTRIES, FILL_COLOR='beige')

; Add the rivers.
rivers = MAPCONTINENTS(/RIVERS, COLOR='blue')

Cheers,
Helder

Subject: Re: 2D Array with a different value for every country
Posted by c.betancourt on Thu, 02 Mar 2017 10:01:41 GMT
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Dear Helder,

OK. Still, there remain two problems: I can choose the color for water and land areas. I did not find any option or keyword to access a certain country. The second problem is, this is not an array that I could modify or fold with anything.

Thank you,
Clara

Subject: Re: 2D Array with a different value for every country
Posted by Helder Marchetto on Thu, 02 Mar 2017 11:05:33 GMT
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On Thursday, March 2, 2017 at 11:01:43 AM UTC+1, c.beta...@fz-juelich.de wrote:
> Dear Helder,
>
> OK. Still, there remain two problems: I can choose the color for water and land areas. I did not find any option or keyword to access a certain country. The second problem is, this is not an array that I could modify or fold with anything.
>
> Thank you,
> Clara

Hi,
has I said, countries or imagery of the earth surface and stuff is not my stuff.
But I have some good news: here you can find info about how to get coordinates of territories out of shapefile:
http://www.idlcoyote.com/code_tips/extractpoly.php
By the way, when you draw the maps of Europe, IDL gets the shapefile (where the borders are defined) from this file:
IDL path\resource\maps\shape\cntry08.shp

Now the bad news. The pro cgExtractShape is not for free:
http://www.idlcoyote.com/idldoc/forsale/index.html

You should ask David for a price, might be not that bad... But I sincerely have no idea.

I bought some time ago activecontour.pro and I'm very happy with it.

Cheers,
Helder

Subject: Re: 2D Array with a different value for every country
Posted by Helder Marchetto on Thu, 02 Mar 2017 11:38:00 GMT
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On Thursday, March 2, 2017 at 12:05:37 PM UTC+1, Helder wrote:
> On Thursday, March 2, 2017 at 11:01:43 AM UTC+1, c.beta...@fz-juelich.de wrote:
>> Dear Helder,
>>
>> OK. Still, there remain two problems: I can choose the color for water and land areas. I did not find any option or keyword to access a certain country. The second problem is, this is not an array that I could modify or fold with anything.
>>
>> Thank you,
>> Clara
>
> Hi,
> has I said, countries or imagery of the earth surface and stuff is not my stuff.
> But I have some good news: here you can find info about how to get coordinates of territories out of shapefile:
> http://www.idlcoyote.com/code_tips/extractpoly.php
> By the way, when you draw the maps of Europe, IDL gets the shapefile (where the borders are defined) from this file:
> IDL path\resource\maps\shape\cntry08.shp
>
> Now the bad news. The pro cgExtractShape is not for free:
> http://www.idlcoyote.com/idldoc/forsale/index.html
>
> You should ask David for a price, might be not that bad... But I sincerely have no idea.
>
> I bought some time ago activecontour.pro and I'm very happy with it.
>
> Cheers,
> Helder

Hi,
if you really *dare* to do the dirty work yourself, here is something to get you started.

Look at the shapefile format here: https://www.esri.com/library/whitepapers/pdfs/shapefile.pdf

Now you can start unveiling what's inside. Here is the header. The rest is left as an exercise for the reader :-)

```
fn = 'fix_your_path\resource\maps\shape\cntry08.shp'
get_lun, fileUnit
openr, fileUnit, fn
fh = bytarr(100)
readu, fileUnit, fh
free_lun, fileUnit
print, 'File code = ', strtrim(swap_endian(fix(fh[0:3],0,type=13)),2)
print, 'File length = ', strtrim(swap_endian(fix(fh[24:27],0,type=13)),2)
print, 'Version = ', strtrim(fix(fh[28:31],0,type=13),2)
print, 'Shape type = ', strtrim(fix(fh[32:35],0,type=13),2)
print, 'File code = ', strtrim(swap_endian(fix(fh[0:3],0,type=13)),2)
print, 'File length = ', strtrim(swap_endian(fix(fh[24:27],0,type=13)),2)
print, 'Version = ', strtrim(fix(fh[28:31],0,type=13),2)
print, 'Shape type = ', strtrim(fix(fh[32:35],0,type=13),2)
print, 'bounding box xMin = ', strtrim(fix(fh[36:43],0,type=5),2)
print, 'bounding box yMin = ', strtrim(fix(fh[44:51],0,type=5),2)
print, 'bounding box xMax = ', strtrim(fix(fh[52:59],0,type=5),2)
print, 'bounding box yMax = ', strtrim(fix(fh[60:67],0,type=5),2)
print, 'bounding box zMin = ', strtrim(fix(fh[68:75],0,type=5),2)
print, 'bounding box zMax = ', strtrim(fix(fh[76:83],0,type=5),2)
print, 'bounding box mMin = ', strtrim(fix(fh[84:91],0,type=5),2)
print, 'bounding box mMax = ', strtrim(fix(fh[92:99],0,type=5),2)
```

This is what I got:

```
File code = 9994
File length = 1906850
Version = 1000
Shape type = 5
bounding box xMin = -180.00000
bounding box yMin = -90.000000
bounding box xMax = 180.00000
bounding box yMax = 83.623600
bounding box zMin = 0.00000000
bounding box zMax = 0.00000000
bounding box mMin = 0.00000000
bounding box mMax = 0.00000000
```

cheers,
Helder

Subject: Re: 2D Array with a different value for every country

Posted by c.betancourt on Thu, 02 Mar 2017 12:15:09 GMT
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Yes! These shapefiles might help. Thank you!
I will try this.

Just in case: If someone else has done something similar to my problem already - please let me know!

Clara

Subject: Re: 2D Array with a different value for every country
Posted by Helder Marchetto on Thu, 02 Mar 2017 21:27:52 GMT
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On Thursday, March 2, 2017 at 1:15:10 PM UTC+1, c.beta...@fz-juelich.de wrote:
> Yes! These shapefiles might help. Thank you!
> I will try this.
>
> Just in case: If someone else has done something similar to my problem already - please let me know!
>
> Clara

Dear Clara,
I later realized, that I was "reinventing the wheel". It can all be done easily using an IDL object called IDLffShape, that you find described here:
http://www.harrisgeospatial.com/docs/IDLffShape.html

I made some code to highlight the countries by clicking on the map. Have a look at it here:
http://idl.marchetto.de/maps-and-european-countries/

What still needs to be done is associate emissivity values to given lat/lon coordinates. For that the idlanroi object might turn out handy.

cheers, Helder