
Subject: Re: Finding coordinates on the circumference of a circle
Posted by [K. Bowman](#) on Tue, 19 Jul 2005 15:11:53 GMT

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In article <1121784988.644724.164530@g44g2000cwa.googlegroups.com>, guillaume.drolet.1@ulaval.ca wrote:

> Hello group-
>
> I am preparing flight lines over a CO2 flux tower in Canada. I need to
> find the geographic coordinates of several points located on the
> circumference of a circle defined around the tower. The points are
> equally spaced (10 degrees), starting at 0 degrees (north) and
> incrementing clockwise. I want to do this for circles of different
> radii (10 km, 13 km, etc.). I need these coordinates in either WGS84 or
> NAD83.
>
> I found 'compass.pro' and 'findrng.pro', routines that find ranges and
> azimuths for given points (lat/lon) around a center location. I would
> like the opposite: find locations around a central point from arrays of
> azimuths and ranges.
>
> Does anybody know something that could help me?
>
> Cheers!
>
> Guillaume

The LL_ARC_DISTANCE function will return the lat and lon of a point at a given azimuth and range from another point, although it doesn't know anything about the datum. For short distances, and considering the precision of an aircraft flight track, that may be adequate.

Ken Bowman

Subject: Re: Finding coordinates on the circumference of a circle
Posted by [James Kuyper](#) on Tue, 19 Jul 2005 17:10:57 GMT

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guillaume.drolet.1@ulaval.ca wrote:

> Hello group-
>
> I am preparing flight lines over a CO2 flux tower in Canada. I need to
> find the geographic coordinates of several points located on the
> circumference of a circle defined around the tower. The points are
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> radii (10 km, 13 km, etc.). I need these coordinates in either WGS84 or
> NAD83.
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> azimuths for given points (lat/lon) around a center location. I would
> like the opposite: find locations around a central point from arrays of
> azimuths and ranges.

The approach that involves calling LL_ARC_DISTANCE has a number of difficulties, including the fact that it can only calculate one position at a time, and it's not clear what datum is being used. Here's an approach that allows you to do an entire circle at one time, and to specify the DATUM to be used. You have to use the azimuthal equidistant projection for this to work properly:

```
tower_latitude=75.0
tower_longitude=-90.0
proj = MAP_PROJ_INIT('Azimuthal Equidistant',
CENTER_LONGITUDE=tower_longitude, $
  CENTER_LATITUDE=tower_latitude, DATUM=8)

radius = 15000.0; 15 kilometers
angles = !DTOR*10.0*FINDGEN(36)
x = radius*COS(angles)
y = radius*SIN(angles)
circle = MAP_PROJ_INVERSE(x,y,MAP_STRUCTURE=proj)
```

I checked the reasonableness of the results using
MAP_SET,tower_latitude,tower_longitude,/AZIMUTHAL,/GRID,/HIR ES, \$
/LABEL,SCALE=1e6
oplot,circle[0,*],circle[1,*],psym=2

Subject: Re: Finding coordinates on the circumference of a circle
Posted by [guillaume.drolet.1](#) on Tue, 19 Jul 2005 19:13:49 GMT
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Thanks a lot for helping me with this.

This last suggestion with MAP_PROJ is great, although I don't quite understand everything. For example, do you specify the radius in meters because the Azimuthal Equidistant projection is in meters?

Guillaume

Subject: Re: Finding coordinates on the circumference of a circle

Posted by [James Kuyper](#) on Tue, 19 Jul 2005 22:21:26 GMT

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guillaume.drolet.1@ulaval.ca wrote:

> Thanks a lot for helping me with this.

>

> This last suggestion with MAP_PROJ is great, although I don't quite
> understand everything. For example, do you specify the radius in meters
> because the Azimuthal Equidistant projection is in meters?

The default SPHERE_RADIUS is the true radius of the Earth in meters.
Therefore, radial distances in the Azimuthal Equidistant projection
will also be in meters. This depends upon knowing precisely how the map
projection works.

If you're not sure about the scale being used in a given projection,
select two points where you know:

- a) what the true distance between those points is and
- b) that the projection you're using preserves that distance.

Pass those points to MAP_PROJ_FORWARD, and from the results you can
calculate the scale factor being used, rather than guessing what it is.
