Re: Latitude / longitude distance and bearing.

Source: http://sci.tech−archive.net/Archive/sci.math/2007−09/msg00098.html

- *From*: David Bernier <david250@xxxxxxxxxxx>
- *Date*: Sat, 01 Sep 2007 08:52:44 −0400

Dave (from the UK) wrote:

> I have two locations, call them 'a' and 'b' .
>
> a) Altitude of a and b (call them alt_a and alt_b).
> b) Latitude of b and b (call them lat_a and lat_b)
> c) Longitude of a and b (call them long_a and long_b)
>
> 'a' and 'b' are fairly close together (10 − 20 km) and in line of sight distance. (Two mountain peaks).
>
> I want to find
>
> 1) The straight line distances from a to b. (*Not* the distance along the circumference of the earth, which I can get from the Haversine formula)
>
> 2) The bearing of 'a' when viewed from 'b'.

The Web page you refer to below mentions two kinds of
bearings:

(1) The initial bearing (at 'b') for an arc of a great−circle from 'b'
to 'a'.

(2) The "rhumb line" bearing, where a rhumb line or loxodrome is a path
of constant bearing . The rhumb line route in general is longer than
the arc of great circle route.

Of the two, I think #1 is easier to compute than the "rhumb line" bearing.

> 3) The vertical angle − i.e how many degress above the horizon is 'a' when viewed from 'b'. (alt_a > alt_b).

So I guess for the horizon you mean the plane perpendicular
to a plumb line ...

> If the distances were sufficiently large, the location with the higher altitude could be below the horizon when viewed from the one with lower altitude, but in this case, the distances are small. so the location with the higher altitude is well above the horizon of the location with the lower altitude.
>
> I am willing to assume the earth is spherical. The distances involved are not huge (a few tens of km), and are in Europe (Latitude is North, Longitude is East).
>
> I asked this on 'Dr. Math' and someone suggested I worked in spherical coordinates (rho, theta, phi) then transfered to rectangular.
>
> I've done that and found the points x_a, y_a and z_a using
>
> rho_a=EARTH_RADIUS+alt_a;
> theta_a=long_a;
> phi_a=M_PI/2.0−lat_a;
>
> Transfered to cartesian coordines
>
> x_a= rho_a*cos(theta_a)*sin(phi_a);
> y_a = rho_a*sin(theta_a)*sin(phi_a);
> z_a = rho_a*cos(phi_a);
>
> so I get the points x_a, y_a and z_a relative to the point 0,0,0 which is the centre of the earth.
>
> I did likewise for location b, to get x_b, y_b and z_b.