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function d = vincenty_dist(lat1,long1,lat2,long2)
%VINCENTY_DIST Geodetic distance between 2 points on WGS84 ellipsoid
%   Inputs are:
%   lat1   :a scalar origin latitude in degrees
%   long1  :a scalar origin longitude in degrees
%   lat2   :a numeric array 1xN destination latitude in degrees
%   long2  :a numeric array 1xN destination longitude in degrees
%
%   Output is:
%   d      :a numeric array of 1xN distance to target in m
%
%   Reference: https://en.wikipedia.org/wiki/Vincenty%27s\_formulae

arguments
    lat1 {mustBeScalarOrEmpty, mustBeNumeric, mustBeReal}
    long1 {mustBeScalarOrEmpty, mustBeNumeric, mustBeReal}
    lat2 (1,:) {mustBeNumeric, mustBeReal}
    long2 (1,:) {mustBeNumeric, mustBeReal}
end

%   WGS84 properties
a = 6378137.0; % WGS84 semi-major axis
b = 6356752.314245; % WGS84 semi-minor axis
f = 1/298.257223563; % WGS84 flattening

%   Convert degrees to radians
lat1 = deg2rad(lat1);
long1 = deg2rad(long1);
lat2 = deg2rad(lat2);
long2 = deg2rad(long2);

%   Convert range of longitude to 0->2*pi
long1 = mod(long1,2*pi);
long2 = mod(long2,2*pi);

%   Find reduced latitude
U1 = atan((1-f)*tan(lat1));
U2 = atan((1-f)*tan(lat2));

%   Calculate difference in longitude
L = abs(long2-long1);
if L > pi
    L = 2*pi - L;
end

%   Iterate to find difference in longitude on auxiliary sphere
lam = L;
lam_old = 0;
ii = 0;
while ~ii || all(abs(lam-lam_old) > 1e-12)
    ii = ii+1;
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lam_old = lam;

sinsigma = sqrt((cos(U2).*sin(lam)).^2+(cos(U1).*sin(U2)-sin(U1)...
    .*cos(U2).*cos(lam)).^2);
cossigma = sin(U1).*sin(U2)+cos(U1).*cos(U2).*cos(lam);
sigma = atan2(sinsigma,cossigma);
alpha = asin(cos(U1).*cos(U2).*sin(lam)./sin(sigma));
cos2sigma_m = cos(sigma)-2.*sin(U1).*sin(U2)./cos(alpha).^2;

C = f./16.*cos(alpha).^2.*(4+f.*(4-3.*cos(alpha).^2));
lam = L+(1-C).*f.*sin(alpha).*(sigma+C.*sin(sigma)...
    .*(cos2sigma_m+C.*cos(sigma).*(-1+2.*cos2sigma_m.^2)));

if lam > pi
    warning('Points are antipodal');
    lam = pi;
    break
end
end

% Use converged values to find distance
u_sq = cos(alpha).^2.*(a.^2-b.^2)./b.^2;
A = 1+u_sq./16384.*(4096+u_sq.*(-768+u_sq.*(320-175.*u_sq)));
B = u_sq./1024.*(256+u_sq.*(-128+u_sq.*(74-47.*u_sq)));
delta_sigma = B.*sin(sigma).*(cos2sigma_m+B./4.*(cos(sigma)...
    .*(-1+2.*cos2sigma_m.^2)-B./6.*cos2sigma_m.*...
    (-3+4.*sin(sigma).^2).*(-3+4.*cos2sigma_m.^2)));
d = b.*A.*(sigma-delta_sigma);

end
```