A Comparison of Methods to Solve the Inverse Problem of Geodesy: Geodesic and Normal-Section Distances on the Spheroid

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Entry:	Bachelors degree in geoscience, physics, mathematics, or any related discipline, or invited entry to the Honours program in the Department
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Resources:	some software
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Starting Date:	Unrestricted

Project Description:

One of the inverse problems of geodesy is concerned with the determination of the distance between two geodetic coordinates on the spheroid. This is used for vehicle routing and calculation of travel times, for example. The distance is rigorously the geodesic distance, but normal section distances are often used as computationally convenient approximations of the true geodesic distance. The forward geodetic problem of geometrical geodesy is the determination of a geodetic coordinate given a known point, distance and azimuth.

Many authors (e.g. Vincenty, Rainsford, Bowring, Robbins, Sodano and Puissant, among others) have suggested practical solutions to the inverse problem on the spheroid, using geodesic or normal section distances. This project will compare and contrast these and other methods identified by the student in terms of computational efficiency and accuracy, and detail their relative strengths and weaknesses. The accuracy can be measured by first solving the (simpler) forward problem to construct a set of control, data. These [assumed exact] coordinates are then used to test the inverse formulae. Several FORTRAN77 programs from the University of Oxford are available for used in this project.

The results of this project will be used to advise users of the relative merits and deficiencies of the approaches. This is of importance because the practical use of the available formulae seems to be based on personal preference as opposed to the accuracy and applicability of the methods.

Further reading:

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