A Study into the Distinction Between Ellipsoid and Planar Computations in a Geodetic Traverse Network

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SUMMARY

ABSTRACT

In carrying out measurements and computations spanning large distances, it is imperative to make some geodetic considerations such as the curve nature of the earth's surface. In general, these distances are computed in relation to the reference spheroid. On the reference ellipsoid/spheroid such length is a geodesic. A geodesic is the line of least curvature between two points on the surface of an ellipsoid. This study seeks to explore and showcase the distinctions between computations carried out with ellipsoidal considerations and computations with planar considerations as well as the effect of attempting to utilize planar computation methods on ellipsoidal/curvilinear traverses. The ellipsoidal computations were accomplished using the Vincenty solutions.

Examination of the forward and reverse azimuths of the geodesic shows that unlike in the case of a plane line, the difference between these azimuths does not amount to 180o but varies per geodesic. Further analysis into possible trends in this deviation indicates that longer lengths experience greater deviations. The formulated geodetic traverse possessed a linear misclosure of 2.291e-07m. However, attempting to utilize planar computation model on the geodetic traverse gave rise to a linear misclosure of 3646.43454738m. When the computed co-ordinates from each of the methods were compared with their corresponding true values, the differences produced absolute positional discrepancies, whose computed root mean square values are respectively 9.289e-08m for Ellipsoidal model and 2179.00433902m for Planar model, thus indicating that planar computation methods are not suitable for geodetic traverses. The results of this study serve to showcase the effect of attempting to compute and adjust the formulated geodetic traverse using planar computation methods.

Keywords: Geodesy, Direct problem, Indirect problem, Geodetic traverse, Ellipsoidal model, Planar Model.