A New Curriculum for Geodetic Computation

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Key words:

ABSTRACT

One of the most enduring legacies of nineteenth century geodesists is their development of processes for geodetic computation. As the instrumentation for geodetic surveying was refined, the challenge for the geodesist/mathematician of the mid-1800's was to fashion algorithms to match the accuracy of the measurements. The technology of computation was logarithms with a maximum of 8-figure accuracy and thus inadequate for direct computations in three dimensional space. The challenge was met by the introduction of an ellipsoid as a two dimensional computational surface and the development algorithms based on its surface geometry. While tortuous in their application, the processes proved to be sufficient for the task at hand.

With the introduction of computers, software to emulate the traditional practices was quickly developed and the tedium of computation removed. It is surprising however, that the need for the ellipsoid as a computational surface was not questioned and forty years later many courses in geodesy still retain the traditional methods. Geodetic computation can now be done using simple vector geometry and largely avoiding the use of the ellipsoidal surface or map projections. While it matters little what algorithm is used once the software is available,the teaching of the geodetic computation using nineteenth century algorithms is labor intensive and crowded with unnecessary complexities.

The paper outlines a curriculum for geodetic computation based on vector geometry and ellipsoid centered cartesian coordinates. The usefulness of the simple relationship between ellipsoid centered and local reference frames is highlighted. The role that curvilinear and map grid coordinates play within this methodology is reviewed.

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