

# TECHNOLOGY



CONTACT: [ipm@innovatecalgary.com](mailto:ipm@innovatecalgary.com) • (403) 284-6400

## TopGrav™ - Topographic Corrections for Gravity Measurements Software

TECH ID #: 018.3

### Background

TopGrav™ is a suite of C++ language programs that computes topographic attraction and/or terrain correction for vector and/or scalar gravity measurements on land, at sea and at flight altitude. The software provides accurate values of either topographic attraction or terrain correction by using a gridded digital topographic model in either a mass-line or a mass-prism representation. The mathematical formulas were developed at the Department of Geomatics Engineering of The University of Calgary.

TopGrav™ uses the techniques and algorithms developed in the eighties and nineties to achieve the best computational efficiency while minimizing the requirement on computer memory. The conventional integral formulas are expressed as a series of two-dimensional convolutions. With the use of the Fast Fourier Transform (FFT), the required computer CPU time is reduced logarithmically (by a ratio of hundreds to thousand times, depending on the size of the computation area.) By using the fast Hartley transform (FHT), the computational efficiency can be further improved by one-third while the required computer memory can be reduced by half.

### Areas of Application

Geophysics and Geodesy, for topographic reductions of terrestrial, shipborne and airborne gravity measurements used in gravity interpolation, geophysical interpretation and geoid/vertical deflection determination.

### Competitive Advantages

TopGrav™ has the unique advantage of using unified formulas that compute both topographic attractions and terrain corrections in land areas, ocean areas or coastal regions with gravity measurements taken either on the Earth's surface or in space, with either constant or horizontally varying densities. Based on FFT/FHT methods, it is also extremely fast as compared to conventional numerical integration software and it is therefore suited for computations involving very large elevation/density data files.

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## Stage of Development

TopGrav™, coded in C++ language with object-oriented design, is easily portable to any platform and operating system, or implemented in any other user-designed software. The software is well documented through a user's manual. Detailed derivation of the mathematical formulas is also available upon request.