

Computing Gridded Traveltimes from the Random Locations of Three Known Points

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Abstract

Gridded traveltimes are an integral part of Kirchhoff depth migration to efficiently compute the traveltimes of source and receiver raypaths. These gridded traveltimes may be formed by directly computing the traveltime as an expanding wavefront using an Eikonal equation approach. They may also be computed from raypaths that spread across the grid, with the gridded traveltimes interpolated from traveltimes along the raypaths.

Both methods require the traveltimes at three known locations to compute the traveltime at a fourth desired location (for 2D data). There are a number of methods that accomplish this task with various geometries for the three known locations, which assume either plane or circular wave fronts, and have varying speeds and accuracies.

We present an alternate method that is accurate for three arbitrary locations and assumes either a plane or curved wave front. The intended use of this algorithm is for a locally curved wavefront assumption when mapping traveltimes along raypaths to gridded traveltimes.