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Eulerian Fast-Marching methods for seismic traveltimes computation

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The fast marching method (Sethian 1996), is a finite difference scheme for the (standard isotropic) eikonal PDE, written in Eulerian coordinates and benefiting from the appealing property of causality : it can be numerically solved in a single pass over the domain, using an adequate ordering of the nodes determined at run time. Non-isotropic eikonal equations however arise in a variety of contexts, such as motion planning, geometry processing, or traveltimes tomography, and their discretization often involves more complex and costly multi-pass schemes, of semi-Lagrangian or Lagrangian type. In this talk, I will present single-pass Eulerian finite difference schemes for some non-isotropic eikonal equations, of Riemannian class and of a Finslerian class characterising seismic traveltimes.

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