Inverse Problems Network Meeting 6

Thursday, 12th December 2019 - Friday, 13th December 2019

University of Manchester

Abstract of Talk

GLOBAL HYPERBOLIC PROPAGATORS IN CURVED SPACE

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Consider a hyperbolic linear partial differential equation (PDE) or system of PDEs. The propagator is the linear operator mapping initial conditions (Cauchy data) to the solution of the hyperbolic equation or system.

Our aim is to construct explicitly, modulo smooth terms, propagators for physically meaningful PDEs and systems of PDEs on manifolds without boundary, and to do this in a global (i.e. as a single oscillatory integral) and invariant (under changes of local coordinates and any gauge transformations that may be present) fashion. Here by "explicitly" we mean reducing the PDE problem to integration of ordinary differential equations.

The crucial element in our global construction is the use of a complex-valued, as opposed to real-valued, phase function - an idea proposed in earlier publications by the speaker and co-authors. It is known that one cannot achieve a construction global in time using a real-valued phase function due to topological obstructions (caustics), however it turns out that the use of a complex-valued phase function allows one to circumvent these topological obstructions.

The three main mathematical models to be discussed in the talk are the wave equation, the massless Dirac equation and Maxwell's equations.

The construction discussed in the talk is a development of that described in arXiv:1902.06982.