Numerical resolution of Monge-Ampère equations arising in optics

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Abstract

Non-imaging optics is a field of optics which is interested in designing optical components, such as mirrors or lenses, that transfer a given source light to a prescribed target. The goal is not to simulate the trajectory of the light through an optical component, which would be the direct problem, but instead to build the shape of a mirror or a lens that transfers a source light to a given target light. This inverse problem amounts in different settings to solving Monge-Ampère type equations. In this talk, I will show how these equations are connected to optimal transport and can be solved using a geometric discretization called semi-discrete. I will also present the design of different kinds of mirrors or lenses that allow to transfer any point or parallel source light to any target. This work involves Quentin Mérigot and Jocelyn Meyron.

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