

Meeting: 1003, Atlanta, Georgia, SS 17A, AMS-SIAM Special Session on Nonsmooth Analysis in Variational and Imaging Problems, I

1003-49-1678 **James V. Burke** and **D. Russell Luke*** (rluke@math.udel.edu), University of Delaware,
Department of Mathematical Sciences, Newark, DE 19716-2553. *Nonsmooth Optics: the case of
phase retrieval.*

We apply nonsmooth analysis to a well-known optical inverse problem, phase retrieval. The phase retrieval problem arises in many different modalities of electromagnetic imaging and has been studied in the optics literature for over forty years. The state of the art for this problem in two dimensions involves iterated projections for solving a nonconvex feasibility problem. Despite widespread use of these algorithms, current mathematical theory cannot explain their success. At the heart of projection algorithms is a nonconvex, nonsmooth optimization problem. We obtain some insight into these algorithms by applying techniques from nonsmooth analysis. In particular, we show that the weak closure of the set of directions toward the projection generate the subdifferential of the corresponding squared set distance function. This result is generalized to provide conditions under which the subdifferential of an integral function equals the integral of the subdifferential. (Received October 06, 2004)