ACCELERATED CONDITIONAL GRADIENT METHODS FOR SENSOR PLACEMENT

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We consider a minimization problem over the space of Radon measures for the optimal placement of measurement sensors. It consists of a smooth functional, describing the quality of the measurement setup, and the non-smooth total-variation norm, describing the associated cost. The optimal solutions consist of a finite sum of Dirac-delta functions. Motivated by this, we analyze a conditional gradient method for their numerical approximation, since the method can be interpreted as iteratively inserting Dirac-delta functions and optimizing the corresponding coefficients. Under general assumptions, a sub-linear C/k rate in the objective functional is obtained, which is sharp in most cases. To improve efficiency, one can fully resolve the finite-dimensional subproblems occurring in each step of the method. We provide an analysis for the resulting procedure: under a structural assumption on the optimal solution, a linear $C\lambda^k$ convergence rate is obtained locally. Numerical experiments confirm the theoretical findings and the practical efficiency of the method.