

ITERATIVE PROJECTION METHODS IN BIOMEDICAL INVERSE PROBLEMS

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Projection methods are iterative algorithms that use projections onto sets while relying on the general principle that when a family of (usually closed and convex) sets is present, then projections onto the individual sets are easier to perform than projections onto other sets (intersections, image sets under some transformation, etc.) that are derived from the individual original sets. A projection method reaches its goal, related to the whole family of sets, by performing projections onto the individual sets. Projection methods employ projections onto convex sets in various ways and may use different kinds of projections, even in the same algorithm. They serve to solve a variety of problems which are either of the feasibility or the optimization types. They have different algorithmic structures of which some are particularly suitable for parallel computing, and they demonstrate nice convergence properties and/or good initial behavior patterns.

This class of algorithms has witnessed great progress in recent years and its member algorithms have been applied with success to fully-discretized models of problems in image reconstruction from projections and in intensity-modulated radiation therapy (IMRT). Apart from theoretical interest, the main advantage of projection methods that makes them successful in real-world applications is computational. They commonly have the ability to handle huge-size problems of dimensions beyond which other, more sophisticated currently available, methods cease to be efficient.