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Explicit Algorithm for Hammerstein Equations with Bounded, Hemi-Continuous and Monotone Mappings

Let E be a reflexive smooth and strictly convex real Banach space and E^* its dual. Let $F\colon E \to E^*$ and $K\colon E^* \to E$ be bounded hemi-continuous mappings such that $D(F) = E$ and $R(F) = D(K) = E^*$. Suppose that the Hammerstein equation $u + KFu = 0$ has a solution in E. We present in this paper a method containing an auxiliary mapping, defined on an appropriate Banach space in terms of F and K and which is maximal monotone. The solutions of the Hammerstein equation are derived from the zeros of this map. Our method provides an implicit algorithm and explicit one that converge strongly to a solution of the equation $u + KFu = 0$. No invertibility assumption is imposed on K and the operator F need not be defined on a compact subset of E. Our theorems improve and unify most of the results that have been proved in this direction for this important class of nonlinear mappings. Finally, illustration of the proposed method is given in L^p spaces.

Keywords: Maximal monotone mapping, Hammerstein equations, iterative methods.

MSC: 47H04, 47H06, 47H15, 47H17, 47J25.