Averaged alternating reflections in geodesic spaces

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Abstract. The convex feasibility problem for two sets consists in finding a point in the intersection of two nonempty closed and convex sets provided such a point exists. In Hilbert spaces there exists a wide range of algorithms that use metric projections on the sets in order to obtain sequences of points that converge weakly or in norm (under more restrictive conditions) to a solution of this problem. One of the most famous algorithms is the alternating projection method which was developed by von Neumann [1] and was recently adapted to the setting of CAT(0) spaces.

Another class of algorithms considered in this respect bases on reflections instead of projections. Given a nonempty closed and convex subset $A$ of a Hilbert space $H$, the reflection of a point $x \in H$ with respect to $A$ is the image of $x$ by the reflection mapping $R_A = 2P_A - I$, where $P_A$ stands for the metric projection onto $A$ and $I$ is the identity mapping. In this lecture we focus on the averaged alternating reflection (AAR) method which generates the following sequence for a starting point $x_0 \in H$: $x_n = T^nx_0$, where $T = \frac{I + R_A R_B}{2}$. We study the AAR method in geodesic spaces. Specifically, we consider spaces of constant curvature, CAT(0) spaces and the gluing of model spaces.

References