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Ubiquitous Algorithms in Convex Optimization Generate Self-Contracted Sequences

We show that various algorithms, ubiquitous in convex optimization (e.g. proximal-gradient, alternating projections and averaged projections) generate self-contracted sequences $\{x_k\}_{k \in \mathbb{N}}$. As a consequence, a novel universal bound for the *length* $\sum_{k \geq 0} \|x_{k+1} - x_k\|$ can be deduced. In addition, this bound is independent of both the concrete data of the problem (sets, functions) as well as the stepsize involved, and only depends on the dimension of the space.

Keywords: Proximal-gradient algorithm, alternating projection, self-contracted curve.

MSC: 52A41, 65K05; 52A05, 90C25.