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Fixed point properties characterized by existence of left invariant means on semigroups

Let S be a semitopological semigroup. Denote by $\mathrm{AP}(S)$, $\mathrm{WAP}(S)$ and $\mathrm{LUC}(S)$ the spaces of almost periodic functions on S, weakly almost periodic functions on S and left uniformly continuous functions on S respectively. Existence of left invariant means (LIM for short) on these spaces can characterize various fixed point properties (FPP for short) of S acting on subsets of locally convex spaces (and vice versa). We consider FPP of S acting as non-expansive quasi equicontinuous mappings on a weakly compact convex set. When S is separable we show, among other things, that this type of FPP is equivalent to the existence of a LIM on $\mathrm{WAP}(S)$ or a LIM on $\mathrm{WAP}(S) \cap \mathrm{LUC}(S)$. Some FPP characterized by the existence of LIM on $\mathrm{AP}(S)$ will also be discussed.

This is joint work with A. T.-M. Lau.