Tian, Li; Gu, Jiangwen; Ye, Qianqian; Xi, Lifeng; Jiang, Kan
Multiplication on self-similar sets with overlaps. (English) Zbl 1423.28029

Summary: Let $A, B \subset \mathbb{R}$. Define

$$A \cdot B = \{ x \cdot y : x \in A, y \in B \}.$$ 

In this paper, we consider the following class of self-similar sets with overlaps. Let $K$ be the attractor of the IFS $\{ f_1(x) = \lambda x, f_2(x) = \lambda x + c - \lambda, f_3(x) = \lambda x + 1 - \lambda \}$, where $f_1(I) \cap f_2(I) \neq \emptyset$, $(f_1(I) \cup f_2(I)) \cap f_3(I) = \emptyset$, and $I = [0, 1]$ is the convex hull of $K$. The main result of this paper is $K \cdot K = [0, 1]$ if and only if $(1 - \lambda)^2 \leq c$. Equivalently, we give a necessary and sufficient condition such that for any $u \in [0, 1]$, there exist some $x, y \in K$ such that $u = x \cdot y$.

MSC:

28A80 Fractals

Keywords:
multiplication; self-similar sets; representation

Full Text: DOI arXiv

References:

[2] Dajani, Karma; Jiang, Kan; Kong, Derong; Li, Wenxia, Multiple expansions of real numbers with digits set $\{0, 1, q\}$, Math. Z., (2018) · Zbl 1473.11016
[3] Dajani, Karma; Jiang, Kan; Kong, Derong; Li, Wenxia, Multiple codings for self-similar sets with overlaps, (2016)
[19] Peres, Yuval; Shmerkin, Pablo, Resonance between Cantor sets, Ergodic Theory Dynam. Systems, 29, 1, 201-221, (2009) · Zbl 1159.37005


This reference list is based on information provided by the publisher or from digital mathematics libraries. Its items are heuristically matched to zbMATH identifiers and may contain data conversion errors. It attempts to reflect the references listed in the original paper as accurately as possible without claiming the completeness or perfect precision of the matching.