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Periodic unique codings of fat Sierpinski gasket

Abstract: For $\beta > 1$ let S_β be the Sierpinski gasket generated by the iterated function system

$$\left\{ f_{\alpha_0}(x,y) = \left(\frac{x}{\beta}, \frac{y}{\beta}\right), \quad f_{\alpha_1}(x,y) = \left(\frac{x+1}{\beta}, \frac{y}{\beta}\right), \quad f_{\alpha_2}(x,y) = \left(\frac{x}{\beta}, \frac{y+1}{\beta}\right) \right\}.$$

Then $O_\beta := \bigcup_{i \neq j} f_{\alpha_i}(\Delta_\beta) \cap f_{\alpha_j}(\Delta_\beta)$ is nonempty if and only if $1 < \beta \leq 2$, where Δ_β is the convex hull of S_β. In this talk we will discuss the periodic codings in the univoque set

$$\mathbf{U}_\beta := \left\{ (d_i)_{i=1}^\infty \in \{(0,0),(1,0),(0,1)\}^{\mathbb{N}} : \sum_{i=1}^\infty d_{n+i}\beta^{-i} \in S_\beta \setminus O_\beta \ \forall n \geq 0 \right\}.$$

More precisely, we will determine for each $k \in \mathbb{N}$ the smallest base $\beta_k \in (1,2]$ in which $\mathbf{U}_\beta$ contains a sequence of smallest period k if and only if $\beta > \beta_k$. We show that each β_k is a Perron number, and the sequence (β_k) has infinitely many accumulation points. Furthermore, $\beta_{3k} > \beta_{3\ell}$ if and only if k is larger than ℓ in the Sharkovskii ordering. This is joint work with Yuhan Zhang.