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Recurrent iterated function systems and chaos game representation (and cannabis)

Iterated function systems (IFS) are a method of generating fractals by constructing an operator on an appropriate metric space whose attractor is self-similar. The operator represents the collective action of a set of affine transformations and fractals are generated by recursively applying the operator towards a fixed point. Recurrent iterated function systems (RIFS) generalize IFS by introducing a digraph that prescribes which kinds of recursive combinations of affine transformations are permissible. Chaos game representation (CGR) is a method of visualizing one dimensional sequences, first introduced in the context of DNA sequences. CGR of DNA sequences have been shown to produce images with self-similar patterns. Presented is a discussion of the relationship between RIFS attractors and CGR via an application to samples of cannabis sativa from different regions around the world. A wavelet multiresolution analysis of both demonstrates scale-invariant patterns.