p-Adic Scaled Space Filling Curve Indices

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Abstract. In Computer Science and applications, space filling curves, and Hilbert curves, as well as their generalizations to higher dimension are used as an indexing method because of their nice locality properties. Here, this concept is generalized to the systematic construction of p-adic versions of Hilbert curves based on special affine transformations of the p-adic Gray code. Thus, a scaled indexing method for data taken from high-dimensional spaces based on these new curves is developed, which with increasing dimension is shown to be less space consuming than the optimal standard static Hilbert curve index. A derived measure allows to assess the local sparsity of a dataset and is tested on some real-world data. In the end, some potential applications will be given.