Title: \(\varepsilon\)-shift radix systems and radix representations with shifted digit sets

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Let \(\varepsilon \in [0,1)\), \(r \in \mathbb{R}^d\) and define the mapping \(\tau_{r,\varepsilon} : \mathbb{Z}^d \rightarrow \mathbb{Z}^d\) by

\[
\tau_{r,\varepsilon}(\mathbf{z}) = (z_1, \ldots, z_{d-1}, -\lfloor rz + \varepsilon \rfloor) \quad (\mathbf{z} = (z_0, \ldots, z_{d-1})).
\]

If for each \(\mathbf{z} \in \mathbb{Z}^d\) there is a \(k \in \mathbb{N}\) such that the \(k\)-th iterate of \(\tau_{r,\varepsilon}\) satisfies \(\tau_{r,\varepsilon}^k(\mathbf{z}) = \mathbf{0}\) we call \(\tau_{r,\varepsilon}\) an \(\varepsilon\)-shift radix system. In the present paper we unify classical shift radix systems (\(\varepsilon = 0\)) and symmetric shift radix systems (\(\varepsilon = \frac{1}{2}\)), which have already been studied in several papers and analyse the relation of \(\varepsilon\)-shift radix systems to \(\beta\)-expansions and canonical number systems with shifted digit sets. At the end we will state several characterisation results for the two dimensional case.

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