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Non-expansive matrix number systems with bases similar to certain Jordan blocks

We study representations of integer vectors as combinations $\sum_{i=0}^{k} M^i a_i$, where the base $M \in \mathbb{Z}^{n \times n}$ is an integral matrix and the digits a_i take values from a finite digit set $\mathcal{D} \subset \mathbb{Z}^n$. The pair $(M, \mathcal{D})$ is called a *number system*. Our focus is to study more deeply a relatively simple, but intriguing case when M is similar to J_n, a Jordan block with eigenvalue 1 and dimension n.