# Digital-topological $k$-group structures on digital objects

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Motivated by the typical topological group, we have recently developed the notion of a digital-topological $k$-group ($DT$-$k$-group for brevity) derived from a digital object $X(\subset \mathbb{Z}^n)$ with digital $k$-connectivity, i.e., $(X, k)$. In relation to this work, we need the most suitable adjacency relation in a digital product $X \times X$ such as a $G_{k^*}$-adjacency relation which can support the $G_{k^*}$-connectedness of the digital space $(X \times X, G_{k^*})$, $(G_{k^*}, k)$-continuity of the map $\alpha : (X \times X, G_{k^*}) \to (X, k)$, and $k$-continuity of the inverse map $\beta : (X, k) \to (X, k)$.

We prove that $(\mathbb{Z}^n, k, +, \cdot)$ is an infinite $DT$-$k$-group and $(SC_k^{n,l}, *, \star)$ is a finite $DT$-$k$-group, where the operations $*$ and $\star$ are particularly defined.

Given two $DT$-$k_i$-groups $(X_i, k_i, *_i, \star_i)$, $i \in \{1, 2\}$, assume the digital product $X_1 \times X_2$. Then we can raise a query. Under what $k$-adjacency of $X_1 \times X_2$ do we have the product property of the given two $DT$-$k_i$-groups $(X_i, k_i, *_i, \star_i)$, $i \in \{1, 2\}$ ?

Finally, we will suggest some applicable areas in the fields of applied mathematics and computer science.

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