Durocher, Stephane; **El-Zein, Hicham**; **Munro, J. Ian**; **Thankachan, Sharma V.**
Low space data structures for geometric range mode query. (English) Zbl 1315.68113
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Summary: Let $\mathcal{S}$ be a set of n points in d dimensions such that each point is assigned a color. Given a query range $\mathcal{Q} = [a_1, b_1] \times [a_2, b_2] \times \ldots \times [a_d, b_d]$, the geometric range mode query problem asks to report the most frequent color (i.e., a mode) of the multiset of colors corresponding to points in $\mathcal{S} \cap \mathcal{Q}$. When $d = 1$, *T. M. Chan* et al. [LIPICS – Leibniz Int. Proc. Inform. 14, 290–301 (2012; Zbl 1245.68071)] gave a data structure that requires $O(n + (n/\Delta)^2/w)$ words and supports range mode queries in $O(\Delta)$ time for any $\Delta \geq 1$, where $w = \Omega(\log n)$ is the word size. Chan et al. also proposed a data structures for higher dimensions (i.e., $d \geq 2$) with $O(s_n + (n/\Delta)^{2d})$ words and $O(\Delta \cdot t_n)$ query time, where s_n and t_n denote the space and query time of a data structure that supports orthogonal range counting queries on the set $\mathcal{S}$. In this paper we show that the space can be improved without any increase to the query time, by presenting an $O(s_n + (n/\Delta)^{2d}/w)$-word data structure that supports orthogonal range mode queries on a set of n points in d dimensions in $O(\Delta \cdot t_n)$ time, for any $\Delta \geq 1$. When $d = 1$, these space and query time costs match those achieved by the current best known one-dimensional data structure.

MSC:

68P05 Data structures
68U05 Computer graphics; computational geometry (digital and algorithmic aspects)

Keywords:

range queries; mode; data structures; color queries

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