CSABA TOTH, University of Calgary, Calgary, Alberta, Canada
Containment queries for colorful simplices

A simplex spanned by a colored point set S in Euclidean d-space is *colorful* if all vertices have distinct colors. The union of all full-dimensional colorful simplices is the *colorful union*, denoted by $U(S)$. We show that the maximum combinatorial complexity of the colorful union for n points in d-space is $\Omega(n^{(d-1)^2})$. We prove several structural properties of the colorful union. In particular, $U(S)$ is the union of $d+1$ star-shaped polyhedra, which leads to efficient data structures for point inclusion queries in $U(S)$. To illustrate the difficulty of working with the colorful union, we construct colored point sets S of size n in 3-space with some pathological features.

Joint work with André Schulz (MIT).