Accepted paper with abstract, SoCG'09

Bernard Chazelle and Wolfgang Mulzer

Computing Hereditary Convex Structures

Color red and blue the n vertices of a convex polytope P in R^3. Can we compute the convex hull of each color class in $o(n \log n)$? What if we have $k > 2$ colors? What if the colors are random? Consider an arbitrary query halfspace and call the vertices of P inside it blue: can the convex hull of the blue points be computed in time linear in their number? More generally, can we quickly compute the blue hull without looking at the whole polytope? This paper considers several instances of *hereditary* computation and provides new results for them. In particular, we resolve an eight-year old open problem by showing how to split a convex polytope in linear expected time.