

Event structures, median graphs and CAT(0) cube complexes

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Event structures, trace automata, and Petri nets are fundamental models in concurrency theory. There exist nice interpretations of these structures as combinatorial and geometric objects and both conjectures can be reformulated in this framework. Namely, from a graph theoretical point of view, the domains of prime event structures correspond exactly to median graphs; from a geometric point of view, these domains are in bijection with CAT(0) cube complexes.

Thiagarajan conjectured that regular event structures correspond exactly to event structures obtained as unfoldings of finite 1-safe Petri nets. Using the bijections between event structures, median graphs and CAT(0) cube complexes, we disproved this conjecture. Our counterexample is derived from an example by Wise of a nonpositively curved square complex whose universal cover is a CAT(0) square complex containing a particular plane with an aperiodic tiling.

On the positive side, we show that event structures obtained as unfoldings of finite 1-safe Petri nets correspond to the finite special cube complexes introduced by Haglund and Wise.

Joint work with Victor Chepoi