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Threshold circuits for global patterns in 2-dimensional maps.


Summary: In this paper, we consider a biologically-inspired Boolean function, called $P^n_D$, which models a task for detecting specific global spatial arrangements of local visual patterns on a 2-dimensional map. We prove that $P^n_D$ is computable by a threshold circuit of size $O(\sqrt{n}\log n)$, which is improvement on the previous upper bound $O(n)$. We also show that the size of our circuit is almost optimal up to logarithmic factor: we show that any threshold circuit computing $P^n_D$ needs size $\Omega(\sqrt{n}/\log n)$.

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