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Very narrow quantum OBDDs and width hierarchies for classical OBDDs

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Abstract

In the paper we investigate a model for computing of Boolean functions - Ordered Binary Decision Diagrams (OBDDs), which is a restricted version of Branching Programs. We present several results on the comparative complexity for several variants of OBDD models. - We present some results on the comparative complexity of classical and quantum OBDDs. We consider a partial function depending on a parameter k such that for any k > 0 this function is computed by an exact quantum OBDD of width 2, but any classical OBDD (deterministic or stable bounded-error probabilistic) needs width 2 k+1. - We consider quantum and classical nondeterminism. We show that quantum nondeterminism can be more efficient than classical nondeterminism. In particular, an explicit function is presented which is computed by a quantum nondeterministic OBDD with constant width, but any classical nondeterministic OBDD for this function needs non-constant width. - We also present new hierarchies on widths of deterministic and nondeterministic OBDDs. We focus both on small and large widths. © 2014 Springer International Publishing.

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