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Dynamic complexity of parity exists queries. (English) Zbl 07471669

Summary: Given a graph whose nodes may be coloured red, the parity of the number of red nodes can easily be maintained with first-order update rules in the dynamic complexity framework DynFO of Patnaik and Immerman. Can this be generalised to other or even all queries that are definable in first-order logic extended by parity quantifiers? We consider the query that asks whether the number of nodes that have an edge to a red node is odd. Already this simple query of quantifier structure parity-exists is a major roadblock for dynamically capturing extensions of first-order logic. We show that this query cannot be maintained with quantifier-free first-order update rules, and that variants induce a hierarchy for such update rules with respect to the arity of the maintained auxiliary relations. Towards maintaining the query with full first-order update rules, it is shown that degree-restricted variants can be maintained.

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03B70 Logic in computer science
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dynamic complexity; parity quantifier; arity hierarchy

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References: