Constructible reversible logic: further properties and some applications

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In 2008 N. Nepejvoda described a costructible logic with group semantics [1]. The logic contains constructible implication $\Rightarrow$, constructible conjunction $\&$ and negation $\sim$ and a constant $E$. These connectives are freely combined with classical boolean operations $\supset, \land, \lor, \neg$. A set of elements and a set of actions over the elements are denoted by the single group $G$, because of natural isomorphism between group elements and group automorphisms. Every propositional letter $A$ denotes a subset $\zeta(A)$ of $G$; $\zeta(A)$ is not necessarily a subgroup of $G$.

The logic was developed in some later papers [2], in particular, it was shown that constructible reversible logic is not a logic with finite number of logical values. Now we present some more new results about this logic.

1. Undecidability of constructible reversible logic with $E$.

The proof is based on Novikov–Adyan result about group equations.

2. Power of the subclasses $\{\&\!, \sim\}$ and $\{\Rightarrow\!, \sim\}$ coincides with power of the whole constructible reversible logic.

3. In some cases the logic does not demand group structure of the initial $G$.

4. Constructible reversible logic can be used in program transformation and analysis if the underlying language also has group semantics.

Литература