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QUANTIFIERS DETERMINED BY CLASSES OF BINARY RELATIONS

Let $\mathbf{K}$ be a class of binary relations. The logic $L(\mathbf{K})$ is defined as follows:

– the class of possible models having a form (R, A), denoted by A^R, where A is a first order structure and R is a binary relation on the universe A belonging to the class $\mathbf{K}$.

– the language is a first order language with additional quantifier Q.

– the satisfaction relation for Q is defined as follows $A^R \models Qx\phi$ iff there is a s.t. for all b if $R(a, b)$ then $A^R \models \phi(b)$.

The first aim of our research is the study of different model- and proof-theoretical properties of $L(\mathbf{K})$ for fixed classes $\mathbf{K}$. Among other it is observed that for several classes $\mathbf{K}, L(\mathbf{K})$ is axiomatizable. For many classes, as for example the class of all linear orderings, the class of all partial orderings, the class of all equivalence relations, the class of all binary relations, such axiomatization is given. It is also observed that different classes of relations can determine the same logic (for example the class of all well orderings and the class of all directed partial orderings).

The second aim of our research is the study of properties of the family of all logics of the form $L(\mathbf{K})$. It is proved that this family forms a complete distributive lattice. Some properties of this lattice are discussed.

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