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GENERALIZED QUANTIFIERS AND FINITE MODELS

In [1] Sandu and Väänänen showed that a theory of partially ordered connectives can be developed along the same lines as partially ordered (Henkin) quantifiers.

Examples of partially ordered connectives are:
$D_{(1),1}$ defined as follows

$$\begin{pmatrix} \forall x & \exists y \\ \forall w & \bigvee_{i\in\{0,1\}} \end{pmatrix} (\phi_i(x,y,z))_{i\in\{0.1\}} \equiv \exists f \exists g \forall x \forall w \phi_{g(w)}(x, f(x), w)$$

$D_{1,1}$ defined as follows

$$\begin{pmatrix} \forall x & \bigvee_{j\in\{0,1\}} \\ \forall w & \bigvee_{i\in\{0,1\}} \end{pmatrix} (\phi_{ij}(x,y)_{i,j\in\{0,1\}} \equiv \exists f \exists g \forall x \forall y \phi_{f(x)g(y)}(x,y)$$

where f and g are unary functions from the universe to the set $\{0,1\}$. It is shown in [1] that $D_{1,1}$ is not first-order definable and $D_{(1),1}$ is strictly stronger than $D_{1,1}$.

In this paper we show that the nonconnectedness of a graph can be characterized in the logic $L(D_{1,1})$ and that for any monadic quantifier Q, the connectedness of a finite graph cannot be defined in $L(Q)$. As a corollary we get that the quantifier $D_{1,1}$ cannot be defined by any monadic quantifier.

References

[1] G. Sandu, J. Väänänen, *Partially ordered connectives*, **Zeitschrift für Mathematischen Logik und Grundlagen der Mathematik**, (forthcoming).

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