Barwise's Information Frames and Modal Logics

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The aim of our research is to develop mathematical theory of Barwise's information frames [1]. These frames, in mathematical sense, are special multi-based models, or algebraic systems, with the relations $\Vdash_s$ which express the context's depending consequence relations on classification types, i.e. they are aimed to handle information about situations which occur as a base set in these frames. We answer the Jon Barwise question from [1]: to find axiomatization for modal logics generated by information frames:

Theorem 1. *(i) Modal logic $L(\mathcal{K}_c)$ of all complete information frames is the logic K. (ii) Modal logic $L(\mathcal{K}_{c,s})$ of all complete and sound information frames is the logic T. (iii) Modal logic $L(\mathcal{K}_{c,h})$ of all complete and hereditary information frames is the logic $K4$. (iv) Modal logic $L(\mathcal{K}_{c,h,s})$ of all complete hereditary and sound information frames is the logic $S4$. (v) Modal logic $L(\mathcal{K}_{c,con})$ of all complete and consistent information frames is the logic D.*

Theorem 2. *(i) The weak modal logic $L_w(\mathcal{K}_c)$ of all information frames is the logic K. (ii) The weak modal logic $L_w(\mathcal{K}_h)$ of all hereditary information frames is the logic $K4$.*

Theorem 3. *Any Kripke complete normal modal logic is complete w.r.t. appropriate class of complete information frames, i.e. is information frames complete.*

Theorem 4.*For any rarefied information frame IF the context's logical consequence relation $\Vdash_s$ can be presented by accessibility context's consequence of usual Kripke frames.*

Theorem 5. *All modal logics generated by arbitrary classes of complete, rarefied and fully classified information frames are Kripke complete.*

[1] Barwise J. *Information and impossibilities.*- Notre Dame Journal of Formal Logic, Vol.38, No. 4 (1997), 488 - 515.

[2] Barwise J., Seligman J. *Information Flow in Distributed Systems.* - Book, Cambridge University Press, Tracts in Theoretical Computer Science 44, 1997.

[3] Dretske F. *Knowledge and the Flow of Information.* - Bradford Books, MIT Press, 1981.

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