On First order and Modal
Łukasiewicz and Product Logics

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1 Abstract

In the book "Metamathematics of Fuzzy Logic" Petr Hájek introduced BL logic and its first order version BL∀ as the many-valued logic underlying fuzzy logic in narrow sense. In this talk we begin with a brief summary of basic results on BL logic and the so-called t-norm based logics (axiomatic extensions of BL) and their first order versions. Then we will give basic results on semantics of these first order logics with special attention to Łukasiewicz and product logics and their completeness results w.r.t. witnessed and quasi-witnessed models (See Hájek's book, Hájek-Cintula paper and Cerami's thesis).

In order to introduce Modal many-valued logics, the main topic of the talk, we summarize previous results on first order Łukasiewicz and Product logics when we restrict the semantics to standard semantics, semantics over chains on the real unit interval. Then we will define and study Modal Łukasiewicz and Product logics and summarize results obtained in this setting and a new one. Taking into account the relation between Modal and Description many-valued logics, we summarize decidability results for VAL, SAT and SAT_{pos} for Modal Łukasiewicz and Product Logics. We end up with an open problem in Modal (and also first order) Product logics.