Multidimensional Logic on the Generalized Consequences

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The idea of the multidimensional logics has the following pre-history. Parallel with the papers of L.Brouwer and of J.Łukasiewicz in Russia in 1910-1913 there appear 3 papers of N.Vasiliev ([1], [2]) with the program of construction of the non-aristotelian logics.Vasiliev has suggested to subdivide the logical laws into two levels: external and internal; the first level is gnosiological - it submits to the laws of non-contradiction and of the excluded middle, the second one depends on the ontological assumptions about the cognizable world.

In the one-dimensional world the only positive statements are possible - the negative ones are not atomic, but presents the result of the inference: one can't ingenuously see that the subject S does not possess the predicate P.

But we can imagine the world, where one can fix not only the presence, but also the absence of the situation. In this case the positive and the negative facts will be independently from each other presented in the experiment. Vasiliev constructs the logic without the laws of non-contradiction and of the excluded middle, but with the law of the "excluded fourth". Then he generalizes this approach on the case of n dimensions - there can be constructed n-dimensional logics with n types of the atomic statements.

V.Smirnov ([2],[3]) has suggested the construction of the n-dimensional logics in the form of the algebras of classes.

The finite consequence of classes $< S1, ..., Sn >$ in which the intersection of any pair of classes is empty, and the union of all classes is the universum, is put for the predicative symbol. The relation of the inclusion is put as follows:

$$< S1, ...Sn > \subseteq < P1, ..., Pn > \rightleftharpoons Si \subseteq P1 \cup ... \cup Pi \text{ and } Pi \subseteq Si \cup ...Sn$$

This approach can be generalized, if one considers the generalized consequences of classes with the partial order. In the talk we will present the multidimensional - pseudo-Boolean -algebra built on the lattice. After entering the relation of inclusion, operations of intersection, union, negation and implication we prove the

Theorem $< W, \subseteq, \cap, \cup, 0, 1, \Rightarrow, \neg >$ *is a pseudo-Boolean algebra.*

We will also bring some informal illustrations of the multidimensional logics. Finally, we will compare n-dimensional logics in the form of algebra of classes with ones in the form of syllogistics.

[1] N.Vasiliev, *Imaginary logic*, Selected works (Russian) Moscow: Nauka, 1989

[2] V.Smirnov, *The logical ideas of N.A. Vasiliev and modern logic*, Studies in Logic and the Foundations of Mathematics

Amsterdam vol.**126** (1989), pp.625-640

[3] V.Smirnov, *Multidimensional logics*, Logical Studies (Russian) Moscow vol.**2** (1993), pp.259-278

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