

Non-Fregean approach to Dunn-Epstein's content relationship logic

Logic is a formal science that analyzes arguments' validity, where arguments are defined as a set of sentences consisting of premises and a conclusion. In both scientific practice and everyday life, in public and private spaces, we use arguments to justify various types of statements. Therefore, the argument's validity is important for any intellectual activity that is worthy to be called a rational discourse.

The formal validity of an argument is analyzed due to the specific understanding of logical constants occurring in that argument. Examples of such constants are logical connectives such as: „it is not the case...” (negation), „...and...” (conjunction), „...or...” (disjunction), „if..., then...” (implication), „...if and only if...” (equivalence).

These connectives can be interpreted either classically, taking into account only two logical values, truth and falsehood, or in a non-classical way, when taking into account two logical values is not enough to express a given use/understanding of connectives. For example, considering only two classical logical values does not help us express an intuitive temporal or causal, or any other except classical, usage of the classical connectives.

According to the recognition of the German philosopher Gottlob Frege, truth and falsehood are some objects (logical objects) to which we refer using sentences. True sentences are understood as names of truth, and false sentences as names of falsehood. However, such recognition raises some problems, e.g., the question arises of what type of object logical values are. The Austrian philosopher Ludwig Wittgenstein modified Frege's approach and rejected the assumption that sentences denote a logical value. In his opinion, language has its reflection, its image in the world understood as the space of all situations. He believed that true sentences are represented by facts, i.e., situations that occur in the world, and false sentences are represented by imaginary situations, i.e., those that do not occur in the world.

The analysis proposed by Frege and modified by Wittgenstein was the subject of reflection by Roman Suszko, a Polish logician and philosopher. According to Suszko's approach, in formal considerations, we should be able to state that given sentences refer to one or different situations. In this way we will be able to take into account Frege's recognition: all true sentences refer to one situation and false sentences to another situation. But also Wittgenstein's, non-Fregean recognition: true and false sentences can refer to many situations. In his logical research, Suszko analyzes the language containing the five connectives mentioned above, giving them the classical interpretation and, additionally, an identity connective enabling the statement of the identity of situations. This connective is nothing but the classical equivalence if we assume Frege's approach, but it can be identified as a non-classical connective if we agree with Wittgenstein. The first logical calculus developed by Suszko to describe the identity connective in non-Fregean way is known as Sentential Logic with Identity (SCI).

As part of our project, modifying Suszko's approach, we want to analyze certain non-classical interpretations of various logical connectives. Our interpretation will consider situations to which the constituent sentences refer and the existence of various connexions between these situations, not necessarily identity. This second aspect of the exposed interpretation of connectives comes from the American logicians Jon Michael Dunn and Richard Epstein. Both postulated that the interpretation of various connectives, mainly implication, in different contexts usually requires considering a content relationship of the component sentences. For example, the sentence “If Roman met Richard, then Warsaw is located on the Vistula River” is challenging to consider true because the contents of sentences are not related to each other in any reasonable way.

In our research, we intend to use mathematical methods adopted in the formal sciences, defining concepts based on set theory and proving relationships between concepts in the standard way. We will also include philosophical considerations devoted to Suszko's identity connective, Dunn-Epstein's connectives, and connectives that will be a modification of the former in the style of the latter. The results of our research will be presented in a series of articles and conference papers.