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Appendix A

Problems with the Predicate Calculus

The Predicate Calculus, which comes the closest to being a precursor of Place, began by using elementary meanings such as “denumerably many” and “function letter.” These terms, however, are not understood by the general population, they require special training in mathematics. If people do not understand the terms being used, then the terms are inert and do not convey meaning. Such terms are not a good place to start.

The following assumes some knowledge of the Predicate Calculus, a conceptual system from the context of mathematical logic [Ref 1].

Issues which impact the viability of The First-Order Predicate Calculus [The Predicate Calculus] as a theoretical foundation are these.

- The Predicate Calculus assumes that the meanings of 'variable' and 'function' are defined through natural language acquisition. It is not clear that this is the case across the general population of scholars and students.
- The Predicate Calculus also assumes that the phrases 'denumerably many' or 'countably many' are assigned meaning through natural language acquisition. In conventional Math, the meaning of these phrases depends on the meaning of a one-to-one function which provides a rule of correspondence between positive integers and the objects in a group. To the general population of scholars, the phrases 'denumerably many' and 'countably many' do not necessarily represent and designate this conventional Math meaning. These phrases are not part of the common, well-established vocabulary, which implies that either these phrases represent no meaning, ambiguous meaning or different meanings in the general population of students and scholars.
- The Predicate Calculus begins its development by constructing the following words.

  Let 'i' and 'j' each represent and designate positive integers, use:

  – a_i for constants

  – x_i for variables

  – f_i^j for functions

  – $\boldsymbol{A}_i^j$ for predicates

Thus, the Predicate Calculus uses a rule for constructing words which puts together the symbols a, x, *f* and A with positive integer subscripts.

Claim: The use of numbers to define the Predicate Calculus is a form of circular reference.

Justification: The role of numeric subscripts in the definition of the Predicate Calculus is not just that of unique marks which do not represent meaning. This is indicated by the fact that the positive integer subscripts are used to:

– impose an ordering of previous, concurrent and subsequent in many lists of names.

– supply the means to do proof by induction

– establish correspondence principles between the names of a formal, first-order theory K and the meanings of a given model.

Positive integers are supposed to be formally defined in the Theory of Mathematics. The Theory of Mathematics is supposed to be defined using the Predicate Calculus since it is a formal theory and the Predicate Calculus specifies limits that govern the identity of a formal theory. So, if positive integers are used to define the Predicate Calculus, then the definition of the Predicate Calculus involves a form of circular reference. And circular reference does not produce a definition that is useful.

- The Predicate Calculus governs the manipulation of symbols according to rules (i.e. it governs syntax) and does not adequately address the meaning issues, i.e. issues of semantics, involved in theory construction and the acquisition of knowledge.
- The Predicate Calculus allows or enables self-reference paradoxes. [Description of paradoxes: Ref 1, p 2-3].

Conclusion

The Predicate Calculus has some flaws which undermine its usefulness as a theoretical foundation for any formal theory.

APPENDIX B

Gödel's Work, Arithmetization & Place of Understanding

Some people may wonder why or how it is that Place of Understanding could achieve its goals given the expectations set by Kurt Gödel.

Gödel's work does not acknowledge or deal with issues of context or conceptualization. Thus, the scopes of variables in his work are not set properly. In this way, he violates the defining boundary of a context and/or the definition of conceptualization.

The following assumes some knowledge of the Predicate Calculus and Gödel's work.

Gödel's theorems require that the following conditions be met. Keep in mind that a "formal theory" is defined or determined by the Predicate Calculus.

A) Existence of a formal theory for numbers (called S) such that the formal theory is different than informal number theory.

B) Existence of a language such that the language: (i) has finitely many symbols, (ii) contains only names which refer to the meanings of the formal theory.

C) Existence of functions which assign numbers sequentially to each constant and variable in the language.

For example, the Predicate Calculus assumes the existence of these functions as follows, where 'i and 'j' represent positive integers:

- each constant gets mapped to a positive integer, j, and the constant is represented and designated by a_j
- each variable gets mapped to a positive integer, j, and the variable is represented and designated by x_j
- each function of i arguments gets mapped to a positive integer, j, and the function is represented and designated by f^j
- each relation which includes i concepts gets mapped to a positive integer, j, and the relation is represented and designated by A^j

Place of Understanding governs and defines a theory differently than the Predicate Calculus. A theory built according to the rules of Place of Understanding does not satisfy (A).

Regarding (C), Place of Understanding does not guarantee that a theory's language has only countably many names. If the language used by a theory has uncountably many names, then this requirement can not be met.

Although it is unlikely that a theory of numbers which is constructed according to the rules of Place of Understanding would satisfy conditions (A), (B) and (C), let's assume for a moment that these conditions can be satisfied.

Arithmetization requires functions (i.e. capabilities) such that the domain of each function is character strings and the scope of each function is a positive integer. Let's call these functions gn-fcns.

The first group of gn-fcns defined in the development of arithmetization assigns a different prime number to each unique punctuation mark, each propositional connective, and each alphabet character of a theory's language. Then a gn-fcn is defined which designates a unique positive integer for each unique character string built from: punctuation marks, propositional connectives and the theory's alphabet characters. The number a gn-fcn effects for one of these character strings is called a Gödel number [g.n.]. The last gn-fcn defined provides a one-to-one association between character strings and Gödel numbers. As a result of this one-to-one mapping, a Gödel number can be decoded to reveal the character string it is connected to. In this way, gn-fcns assign an alternative name to any instance of written language based on the char·str of its original name.

meaning ⇔ char·str ⇔ Gödel number

Observe that gn-fcns are capabilities which belong to a context, a context which contains char·str images and positive integers as concepts.

Next, Gödel's work goes on to define some relations such that each relation is of the form: "x is the gödel number of______"; such that the scope of 'x' is positive integers and the blank is filled in by an instance of written language such as a statement, an assumption, a list of statements, a proof, etc. Call a relation of this form a Gödel relation. Gödel also puts together the "simple" relations of this form to build compound relations. A naming schema is used to name each relation, e.g. Pl(x) or W(x,y).

The development of arithmetization includes the definition of the following compound relation, W(x,y) (where A{x} refers to a statement which contains variable 'x' and the scope of 'y' is positive integers).

W(x,y) ≡ x is the g.n. of A{x} and y is the g.n. of a proof of A{x}

Consider whether or not W(x,y)⊆ Scp(A{x}) [i.e. whether or not W(x,y) is contained in the scope of the name 'A{x}']. "W(x,y)" is a name for a statement that contains the variable 'x.'

The meaning of "W(x,y)" is "x is the g.n. of A{x} and y is the g.n. of a proof of A{x}" and 'x' is a part of this statement. So W(x,y) is a part of the meaning of A{x} since there are other statements that A{x} refers to also. However, if the meaning of W(x,y) is part of the meaning of A{x}, then the following situation results:

W(x,y) is a part of the meaning of A{x}, and A{x} is a part of the standard used to separate the meaning of W(x,y), so that the meaning of W(x,y) is both a part (part of A{x} which is part of W(x,y)) and a whole with respect to itself, W(x,y) – which is a contradiction by definition of part and whole. Observe that W(x,y)⊆ Scp(A{x}) determines a form of circular reference so that the proposed standard: "x is the g.n. of A{x} and y is the g.n. of a proof of A{x}" is not successful at separating all the meaning which gets assigned to W(x,y) [for support of this claim see the justification of the Voc·Def Principle].

Also observe the following. Given the following form of a Gödel relation:

gnr(x) ≡ x is the Gödel number of an instance of written language

Substituting gnr(x) for "an instance of written language" in "x is the g.n. of an instance of written language" is like the Liar's Paradox. The means to communicate the meaning of 'x is the g.n. of gnr(x)' requires a concept of itself – referred to by the noun 'gnr(x)' and this is a violation of the direction involved in the ability to conceptualize [it is a violation of the Conceptualization Principle]. The instance of written language featured in a Gödel relation refers to a concept of a means to communicate (i.e. a force meaning). And a concept effected from a Gödel relation is not available in the same context in which the Gödel relation, or its associated gn-fcns (force meanings) are built or defined—by the definition of conceptualization, which determines that the distinction between stuff and force is not violated within a context.

Gödel's Theorem for S [1931][18] and Gödel's Second Theorem [1931][19] requires a statement, ✚✚, such that the meaning of ✚✚ requires ¬W(x,y) to be contained in the scope of A{x}.

By the above reasoning, either:
a) the proposed voc·def defining W(x,y) is not a language rule by the Voc·Def Principle due to the circular reference it determines, or b) W(x,y) and any statement which contains W(x,y) are not contained in the scope of A{x}. In either case, ✚✚ , as it is conceived of in Gödel's work, is not allowed.

Consequently, Gödel's Theorem for S, Gödel's Second Theorem and results which depend on them, are not allowed in theoretical work which complies with the assumptions and rules of Place of Understanding.

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18 Ref. 1, p 159.

19 Ref. 1, p 164.

Appendix C

Quick Reference to Axioms of Place of Understanding

Not-Nothing Axiom

Something is not everything and is not nothing if and only if something is separate from not-something.

Force Axiom

The definition standard for a force provides the means to determine a direction: from what it acts on, to what it effects.

Stuff Axiom

The definition standard for some stuff provides the means to determine if it is present or absent.

Not-Chaos Axiom

A result or restriction is present in any setting S if and only if it has been effected by a force in setting S.

Ready Set Axiom

When raw materials and simple capabilities initially become present in a c-site, they are separate and independent of each other.

Go Axiom

A rule effects by being present, and a capability effects by being activated to use that which is available and appropriate.

HQ Axiom

A person's mind is a construction site that has stuff, rules, and capabilities present.

CommLink Axiom

A character string effects communication if and only if it represents and designates a meaning.

Attendance Axiom

A simple declarative clause refers to a claim that a result or restriction is present in the active context.

Comm Theory Rule

A theory begins with the creation of a new blank context.

Initial Meanings Rule

The initial meanings of a theory Th comply with the following:

a) are present in HQ prior to the beginning of Th
b) can be listed, such that the list has a beginning and an end
c) comply with the Ready Set Axiom
d) are transferred into the context of Th via an axiom
e) if developed in a different theory, other-Th, then ALL the initial meanings from other-Th must be included as initial meanings of Th.

HQ Meanings Rule

HQ meanings that can be used to define a theory meaning include: Def», Syn», ≡, ❍, approved-HQ-tools, from...to, to be, to equal, and to patternmatch.