Formalizing Self-Reference Paradox using Predicate Logic

We begin with the hypothetical assumption that Tarski's 1933 formula ∀ True(x) φ(x) has been defined such that ∀x Tarski:True(x) ↔ Boolean-True. On the basis of this logical premise we formalize the Truth Teller Paradox: "This sentence is true." showing syntactically how self-reference paradox is semantically ungrounded.

https://plato.stanford.edu/entries/tarski-truth/#ForCor

1.2 Formal correctness

The definition of *True* should be 'formally correct'. This means that it should be a sentence of the form: For all *x*, *True*(*x*) if and only if φ(*x*),

where *True* never occurs in φ; or failing this, that the definition should be provably equivalent to a sentence of this form. The equivalence must be provable using axioms of the metalanguage that don't contain *True*. Definitions of the kind displayed above are usually called *explicit*, though Tarski in 1933 called them *normal*.

"This sentence is true." Formalized as this predicate logic:

∃x ∈ Propositions ∃P ∈ Properties ∃T ∈ Predicates | (x ↔ P(x)) & (P(x) ↔ T(x))

Simplified as this formula

x ↔ hasProperty(x, True(x))

When the above x is plugged into True(x) to be evaluated we get

(1) True(hasProperty(x, True(x)))

(2) True(hasProperty(x, True(hasProperty(x, True(x)))))

(3) True(hasProperty(x, True(hasProperty(x, True(hasProperty(x, True(x)))))))

(n) ... On and on to an infinitely recursive depth.