Conceptual Synthesis: Quantum-Inspired Analogy for Autonomous Semantic Evolution

Starting Point (My Intuition):

I have a feeling that concepts from quantum mechanics, particularly bra ($\langle\psi|$) and ket ($|\psi\rangle$) notation and the idea of the superposition of states, can offer a useful framework to address one of the central problems of my project: how a computational system can detect the limits of its "semantics" (its set of rules/postulates) and autonomously generate new semantics.

The Problem:

Classical formal systems are static and, if sufficiently powerful, incomplete (Gödel's Theorem). They lack an internal mechanism to recognize this incompleteness or to invent new fundamental rules. Biological systems, on the other hand, are adaptive and constantly evolve their internal "regulations." I want to build a computational system that can do something similar: overcome its formal limits by creating new "semantics."

The Quantum-Inspired Analogy (The Explored Direction):

Instead of representing concepts, rules, or even derived theorems solely as discrete syntactic strings with a fixed meaning (as in a database or a classical ATP system), I am exploring the idea of representing them as state vectors in an abstract "conceptual space," similar to a Hilbert space.

1. ### Representation of Concepts/Rules as Vectors ($|\psi\rangle$):

Each concept or rule fragment is not just a symbol, but a vector that can exist in a superposition of potential meanings, roles, or logical relations it might have not only in the current semantics but also in potential or not-yet-defined semantics. The coefficients in this superposition would represent a kind of "weight" or "plausibility" of each potential meaning.

2. ### The Conceptual Space as an Analogous Hilbert Space:

The set of all conceptual possibilities forms a vector space (my "conceptual space") where the "axes" (bases) could be the fundamental properties or atomic conceptual elements of the semantics. This space is where the potential for new ideas resides.

3. ### Semantic/Logical Operations as Operators ($|\psi\rangle\langle\phi|$):

Inference rules, the composition of ideas, or the verification of relations are not simple manipulations of strings, but operations (analogous to quantum operators) that act on these state vectors in the conceptual space, transforming states of potential into other states.

4. ### Limit Detection as "Measurement" and Collapse:

The process by which the system detects the limits of the current semantics (which I currently imagine occurs through a feedback loop, statistical analysis of the properties of processed strings - e.g., Gaussian tails - and the search for specific patterns like self-reference) can be seen as an analogous "measurement process." This "measurement," which has an element of indeterminacy/probability (inspired by both quantum mechanics and the observation of biological systems), "collapses" the superposition of potential meanings/states onto a "determined" outcome: the identification of a specific limit, a statistical anomaly, or a self-referential pattern within that semantic context.

5. ### Self-Reference and Limits as Measurement Outcomes:

The discovery of self-reference (defined as a string that describes itself or its generation process) or a statistical anomaly is the "result" of this "measurement" in the conceptual space, and this result is the signal that the system has reached a formal or exploratory limit in that specific "direction" or "state."

6. ### The Bridge to New Semantics:

This fluid representation and the ability to "measure" limits within it are seen as the crucial step to then "collapse" onto new concrete ideas: the form of the new postulates or rules that will constitute the next semantics. It transitions from the representation of "potential" to that of the "determined" (the new rule).

In Summary for Discussion:

My hypothesis is that to create a system capable of inventing new semantics (going beyond simply finding theorems in a given semantics), it is necessary for it to operate not only at the syntactic level but also in a "conceptual space" where ideas exist in a superposition of potential meanings. The formalism of Hilbert spaces and bra-ket notation seems to offer a powerful mathematical model to represent this potentiality and to define a "measurement process" (analysis, search for self-reference) that leads to the "collapse" or determination of limits, thus triggering the process of creating new rules.