

Is the fundamental entity of the Universe a form of logic gate?

Tariq Khan
Omaha, Nebraska USA

A short essay proposing that the foundation of reality is a single action gate a la logic gate. This gate is possibly a since core entity used for any and all choices or decisions by any conscious mind past or future, or primordial schisms or instigating cellular automata rules.

"A logic gate is an idealized model of computation or physical electronic device implementing a Boolean function, a logical operation performed on one or more binary inputs that produces a single binary output."
-- Wikipedia

"To make all things from nothing, unity suffices."
-- Gottfried Wilhelm Leibniz

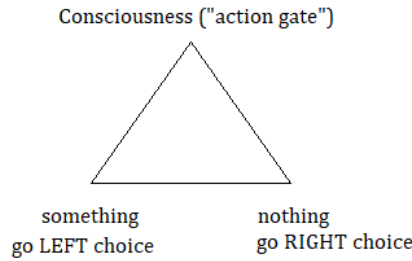
"These powerful formulas enable the calculation of any power of the mysterious e for any real number, integer or fraction from negative infinity to infinity, to any desired precision. They allow the construction of a complete table of natural logarithms and, from that, common logarithms, from scratch."
-- Pradeep Mutalik, Quanta Magazine [1]

"it still is the only completely coherent approach to explaining both the contents of quantum mechanics and the appearance of the world."
-- Hugh Everett III, letter to L. David Raub, 1980

"it's turtles all the way down."
-- J. R. Ross, Constraints on Variables in Syntax, 1967

How can one imagine a true beginning? A single particle cannot replicate without an instruction. That particle itself would contain space if not space and time. But before even this, we have an existential primordial schism of something versus nothing. But even in the context of a background or foreground space and time, there is no "action" without a core action. The very act, choice, idea, or split of something versus nothing is the third and final vertex of this primordial trinity. Is this a proto-consciousness or infinite God consciousness? We may never know. However, one can argue that the fundamental entity of a Universe must begin here with action or choice. It is here that we see an analogy to the computational logic gate. But our analogy is not perfect. Rather than two inputs leading to a single output, we have a single "conscious" vertex required for the instantiation or existence of the 2nd and 3rd (i.e., no observer means no something and nothing) (**Fig. 1**).

Fig. 1. An “existential trinity.” Does every action in our reality reference a single primordial action gate?



Note that while this imagined beginning is “simple” it can lead to immense if not Universal scale complexity. This pattern already can be seen in aspects of Nature or our reality. Note how the irrational number π can actually be represented as non-infinite formula.

Fig. 2. Formulas enable the calculation of any power of the mysterious e for any real number, integer, or fraction from negative infinity to infinity, to any desired precision.

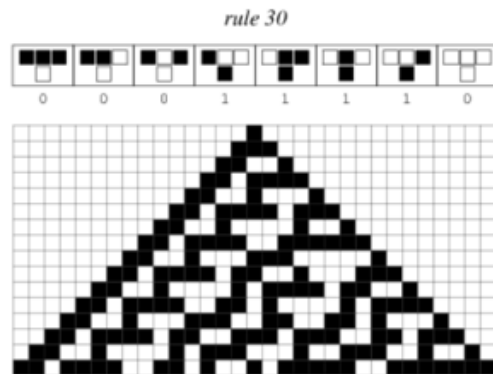
$$e^x = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + \frac{x^5}{5!} + \dots$$

[1]

Also note how Huge Everett III’s multi-verse concept involves an action (choice) that again leads to a schism between all possible Universes after going LEFT versus all possible Universes after going RIGHT. The nebulous nature of a particle’s wave nature and probability “collapse” into particle once “which path” information is known. Remove the “existential vertex” of the “knower” and we return to all the wave possibilities – see the Delayed Choice Quantum Eraser experiments for future work in this area.

In another analogy, note how cellular automata examples start with simple a priori rules (decisions) and then grow into complex patterns and structures (**Fig. 3**).

Fig. 3. Cellular Automata example showing primordial rules determining future evolution of structure.



[2]

In a chess game, we again see a priori rules in a micro-Universe. But the action involves decisions from a conscious decisions-making vertex (our “action gate”) that leads to change and play of the game. Each and every play refers back to one of two conscious agents. Perhaps the human affinity with chess originates from a deep analogy to the nature of existence itself. Motion and change in physical space arising from references to a conscious agent i.e., action gate (**Fig. 4**).

Fig. 4. Is reality closer to a game of chess? Every move references a single consciousness or “action gate”?



[3]

One might speculate on an entire mathematics or calculus built on these fundamental "action gates" quite distinct from computer science uses with chip logic. One could further imagine a reality where if consciousness or this "action gate" is fundamental then perhaps there is only a single gate with every living conscious mind if not Universe a runtime using the same single action gate mechanism for every single split or decision.

Perhaps, in this perspective, a consciousness does not "move through a Universe" but rather a Universe is either constantly "referencing" the single gate or, if we abandon free will, then every universe is kick started by a fundamental action gate and then is set in motion like a cellular automata.

In a reality, in a model where free will *is in place*, consciousness becomes the foundation of the 3-prong triangle gate. Even a choice of no action is still a binary choice, versus action. Thus, perhaps consciousness is, in essence, part of an eternal loop using the primordial action gate for every given scenario, person, Universe. Note, regarding the famous quantum mechanics dual-slit experiment, that it now has a framework as suggested by David Deutsch in his 1998 book *The Fabric of Reality: The Science of Parallel Universes--and Its Implications* where all the Universes in a multi-verse all exist "in parallel"^[4] but the action gate decisions determine which Universe or vector amongst them that our conscious mind in question will inhabit i.e., "which path" a photon took.

[1] Mutalik, P. (November 24, 2021). Why e, the Transcendental Math Constant, Is Just the Best. Quanta Magazine. Retrieved from: <https://www.quantamagazine.org/why-eulers-number-is-just-the-best-20211124> December 20, 2021.

[2] Rule 30 Cellular Automata image retrieved from Wolfram Mathworld. Retrieved from: <https://mathworld.wolfram.com/CellularAutomaton.html> on December 20, 2021.

[3] Chessboard image retrieved from: https://society6.com/product/chess-board807255_print on December 12, 2021.

[4] Deutsch, David. (1998). *The Fabric of Reality: The Science of Parallel Universes--and Its Implications*. Penguin Books.