A Fractal-Frame Interpretation of Spacetime

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https://www.youtube.com/watch?v=PJ2QsqqQSeY&lc=UgwmJhLPuqzVMAWtDwd4AaABAg.9gk5gj6fSoi9gz2MIM3k4R

A Comment on the YouTube Fermilab post:
What happens when you fall into a black hole?
https://youtu.be/PJ2QsqqQSeY?t=4m7s

@TheChzoronzon thanks! I like your fractal visualization for the edge-of-time microstructure of the energy excitation hierarchy [1]. That's the tree-like structure of causal, historical energetic events that complement and constrain the otherwise infinitely diverse possible futures possible under the Poincare symmetries of special relativity. Since late August, I've referred to this energy-event hierarchy as the launch hierarchy. As long as no earlier frame intrudes, the physics of all launched (children) frames and their descendants are describable using only the invariant and fully synchronous, $c_{left}=c_{right}=c$ (see [2], [3]) coordinates and physics of the root launch frame.

What I like about your deeper-level fractal interpretation is that it takes the launch hierarchy down to the particle level, where it becomes intimately connected to the flow of time. Cycles of all types become corkscrew-like helices of incredibly rapid and repeating inertial frame changes — better known as angular momentum — and, surprise, that's also precisely where Planck quantization abruptly kicks in! (Something intriguing is going on in that sudden onset of quantization, which is so profoundly different from the infinite partitionability of linear momentum, the one that makes information so energy-cheap that we tend to forget that it has an unquantized and thus indefinitely small energy cost [4]. To quote Grace, "We need to take some samples!")

Alas, though, I must also point this out: Although a nanoscale fractal excitation or launch frame tree provides an excellent framework for something akin to Sabine Hossenfelder's well-stated superdeterminism [5], there's nothing in frame trees that *requires* such an interpretation. If anything, the ability of the various branches to evolve causally, with only energetic launches and pair creations (information creation) constraining the otherwise infinite choices of the Poincare view of reality, argues that superdeterminism is *not* required by the fractal. Superdeterminism requires infinite information densities at the leaf nodes. Yet, if anything, the helicity that goes on at that terminal level of fractal detail elaboration argues that the tree has reached a limit: It no longer has enough information resources to "record" new information and instead falls into a form of cyclic repetition that we interpret as quantum indeterminacy. I don't think it's an accident that that is also precisely where Planck's constant emerges and begins quantizing that helicity.

Notice that the tree erases its past by converting energy into momentum pairs. That past is still *encoded* in the tree, but all of the energy and momentum are busy creating the "current state" (this is Poincare spacetime, so beware of taking that too literally) of the tree. There's no energy left in the past.

Given those points, I think a better approach would be first to assume something more straightforward, then try to prove the need for superdeterminism. An example of a more straightforward interpretation is an evolving Strandbeest universe [6] that retains finite complexity. To argue from that towards superdeterminism, be careful not to fall into the trap of the smoothness-is-a-given math argument. Despite the understandable appeal of infinite differentiability to many brilliant folks [7] working in continuum mathematics, infinite smoothness and infinite differentiability arguments are always assumptions, not experimental outcomes. This particular assumption has caused much grief over the past century, and there's no evidence from either physics or computation that infinitely precise real numbers of any kind have physical meaning.

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[1] T. Bollinger, *The Role of Energy in the Twin Paradox [YouTube Dialect comment].* Apabistia Notes, August 18, 2022.
https://sarxiv.org/apa.2022-08-18.2320.pdf

[2] T. Bollinger, *On the Importance of Derek Muller's Asymmetric Light Speeds [Veritasium comment].* Apabistia Notes, August 29, 2022.
https://sarxiv.org/apa.2022-08-29.0030.pdf

[3] **The Tachyon-Snail Symmetry**. Did I mention that one can only define light speed in pairs? See the above Veritasium comment [2] and several later Apabistia Notes [8]. The light-speed pair symmetry is vital to special relativity since it's how asynchronous dynamics produce physics identical to and indistinguishable from synchronous dynamics. Asynchronous dynamics is, in fact, the *only* way a moving entity embedded within and accessible in the launch frame's $xyzt$ coordinates can evolve without violating frame equivalence. If a software version of minutephysics' delightful Lorentz "world simulator" [9] exists (does it? it should!), you can watch asynchronous physics dynamics in action as light struggles to catch up to the front of a moving system ("snail light") while simultaneously slamming almost instantly into the back of the same system ("tachyon light"). Note that I'm not picking the word "tachyon" facetiously. I'm reasonably confident — but I need to look at the issue closer — that the deeper reason why tachyon-like solutions pop up in relativistic physics is the need for tachyon-snail pairs to implement special relativity. Even more bluntly: Tachyons *do* exist. They are better known as photons and can travel arbitrarily close to infinity at velocities. The (gigantic) catch is that every tachyon direction must pair with a negative, opposite-direction snail-light partner. The combination ensures no *signals* — no causal data — ever propagates faster than synchronous frame light speed *c.* Also, please be aware that this is all a bit of fiction since *every* $xyzt$ coordinate system is fiction. You can only create an $xyzt$ instance by including observer-biased data, and that's not what's going on in the deeper, less observer-dependent Lorentz area L_x, L_y, L_z representation of Poincare spacetime [10]. But $xyzt$ is such an incredibly *useful* fiction and one our brains can understand! Plus, judicious use of an $xyzt$ launch-frame hierarchy by ensuring no earlier frame intrudes permits unlimited use of fixed and orthogonal space and time coordinates. Shades of Newton! We do this informally, of course, but it's nice to add more rigor by being explicit about when it is and is not permissible. For example, frames launched by the observer frame — e.g., rockets with twins launched from earth or particles launched from accelerators — can always be treated safely as slower in time, up to quantum limits related to wave collapse. It's a lot less brain strain and stays entirely Poincare symmetric without injecting "who knows?" every time a frame-dominance question comes up.

[4] T. Bollinger, *How to Convert One Green Photon into Two Locomotives of Momentum.* TAO Physics, November 15, 2021.
https://tarxiv.org/tao.2021-09-30.pdf

[5] T. Bollinger, *On Finite Asymptotic Superdeterminism [Hossenfelder comment].* Apabistia Notes, May 21, 2022.
https://sarxiv.org/apa.2022-05-21.2335.pdf

[6] T. Bollinger, *The Strandbeest Universe [Hossenfelder comment].* Apabistia Notes, May 5, 2022.
https://sarxiv.org/apa.2022-05-29.1836.pdf

[7] T. Bollinger, *Assessing the Noether-Rehteon Conservation Doublet [YouTube Fermilab comment].* May 27, 2022.
https://sarxiv.org/apa.2022-05-27.2321.pdf

[8] Apabistia Notes
https://sarxiv.org/apa/

[9] T. Bollinger, *Cosmic Ray Muons and Age Gradients [minutephysics comment].* Apabistia Notes, August 29, 2022.
https://sarxiv.org/apa.2022-09-29.2240.pdf

[10] T. Bollinger, *The Role of Meter-Seconds in High-Precision Special Relativity [Stack Exchange comment].* Apabistia Notes, July 7, 2022.
https://sarxiv.org/apa.2022-07-09.2355.pdf

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