



THE SUNLIGHT FLUCTUATIONS

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—Ayush Gupta (19-06-2025)

Real-world observation.

One day in a random morning I observed a beautiful view of sunlight coming through my windows. I saw that sunlight was coming from my window and there was a tree with dense number of leaves just in front of my windows so the sunlight was partially blocked, on the floor there was a pattern of sunlight and shadow.



Then wind started flowing so tree leaves and its branches started moving or you can say oscillating in an imperfect way due to the imperfect winds. Those pattern of sunlight and shadow was totally dynamic which started changing every unit of time, and I realised that it was exactly like the simulation of quantum fluctuations inside a vacuum space, it is said to be probabilistic and random like when and where a new virtual particle may appear because we simple don't know the cause of that, even in this sunlight case it looks totally random and is very chaotic, but can be totally estimated or determined if we study the "cause" of this "effect", like measuring wind, angles and position of leaves, sunlight angle, etc, I guess a supercomputer or even a normal computer will easily to simulate this. So, what if that quantum fluctuations we are looking at are just that "effects" of some underlying "cause" that we just don't know yet that's why it's said to be probabilistic?

A Thought Experiment!

Suppose there's a table, which is unique, and that have too many table leg pillars supporting the table on ground, those many pillars are randomly distributed throughout the whole table.

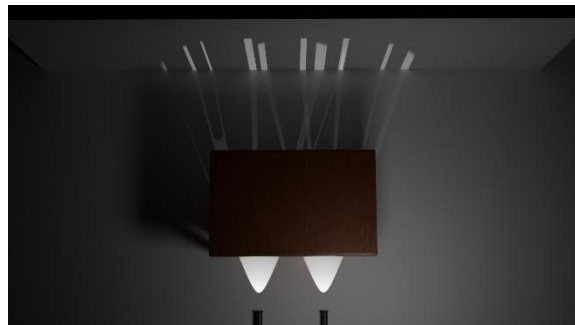


Now suppose we are looking from the top axis, so we don't know where all that pillars are, and we send a ping pong ball from one side of table and see that if the ping pong ball even comes to other side or not, if we repeat this experiment a thousand times then we'll see that balls coming from the other side have been through very chaotic collisions so predicting that from which side the ball exits the table and the ball's velocity are very hard, until and unless we don't see that exact positions of those pillars underneath the table. Maybe here a supercomputer can a little bit approximate after millions of trials. Let's make this game of predicting ball even more harder, now suppose those pillars are dynamic and they are changing their own position every moment of time (they are moving in a very standard pattern or every pillar uses a some rules to decide where it will move next but they will always be attached to the table so the table is always balanced). We really can't see the pillars movement from top view, now again send the ball inside the table so even though the pillars are moving in a very standard pattern I don't think even a supercomputer or a super quantum computer would be able to locate from which side the ball will exit the table or single pillar's location inside the table at an instant of time.

This is quantum-style unpredictability of ball's velocity without needing actual quantum randomness. So, does quantum randomness even exist or probability is just hidden in the geometry chaos?

Screen + light analogy (observer misinterpretation).

Now let's cheat on my own game, we will add two torches and a screen to our system to see the light's pattern on the screen.



Now we can easily bypass all the pillars if we send the ball "too fast" through the bright spots, because that place is empty at some instant of time, but but but let's forget the ball now and focus on the changing patterns on the screen, it's 2d bands of lights constantly shifting its position and shape (due to those moving pillars). Now suppose a person who doesn't know about this setup and only saw the changing patterns on the screen will easily say that those light patterns could be fundamental to screen and totally random and unpredictable by all means and if he is a Quantum Physicist then he might even say that this is the simulation of electrons just "taking energy from the vacuum then emitting the photons the gets absorbed back into the vacuum". Boom we have recreated what we say as "Quantum Fluctuations" where the virtual particles just take energy from the vacuum then annihilate themselves and give back energy to the vacuum. In the thought experiment we are projecting 3D to 2D screen, so maybe those quantum fluctuations in our dimensions are also a part of something higher dimensional that we don't have much idea about?

So, is it possible that what we call 'quantum fluctuations' just be emergent from deterministic but hidden geometric structures?