
From: Joscha Bach <joscha.bach@gmail.com>
Sent: Monday, February 19, 2018 9:34 PM
To: Jeffrey Epstein
Subject: Re:
Attachments: signature.asc

Computation itself does not cost energy, only the deletion of bits in a =eversible universe does. Energy is preserved because after the universe =s reversible, the amount of information in it is constant.

> On Feb 19, 2018, at 16:11, jeffrey E. <jeevacation@gmail.com> wrote:
>
> Energy comes from?
>
> On Mon, Feb 19, 2018 at 3:58 PM Joscha Bach <[REDACTED]> =rote:
> In the computational oscillator universe, energy has two forms: there
> =s the information contained in the oscillator pattern itself, which
> to =e looks like its mass: how much information fluctuates in each
> step? =Mass is basically displacement of information in time.) And
> there is =omentum, which is the amount of information that gets
> translated along =he computational graph. (Momentum is displacement of
> information in =pace.)
>
> If we look at the relationship between the locus of computation and =he global state, a number of variants are possible:
> - global calculation advances all bits in the state vector at the same
> =ime
> - single bit local calculation advances one one bit at a time
> - multi-local calculation has a number of individual "read/write
> =eads" that weave simultaneously
>
> All variants can be realized so that the resulting dynamics are the =ame, which means that they would be independent from the perspective of =n observer. However, variants B and C could also be implemented in such = way that the outcome of the computation depends on the order in which =ocations of the universe are touched. I doubt that this is the case, =because it might make the universe look for stochastic than it does.
>
>> On Feb 19, 2018, at 06:49, jeffrey E. <jeevacation@gmail.com> wrote:
>>
>> Energy? Unlimited? Equal per computation ? Non local ? Two places
>> =t once? Distribution s. Field effects time to compute / all the
>> same =ime ? Synchronized
>>
>> On Mon, Feb 19, 2018 at 6:24 AM Joscha Bach <[REDACTED]> =rote:
>>
>>
>> As you may have noticed, my whole train of thought on =omputationalism is based on the rediscovery of intutionist mathematics =nder the name "computation".
>> =tp://math.andrej.com/wp-content/uploads/2014/03/real-world-realizab
>> ility.=df

>>

>> The difference between classical math and computation is that =lassically, a function has a value as soon as it is defined, but in the =computational paradigm, it has to be actually computed, using some =enerator. This also applies for functions that designate truth. For =omething to be true in intuitionist mathematics, you will always have =o show the money: you have to demonstrate that you know how to make a =rocess that can actually perform the necessary steps.

>>

>> This has some interesting implication: computation cannot be =aradoxical. In the computational framework, there can be no set of all =ets that does not contain itself. Instead, you'd have to define =unctions that add and remove sets from each other, and as a result, you =ight up with some periodic fluctuation, but not with an illegal state.

>>

>> Intuitionist math fits together with automata theory. It turns out =hat there is a universal computer, i.e. a function that can itself =ompute all computable functions (Turing completeness). All functions =hat implement the universal computer can effectively compute the same =et of functions, but they may differ in how efficiently they can do it. =fficiency relates to computational complexity classes.

>> The simplest universal computers known are some cellular automata, =ith Minsky and Wolfram arguing about who found the shortest one. =oolean algebra is Turing complete, too, as is the NAND gate, the lambda =alculus, and almost all programming languages. The Church Turing thesis =ays that all universal computers can compute each other, and therefore =ave the same power.

>>

>> I suspect that it is possible that the Church Turing thesis is also = physical law, i.e. it is impossible to build physical computer that =an calculate more than a Turing machine. However, that conflicts with =he traditional intuitions of most of physics: that the universe is =eometric, i.e. hypercomputational. The fact that we cannot construct a =ypercomputer, not just not in physics, but also not mathematically =where we take its existence as given when we perform geometry), makes =e suspect that perhaps even God cannot make a true geometric universe.

>>

>> How can we recover continuous space from discrete computation? Well, =pacetime is the set of all locations that can store information, and =he set of all trajectories along which this information can flow, as =een from the perspective of an observer. We can get such an arrangement =rom a flat lattice (i.e. a graph) that is approximately regular and =ine grained enough. If we disturb the lattice structure by adding more =inks, we get nonlocality (i.e. some information appears in distant =attice positions), and if we remove links, we get spatial superposition =some locations are not dangling, so we cannot project them to a single =oordinate any more, but must project them into a region).

>>

>> On the elementary level, we can define a space by using a set of =bjects, and a bijective function that maps a scalar value to a subset =f these objects. The easiest way of doing might be to define a typed =elationship that orders each pair of objects, and differences in the =calar are mapped to the number of successive links of that relationship =type. We can use multiple relationship types to obtain multiple =imensions, and if we choose the relationships suitably we may also =onstruct operators that relate the dimensions to each other via =ranslation, rotation and nesting, so we derive the properties of =euclidean spaces.

>>

>>

>>

>> To get to relativistic space, we need to first think about how =nformation might travel through a lattice. If we just equalize value =ifferentials at neighboring locations, we will see that the information =issipates quickly and won't travel very far. To transmit information =ver large distances in a lattice, it must be packaged in a way that =reserves the value and a momentum (in the sense of direction), so we =an discern its origin. A good toy model might be the Game of Life =utomaton, which operates on a regular two dimensional lattice and =llows the construction of stable, traveling oscillators (gliders). In =ame of life, only the immediate neighbor locations are involved, so =liders can only travel in very few directions. A more fine grained =omentum requires that the oscillator occupies a large set of adjacent =attice locations. SmoothLife is a variant of Game of Life that uses =ery large neighborhoods and indeed delivers stable oscillators that can =ravel in arbitrary directions.

>> I think I have some idea how to extend this toy model towards oscillators with variable speed and more than two dimensions. It may also be possible to show that there are reasons why stable traveling oscillators can exist in 1d, 2d and 3d but not in 4d, for similar reasons why stable planetary orbits only work in 3d.

>>

>> To give a brief intuition about a traveling oscillator as a wavelet: think of a wavelet as two concentric circles, one representing the deviation above zero, the other one the deviation below zero. They try to equalize, but because the catch up is not immediately, they just switch their value instead. (This is the discretized simplification.) Now displace the inner circle with respect to the outer one: the arrangement starts to travel. Making the pattern stable requires distorting the circles, and probably relaxing the discretization by increasing the resolution. The frequency of the wavelet oscillation is inversely related to how fast it can travel.

>>

>> You can also think of a wavelet as a vortex in a traveling liquid.

>> The vortex is entirely generated by the molecular dynamics within

>> the liquid (which are our discrete lattice computations), and it

>> does not dissolve because it is a stable oscillator. The vortex can

>> travel perpendicular to the direction of the fluid, which is

>> equivalent to traveling in space. It cannot go arbitrarily fast: the

>> progression of the liquid defines a lightcone in which each molecule

>> can influence other molecules, and which limits the travel of every

>> possible vortex. Also, the faster the vortex moves sideways, the

>> slower it must oscillate, because the both translation and state

>> change depend on sharing the same underlying computation. It will

>> also have to contract in the direction of movement to remain stable,

>> and it will be maximally contracted at the border of the light cone.

>> (The contraction of a vortex is equivalent to giving it a momentum.)

>>

>> An observer will always have to be implemented as a stable system capable of state change, i.e. as a system of vortices that interact in such a way that they form a multistable oscillator that can travel ininson. From the perspective of the observer, time is observed rate of state change in its environment, and it depends on its own rate of change, which in turn depends on the speed of the observer. This gives rise to relativistic time. Also, the observer does not perceive itself as being distorted, but it will normalize itself, and instead perceive its environment around itself as being distorted. As a result, the observer will always have the impression to travel exactly in the middle of its light cone. This model seems to recover Lorentz invariance, but with a slight catch: it seems to me that while speed of light is constant and there is no preferred frame of reference wrt acceleration, the resolution of the universe changes with the speed of the observer. No idea if this is a bug or a feature, or if it will be neutralized by something I cannot see yet before I have a proper simulation.

>>

>> Obviously, all of the above is just a conjecture. I can make a convincing looking animation, and I am confident that many features like simultaneity etc. will work out, but I don't yet know if a proper numeric simulation will indeed work as neatly as I imagine.

>>

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>>

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>>> On Feb 18, 2018, at 09:00, jeffrey E. <jeevacation@gmail.com> wrote:

>>>

>>> I want to hear more on your views on projection spaces. . . Also feel free to put some more meat on the bones of the thinking re Lorentz transformations

>>>

>>> --

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