
From: Joscha Bach <[REDACTED]>
Sent: Monday, February 19, 2018 11:25 AM
To: Jeffrey Epstein
Subject: Re:
Attachments: signature.asc

As you may have noticed, my whole train of thought on computationalism =s based on the rediscovery of intuitionist mathematics under the name =computation".

=tp://math.andrej.com/wp-content/uploads/2014/03/real-world-realizability.=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 =omputational 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 that =here is a universal computer, i.e. a function that can itself compute =ll computable functions (Turing completeness). All functions that =mplement the universal computer can effectively compute the same set of =unctions, 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, with =insky and Wolfram arguing about who found the shortest one. Boolean =gebra is Turing complete, too, as is the NAND gate, the lambda =calculus, 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 a =physical law, i.e. it is impossible to build physical computer that can =alculate more than a Turing machine. However, that conflicts with the =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 =ype. We can use multiple relationship types to obtain multiple =imensions, and if we choose the relationships suitably we may also

=construct operators that relate the dimensions to each other via =translation, rotation and nesting, so we derive the properties of =euclidean spaces.

To get to relativistic space, we need to first think about how =information 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 =over 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 =iders 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 =very 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 =scillators with variable speed and more than two dimensions. It may =Iso possible to show that there are reasons why stable traveling =scillators can exist in 1d, 2d and 3d but not in 4d, for similar =asons why stable planetary orbits only work in 3d.

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

You can also think of a wavelet as a vortex in a traveling liquid. The =ortex 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 =o the direction of the fluid, which is equivalent to traveling in =pace. It cannot go arbitrarily fast: the progression of the liquid =efines a lightcone in which each molecule can influence other =olecules, and which limits the travel of every possible vortex. Also, =he faster the vortex moves sideways, the slower it must oscillate, =ecause the both translation and state change depend on sharing the same =nderlying computation. It will also have to contract in the direction =f movement to remain stable, and it will be maximally contracted at the =order of the light cone. (The contraction of a vortex is equivalent to =iving it a momentum.)

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

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

> 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 =eel free to put some more meat on the bones of the
thinking re lorentz =transformations
>
> --
> please note
> The information contained in this communication is confidential, may
> be attorney-client privileged, may constitute inside information, and
> is intended only for the use of the addressee. It is the property of
> JEE Unauthorized use, disclosure or copying of this communication or
> any part thereof is strictly prohibited and may be unlawful. If you
> have received this communication in error, please notify us
> immediately by return e-mail or by e-mail to jeevacation@gmail.com,
> and destroy this communication and all copies thereof, including all
> attachments. copyright -all rights reserved