

Complex Time ~ Concepts for Consideration

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Abstract:

The human perspective is incomplete, we see only outward from a point and cannot resolve the sequence of quantum action because Euclidean geometry is used to define relativity. A geometry indicated by special relativity defining separation not by distance but as separation in the constant proper time of the observer, allows distinction between electrical and quantum action. The proper time of the observer then has a natural complex conjugate when multiplied by the subjects relative velocity as a proportion of the velocity of light and a single equation describes relativity between charges without assuming geometry for empty space. Time dilation and divergence between charges then constitute a mechanism for all interaction, providing a common explanation for gravity, inertia and electromagnetism.

Introduction:

The distances between objects have such obvious reality that we fail to incorporate the length contraction of special relativity into our appreciation of mechanics. Our understanding of light then fails because the scalar measure of the clock, which is an indispensable component of our navigational ability, describes a traverse for quanta of light through time from a remote perspective but instantaneous from its own perspective, which those quanta cannot simultaneously have.

If general relativity and quantum mechanics disagree then maybe it's time to consider a fresh interpretation of Einstein's special relativity, starting with a discussion of some concepts. Light speed is a maximum speed for everything, which is equal to infinity for quanta of electromagnetic energy because their time is completely dilated, they arrive instantaneously from their own perspective. This is just special relativity, the problem is that this description defies logic, time has stopped for the quanta travelling at light speed but in all relativity time is an intimate and indispensable component of separation. With change of location there is a passage of time so time cannot stand still over distance. What we need is a redefinition of the mechanism of time itself, we need a mechanism which is not paradoxical.

Consider the possibility that there is an amount of time intrinsic to all separation, not directly proportional to the separation but decreasing as the rate of change of that separation increases. Time itself maybe something which exists not just as a sequence for events but also as an essential feature of separation, which varies in extent inversely with the relative velocity across that separation. What the idea of complex time is asking you to believe is that the quantum of energy and momentum that we usually think of as a photon travelling through space, is actually an instantaneous connection between the charges of matter across a very different structure of time. A structure in which separation is in the proper time of the observer and only looks like distance from the point perspective of the observer.

This departs from special relativity because it describes separation as being disparate location in the proper time of the observer, because it describes separation not just in time but in space as well, as being something which collapses at the speed of light. This is not just a new interpretation of physical relationships, it is a fresh explanation for the fundamental nature of physical separation. One which may answer questions about the actual mechanism of gravity which classical relativity cannot. If separation collapses for electrical and electromagnetic interaction then interaction between all charges is both immediate and continuous. Inertia and gravity then have a feasible mechanism, Coulomb interaction, by which they can be part of a balance of interactions with the wider universe.

This requires better explanation because there is an obvious delay in quantum action from a point perspective. That delay may be nothing more than a product of perspective. Space itself is a thing that we cannot do without, we are attached to our personal perspective for good reason. It is almost beyond imagining that the personal perspective produces an illusion which we see as empty space. An illusion not because space is not there but because it only exists when we look out at it from

within human limitations. By observation we know space is there, of course, we can see it between everything else, but its existence is evidence of nothing.

Relativity is a vision beyond the immediate, beyond the human perspective, from all perspectives at once. The name for this is 'covariant', true from all perspectives, and we can learn much from it about the nature of reality. We can, if we so choose, understand that our own perspective might be part illusion and the separation between things is proportional to their relative velocity. As that relative velocity approaches the speed of light, the separation collapses, leaving nowhere for space to exist except in our singular interpretation of a complex universe.

Illusion is where we make our world, to our own specifications. Outside of that there may be no space at all, only connection, only interaction. Light does not have a location, its velocity carries it over separations which have collapsed. That is why general relativity and quantum mechanics are incompatible, because they are descriptions of a universe made mostly of empty space, empty space which does not in actuality exist except from our unique and incomplete perspective.

An Equation for Complex Time:

To understand light mathematically it is necessary to more completely accept Einstein's conclusion that time and distance are inextricably interconnected. Time is a complex relationship between locations which has, along with the scalar measure of the clock, a complex conjugate only describable in units of the square root of minus one, here symbolised by i . Complex time reveals the gradual collapse of separation with increasing relative velocity, as required by special relativity. Where, t is the clock time of the observer, v is the velocity observed and c is the speed of light,

$$t + ivt/c = 0$$

This equation reveals how the nature of a quantum changes with perspective because its energy transcends forward across scalar time without duration in its existence from its own perspective, while it has varying duration from other perspectives. This equation describes relativity between the charges which constitute matter without need for any geometric structure for space.

Perspective:

Geometry is not complete from any one perspective because a single perspective cannot resolve the dynamic of relative velocity revealed by special relativity. Travel is asymmetric with change of perspective, as is the transmission of energy, resolving these relationships requires a fresh approach. If we define physical separation as separation within the proper time of the observer, we can then use direction to complete a covariant and dynamic description of that separation. This is an improvement on classical relativity because causality depends upon a seamless mechanism for the transmission of quanta. Causality and conservation are the consequence of interactions between charges but space itself has no substance with which matter may interact, spatial geometry being immaterial.

True separation between objects is ct , the time it takes from the observers perspective, to cross that separation at the speed of light. What we must forgo, in order to resolve geometry, is our idea of invariant distance in empty space. Distance is neither invariant nor covariant. The idea that a specific separation exists across empty space, collapses when time is included in the definition of that separation. That is a consequence of special relativity because coincidence in time cannot be defined, outside of dysfunctional Newtonian mechanics, without complex numbers.

To quote from Sin-Itiro Tomonaga's 1966 Nobel lecture, "... *the concept of a common time at different space points does not have a relativistically covariant meaning.*" We need complex time because empty space is not a complete frame of reference. The length contraction of special relativity distorts all perspectives to some extent so distance cannot be used to define location, it cannot even be used to specify direction except by reference to distant objects.

There is no easy way to explain that our intuitive understanding of the universe is essentially illusion. Complex time calls into question the existence of light outside of the atoms exchanging quanta of energy, and it questions the existence of the empty space across which that energy is exchanged. These strange things are, because the emission and absorption of the energy of all interaction is both forward in the scalar time of any single perspective and coincident at the speed of light and we cannot resolve a seamless mathematical appreciation of dynamics without understanding both of these things.

The concept key to a mathematical resolution of interaction is that the present moment, in the proper time of any one charge, is shared everywhere which is separated from it outward at the speed of light. To understand complex time, interpret physical distances as separations between locations in the observers proper time, which become covariant separation vectors when direction is specified.

Dimensions:

Specific distances are apparent only from singular perspectives so the three perpendicular spatial dimensions must be artificial constructs which do not remain orthogonal in any dynamic sense. Neither orthogonality nor time dilation are absolute, they vary with perspective but physical reality must be essentially the same from all perspectives both inertial and accelerated.

Roger Penrose makes the excellent assumption that nature is something which exists in the same form irrespective of perspective, as required by the conservation of energy and charge, as well as by the conservation of momentum which relates them. Complex time is required to make this observation possible, without it there is no agreement between perspectives, with it, all charges everywhere constantly interact providing a mechanism for the conservation of energy.

We need to explain both the macroscopic universe and the particle realm, both the experimental results supporting relativity and those supporting quantum mechanics, with a single credible explanation. But that explanation cannot be anchored in a geometric structure of empty space because that would not be truly relative. It must be a relational explanation based upon actual interactions between the

charges of mass and the specific energies which that describes for all interactions.

Complex time satisfies this requirement because it allows us to specify the energy difference between the location and velocity of one mass relative to another. The scalar proper time of any single perspective cannot give us true energy relations because relative location is not fully specified. The same is true for the relative difference between the frequency of emission and the frequency of absorption of a single quantum which must be directly proportional to the difference in the rate of proper time between the emitting charge and the absorbing charge from the perspective of any observer, as required by the conservation of energy.

Faraday's field theory of electromagnetism relies on the interaction of electric current with the properties of space, Maxwell resolves this idea mathematically prior to the revelation of relativity. Einstein's general theory of relativity relies on the interaction of mass with properties of space, describing gravity as a consequence of the geometric distortion of spacetime. Complex time does none of this, it only describes the inevitable force for change of relative location between charges, which is Coulomb force. Coulomb force is proportional to charge, separation and relative motion, but cannot be proportional to the distance between charges from a single perspective because distance varies with perspective.

Interaction:

The force between charges is proportional to the difference in their rates of proper time divided by the square of the separation between them. This is the cause of Coulomb force and the mechanism of all continuous interaction, not just gravity. The kinetic energy accumulated by the action of Coulomb force upon the charges of mass is then proportional to, the dilation of the rate of proper time between opposite charges approaching or between like charges separating, and proportional to the divergence of the rate of proper time between opposite charges which are separating or like charges which are converging. The repulsion between like charges simply acting opposite to the attraction between opposite charges. All forces are inversely proportional to the square of the separation between the acting charges, in the proper time of the observer, not inversely proportional to the square of their separation as a poorly defined distance lacking covariance.

Gravity:

To understand gravity in this context it is necessary to appreciate the unequal balance of attraction and repulsion between the charges of neutral masses. This is the consequence of the difference between, the sum of the inverses of the squares of the separations of the attracting charges, and, the sum of the inverses of the squares of the separations of the repelling charges. Assuming these sums to be equal and opposite is a baseless assumption which deserves deeper investigation. Remembering that their difference only need be near to one part to a power of minus forty for electrical force between masses to fully account for gravity. The mathematical resolution of this sum can begin with a simple statement of the relationship between an individual charge and the rest of the universe without complication by assumptions.

The sum of inertial forces, F acting between charges, q is a product of the electromagnetic constant, k multiplied by all charge pairs, n in proportion to their charge and the inverses of the squares of their separations, $r = ct$. Gravity is the same sum acting continuously between neutral masses, which is almost equal to that acting between gravitational centres when the assumption is made that gravity has a different mechanism of action.

$$F = \sum_{n=1}^n kq_2q_1 / r_n^2 \sim G m_2 m_1 / r^2$$

Inertia:

An appreciation of the origin of inertia can then be gained by attributing the resistance to acceleration of mass, to an electrical relationship with the wider universe. In complex time the acceleration of any one charge cannot fail to engender momentum in the wider universe, equal and opposite to the momentum resulting from that acceleration. Inertia is a direct consequence of the energy which that takes. No separation in time exists between action and effect in complex time, which is why the inertial interaction with the wider universe is instantaneous. Back reaction with delay equal to double the separation, ct , in the proper time of the charge, is then spread across its time and not localised at the charge. Charge self interaction under acceleration no longer raises paradox because it does not occur.

An object falling under gravity in vacuum, offers no resistance to that acceleration so the equivalence principle can be extended to include inertia. The zero for inertial change being that motion which does not resist gravity. Stationary mass on the surface of a planet is resisting gravity by the equivalent to a constant upward acceleration, the reaction caused by its inertia is the pressure that it exerts upon the ground. The apparent separation in space and time and the lack of a frequency of quantum interaction between all charges, has precluded electrical interaction as a causal explanation for inertia but in complex time this is resolved. If energy is exchanged without separation across complex time, then continuous electrical interaction between all charges is a credible mechanism for both gravity and inertia.

Nothing has been invented here, this is just the product of a different perspective in which it is logical that gravitational, electrical and inertial forces are all the same Coulomb interactions, continuous by nature and differing from electromagnetic forces. Quanta of electromagnetic interaction are not continuous, they relocate energy and momentum in proportion to frequency, as a consequence of the resonance of the emitter with the absorber. The essential concept for understanding quanta is that they act immediately within complex time and are shielded when the shield acts as the absorber. Their mechanism of interaction is the continuous electric force consequent upon the differing rates of proper time between charges, which expresses a quantum of interaction when those charges find resonance.

It is important to distinguish between electrical action and electromagnetic action, the essential concept for understanding electrical action is that it cannot be

shielded because all charges continuously act with force proportional to the inverse square of their separation. This is not true of quanta which are discrete, allowing the transmission of energy and momentum only at resonance between the charges of atoms, either internally or between separate atoms. The specific frequency of quanta means that phase regulates their action so that both phase coincidence within complex time and resonance are required to enable their transmission of energy and momentum.

To develop confidence in these concepts as complete definitions of interaction, supplanting everything we know about exchange particles, will take extensive consideration. It is necessary to disturb our most secure notions of the relationship between time and distance, because established notions do not allow us to appreciate the universe for what it is without invoking fields of force which vary with perspective. Special relativity revealed this a century ago but we still have some work to do taking its lesson into consideration. It matters not how determined our mathematics, none of it describes a mechanism by which matter can interact with the empty space that it appears to be in. Where is the mechanism of interaction between matter and empty space which could satisfy conservation of momentum, that would be an ether. Separation between objects may not be something we can specify without using a complex conjugate for our measure of time, moderated by the relative velocity of those objects.

Causality:

Interaction can be clearly defined in complex time. Causality refers to the interaction between things as cause for the development of circumstance. Without a real sequence for events which depends upon the inevitable speed of light across which all interaction must occur, there is separation of effect from cause. For this reason the strict set of relations described by orthogonal spatial dimensions cannot be true except within the space local to a single charge. You can resolve causality in the direct influence that the acceleration of any one charge has on the location of all other charges. This was already apparent from conservation of energy but it cannot mean that the future is inevitable because there is wide variety of influences acting at any one instant of the proper time of any one charge, which diverge with its acceleration.

Our arguments about time are based on insufficient reason until we understand that there is no common scalar time at disparate points in space, the proper time of individual charges is a property of each charge separately. Scalar time beyond the individual charge is not just unresolvable, it is misleading, allowing distorted perspectives to appear necessary. Empty space may be nothing more than illusion in our highly specialised perspective.

We see the emptiness between separations in time as being empty space because that is what it looks like and that has satisfied our navigational needs until now. There may however, be a simple mechanism by which a craft in that empty space can induce acceleration relative to the distant universe, which we fail to recognise because our perspective is limited to a point. The variation of separation between masses with their relative velocity, shown to us by special relativity, requires

us to set aside the truth according to our eyes and consider a new description of interaction.

General relativity was not intended to mislead and it has enabled many things including GPS navigation but it remains less than physical with respect to charge interaction. Complex time is offered as an alternative interpretation of special relativity, it has the advantage of simplicity once the conceptual transition has been achieved. Relative velocity between objects is absolute but distance varies with perspective. Adopting relative velocity as a qualifier of separation has many difficult consequences which remain to be resolved but it may be the only way to reconcile the experimental results supporting quantum mechanics with those supporting general relativity.

Conclusion:

Time is not just another dimension, it is a property of distance, a complex function strictly relating separation to relative velocity. Time is independent from structure, being both a constant rate for any one charge and a variable feature of each charge interaction separately. Our appreciation of time is unique to our perspective but it is also an indispensable descriptor of the nature of interaction. Individual charges and their interactions are what constitute our entire universe.

The difficulty we have had deciphering the revelations of special relativity has been a consequence of our pre-suppositions, for want of objectivity our comprehension has been hindered. When we free ourselves from the need for coincidence in scalar time we can then understand the progress through complex time of individual pairs of charges, a progress which has the opposite sense between like charges to that which it has between opposite charges.

Instant interaction between charges separated by intergalactic distances is how inertia works, not because anything traverses the space between them faster than the speed of light but because their interaction occurs at coincidence within complex time. Proper time is the sequence for everything, not because it regulates everything but because that is what we perceive from our own location. The covariant perspective is unfamiliar but functional, the complex conjugate of time reduces separation to nothing at the speed of light by resolving passage through time as being dependent upon the relative velocity of your perspective.

Richard Feynman, who devoted much of his time looking for a solution to these problems, explained that there are many ways to describe physical reality which look very different but solve the same problems. The paradox standing in the way of unification of the fundamental forces includes retrocausality and radiation resistance, these can be resolved within complex time because emission of quanta is as much a consequence of their absorption as it is the other way around. Mathematical development may be able to discern if these notions of complex time are worth consideration as a useful description of physical reality. This discussion is a call for that work to be undertaken.

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