RELATIVITY - THE THEORY OF INFORMATION

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Abstract. This paper shows that the theory that we know as the Theory Of Relativity is more accurately described as A Theory Of Information. Explained from an informational perspective and the conclusions that its author, Albert Einstein came to, come into question through the natural viewpoint as the entire theory being simply about the transfer of information between informational systems.

1. Synopsis

The purpose of this paper is to re-interpret what we term "'The Theory of Relativity"' into a "'Theory of Information. This paper, in doing so, shall expose some fundamental contradictions and false conclusions that have stood for more that 100 years caused by the incomplete understanding of the "'theory of relativity. When referred to in this paper the Theory of Relativity refers to the Special Theory of Relativity proposed in 1905 by Albert Einstein, a man himself who had no fear in challenging the accepted scientific norms. So in the spirit of Einstein we present this paper

2. Relativity The Theory Of information

Einstein himself understood and explained his monumental work, The Special Theory Of Relativity as a theory about the prorogation of light or electromagnetic waves, of which, visible light occupies a small part of the spectrum. He managed to take much of the work that had been achieved by many other eminent scientists and put it together , see the overall picture and produce his seminal work. The other scientists were many including Lorenz , Poincare , Minkowski and many others . One could argue that the most astounding hypothesis that came out of his work was that everything in the universe is not only traveling through 3 dimensional space but through time as well. Indeed the concept of 4 dimensional space-time had already been introduced by Minkowski, an idea that Einstein was well familiar with. This paper will show that when analyzed from its proper context, the transfer of information, this conclusion is obviouls false and Newton had it correct the first time, bodies are only traveling through 3 dimensional space and space time is an illusion.

3. The relativity of information transfer.

The Theory of Relativity predicts that clocks traveling in reference states with uniform motion shall keep time differently when viewed from other reference frames. The clock is predicted to keep the same time despite the orientation of the clock in the reference state that it is moving when viewed from another reference frame traveling with uniform motion (becuase each reference frame is travelling through time at a different rate). This is one of the bedrock principles of relativity as a major part of the theory rests on the prediction of moving through time as well as space . Times that can be calculated by the Lorenz Transform which grew out of Maxwell's and Lorenz's study of electro-magnetism. The next section, by means of simple proposed experiments shall show that the time kept by clocks moving with relative motion to an other is NOT orientation less. If this is the case then the

proposal that objects in the universe are moving through time and space cannot be true.

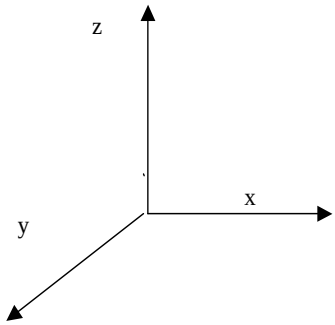
4. The Atom Clock explanation

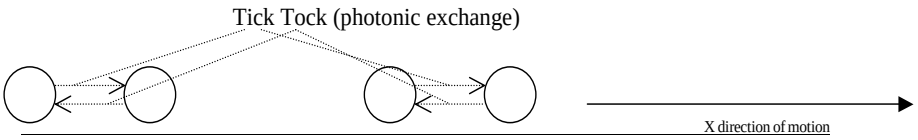
Figure 1 shows the simplest kind of clocks imaginable. There are two clocks in the diagram and each consists of two (unspecified) atoms , each set of two atoms separated in space by the same distance . Each set of atoms sends a photon to the other which, in return sends a photon back to the other atom. So in this way the photon, traveling to the right in the diagram corresponds to the 'tick' of our atom clock and the photon sent in reply, to the left in our diagram, corresponds to the 'tock' of the clock. So in this way the experiment consists of two identical atom clocks, each atom in the respective clock separated by an identicle distance. Therefore, when the two clocks are at rest, relative to each other, they produce identical 'tick tocks' of their respective atom clocks and thus "keep the same time" .

4.1. **The Atom Clock explanation (clocks orientated in line with each other.** The figure also shows the clocks, when they are moving at uniform motion to each other. The first clock (A) is taken as the clock at rest and the second clock (B) is taken as the clock in uniform motion.
So the question is from the perspective of clock (A) what effect does the uniform motion have on clock (B).
As clock (B) is in motion, when the photon is transferred from the right sided atom to the left sided atom, the motion of the atom clock means that the photon has a longer distance to travel, a distance proportional to the velocity of the clock. So from the perspective of clock(A), the tick of clock (B) seems to proceed slower than normal.
When the "'tick"' photon arrives at the right sided atom and the "'tock"' photon is transferred to the left side atom, this photon has less distances to travel as the left sided atom is traveling towards the traveling photon with the uniform velocity. This causes the "'tock"' photon to reach the left sided atom quicker than normal and the "'tock"' proceeds more quickly than when the clocks are at rest to each other. The increase in the "'tock frequency is again proportional, this time in a positive sense to the uniform motion.
conclusion: The tick of the moving clock slows down by an amount proportional to the uniform motion and the tock of the clock speeds up by the same amount so the overall effect on the tick-tock is zero. The tick-tock in our little atom clock moving with uniform velocity with respect to the atom clock at rest proceeds exactly the same as if there were no uniform motion between the two atom clocks.
But how can this be? does not relativity, one of the foundations of modern physics, predict that clocks moving in uniform motion with respect to each other shall "'keep different times"'.
There can only be two solutions to this conundrum : either the results of, or the experiment itself is in error or The theory of Relativity is, in least part, WRONG.

4.2. **The Atom Clock explanation (clocks orientated perpendicular with each other.** Figure two shows the same two atom clocks, with the same uniform motion with respect to each other. This time the only difference is that the atom clock taken as in motion is orientated at 90 degrees to the atom clock at rest.

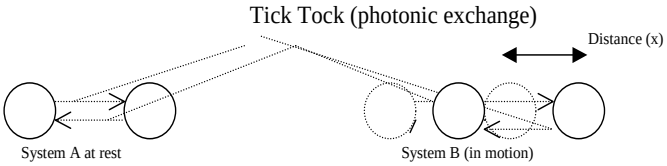
Two sets of atoms separated by the same distance, moving with uniform motion with reference to each other along the X axis only. Each set of atoms emits and receives a photon thus creating a natural 'tick – tock ' of a clock. Using this thought experiment it is much more simple to determine if, as is stated in the Theory of Special Relativity that clocks moving with uniform motion relative to each other will keep different time dependent on their velocity and independent of their Spacial Orientation. This is the foundation of Relativity that states that objects are travelling through space and TIME.





A Reference Atomic System (at rest) B Moving Atomic system (in motion)

The crucial question in this thought experiment, which can be literary taken as 2 clocks in uniform motion with respect to each other along the x-axis is : What is the time difference from the point of view of system A (at rest) to system B (moving along the x-axis).



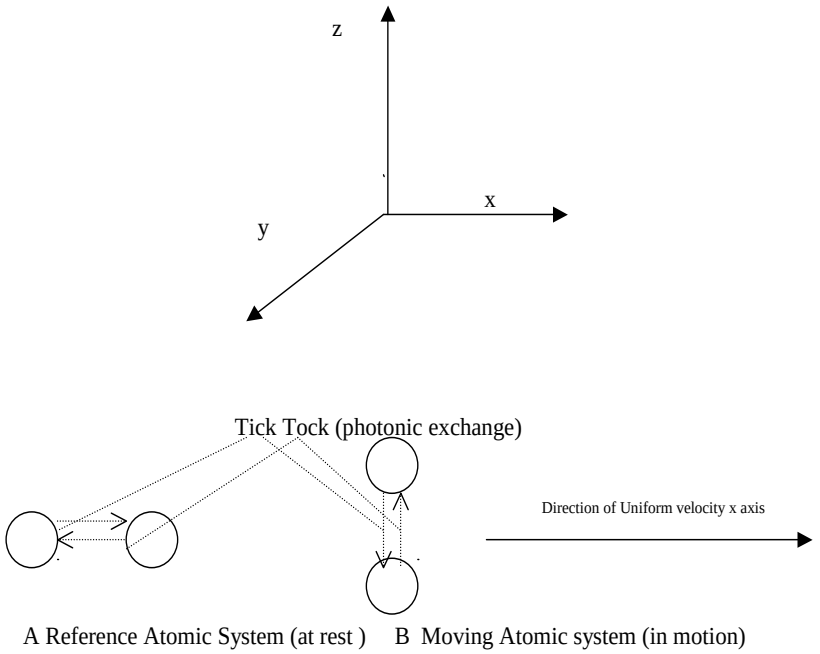
From the point of view of System A the tick and the tock of System B are :

During the tick of the clock when a photon travels from the first atom to the second, because the system is in motion the photon has further to travel by the distance X therefore the tick in comparison to the tick of system B seems to proceed at a slower rate.

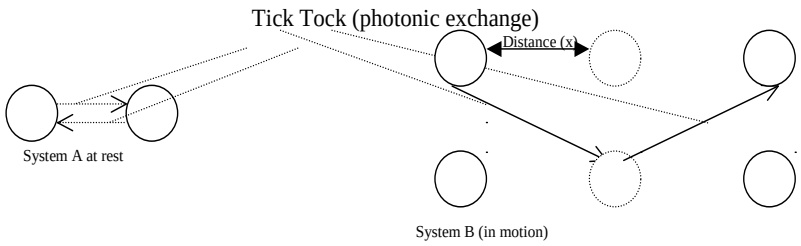
During the tock of the clock when the photon has a shorter distance to travel due to the motion of system B the tock seems to proceed at a faster rate.

FIGURE 1. Simple Clocks traveling in the x axis with Uniform Motion

In this experiment the orientation of the clocks is changed. The second clock is arranged in space perpendicular to the first. Then the relative effects of the uniform motion on the clocks is determined. Again the two sets of atoms are separated by the same distance, moving with uniform motion with reference to each other along the X axis only. Each set of atoms emits and receives a photon thus creating a natural 'tick – tock ' of a clock.



This time with the second atom clock oriented at 90 degrees to the direction of movement again the crucial question: What is the time difference from the point of view of system A (at rest) to system B (moving along the x-axis).



From the point of view of System A the tick and the tock of System B :

During the tick/tock of the clock the photons in Clock B, from the perspective of Clock A, travel a longer distance in both the photonic tick and the photonic tock . This has the effect that from Clock A the tick and the tock of Clock B proceed slower than they would if there was no uniform motion between the two clocks. So the Clock B seems to slow down.

FIGURE 2. Simple Clocks traveling in the x axis orientated at 90 degrees with Uniform Motion

In this configuration it is simple to determine that from clock A's perspective the tick and the tock of clock B both have a longer distance to travel due to the perpendicular arrangement and the uniform motion. This, from the perspective of clock A shows that both the tick and tock of clock B, as they have longer to travel, will proceed at a slower rate and in comparison with clock A, clock B will "'keep a slower time"'.
conclusion: **This shows Clocks in reference systems with uniform velocity in respect to each other MAY "'keep different time"' but that it is wholly dependent on the Clocks respective orientation.** *The full implications of the above statement are, to put it mildly revolutionary, because: If the difference in the "'time keeping"' of clocks is not orientation less then it means that objects ARE NOT traveling through TIME and Space but only Space and that the whole concept of SPACE-TIME is False and Isac Newton, all those years ago was correct, when he derived physics that portrait objects moving in 3-dimensional space only.*

5. The Lorenz Transfer

In developing his theory Einstein built on the work of others, in particular, James Maxwell Clerks work on electro-magnetism and the Lorenzs transform, The Lorenz Transform - shown below for time is exactly that used by Einstein

$$t' = \frac{(1 - \frac{v}{c})t}{\sqrt{1 - \frac{v^2}{c^2}}} \tag{5.1}$$

Einstein used it to describe the transform between two uniformly moving frames of reference. So how does the Lorenz Transform stand up to the previous ideas. Very well actually, but now it can be viewed in a more profound and subtler way. Before proceeding it is important to define just exactly what the Lorenz Transform is.
The Lorenz Transform is a transform that describes the transform of information from a moving frame of reference to a stationary Frame Of reference. It is not a transform that transforms space-time coordinates from a moving frame of reference to a stationary frame which is the accepted definition.

If, in figure 1, where the atom clocks are orientated along the axis of travel, the transform of information from the clock moving uniformly to the clock at rest is wholly dependent on the numerator of the Lorenz Transform for time as in :

The numerator:-

$$t' = (1 - \frac{v}{c})t \tag{5.2}$$

If we take only the "'tick"' of the atom clock, since the moving atom clock is moving with velocity v then when information about the tick of the clock is transfered back to the stationary clock there is an extra distance for this information to travel. This extra distance (compared to when the clocks are at rest with respect to each other) is proportional to the axial velocity v. This extra distance causes the tick information to reach the stationary atom clock at a slower rate, therefore the ticks appear to be occurring slower.

The extra distance is proportional to the distance traveled when the event occurs (the tick) represented by vover the constant c the rate of transfer of information

$$1 : 1 - \frac{v}{c} \tag{5.3}$$

$$t = (1 - \frac{v}{c})t' \tag{5.4}$$

I have tried, in this explanation of the numerator of the Lorenz factor not to refer to c as the "'speed of light"' as it is more accurately defined in the approach used in this paper as the "constant of information transfer".

Indeed what the Lorenz transform is actually predicting is the "reduced constant rate of information transfer" This is a fraction of two constants, the extra distance that the information has to travel and c the constant of information transfer.
Whilst its true that the velocity of the moving clock causes that extra distance it remains that the distance (a constant) is what reduces c another constant - the constant of information transfer.

5.1. **The Lorenz Transfer Denominator.**

$$\sqrt{1 - \frac{v^2}{c^2}} \tag{5.5}$$

.

This time taking figure 2 where the uniformly moving atom clock is orientated perpendicular to the axis of travel, the information transfered back to the atom clock at rest is wholly dependent on the denominator of the Lorenz Transfer equation.

Once again it can be explained due to the reducing effect on c - the constant of transfer of information.

The principle difference this time is that the information that causes the tick-tock of the uniformly moving clock is traveling in two dimensions, the y and the z dimensions relative to the clock at rest. Again the fundamental principle is the same - the extra distance that information about the tick event has to travel to the clock at rest.
This extra distance can be calculated by the pythagarous equation but another, more illuminating way to determine the extra distance is to see it just as in the example above - the extra distance is a result of the reducing factor caused by the zy dimensional velocity v but the difference this time is that it is a ratio of squared distances as the information, i.e. the tick is traveling in two dimensions. So the square of both distances traveled is taken as a ratio v representing the distance traveled by the clock and c the constant of information transfer. Finally to get the final answer the square root must be taken. So again this time its a ratio of constants - the extra distance traveled to the constant of information travel (c).

So analyzing relativity from its correct informational context and the Lorenz Transform not only holds true, it is far simpler to understand its fundamental

meaning - simply put - the transfer of information

$$t' = \frac{(1 - \frac{v}{c})t}{\sqrt{1 - \frac{v^2}{c^2}}} \tag{5.6}$$

6. The Theory of Relativity - The Theory of information

Throughout this paper the term "information" has been used, but what exactly is information and if, as proposed in this paper relativity is a theory of information just what exactly is that.
The definition of information which is understood by most who use the term is that information is that which is transferred between "systems" such that one system gains knowledge that the second system did not previously posses. This can be seen in communications systems, where the information, which can be knowledge about anything, is transfered to the second system. I believe that this is an incomplete approximation of what information really represents. The simple thought experiment that has just been shown can be used to illustrate this.
The two atom clocks in the experiment could be part of a more complex system. In complex systems, information, in the form of sub-atomic particles, photons, electrons or other particles are being constantly transfered between the constituent atoms or molecules. So what is the reason for this constant transfer of sub-atomic particles. I believe it is the basic mechanism of creation whereby, using the transfer of information, new types of matter with different properties is constantly being created and destroyed. Information transfer is the act of creation of one type of matter into another. In this way the reality, i.e. the universe that we inhabit is created by information transfer. I term this type of creation by information transfer External Reality Creation (ERC) and it is this that is the very essence of information transfer. There is another type of creation that is caused by the same mechanism, the transfer of information (sub-atomic particles) that we shall encounter in the next section.

7. TIME

The previous analysis has proved that clocks are indeed dependent on their orientation and that the part of the theory of relativity that concludes that objects are traveling through time and space is false. Objects are simply traveling through 3 dimensional space so the question that begs to be answered is , if TIME is not a dimension, the fourth dimension as first proposed by Minkowski and later "'proved"' by Einstein just what is time.
The next part of this paper shall attempt to determine just exactly what we perceive as the phenomena "TIME" actually is .

8. The Nature of Information

In attempting to define and indeed capture the true essence of information, the previous section has explained that information transfer is fundamentally about creation. Without the transfer of information on a sub-atomic level, this universe

would not be filled with the infinite variety of different types of matter, from the planets to stars and also the myriad array of living entities that we find on our own planet, including ourselves. This I have termed EXTERNAL REALITY (ERC). Now I wish to focus on a different type of reality and to show that they both follow the same basic mechanisms. This reality , I term INTERNAL REALITY CREATION (IRC) and with both of these realities the universe is completely (at least to our current knowledge) composed in its entirety.

Internal Reality is what we experience in our minds as opposed to that which exists in physical form. This paper shall show that Relativity seen as a Theory of Information explains both types of creation. The next section shall explain Internal or Perceptive reality from a relativity/information perspective. The result of which shall lead one to a very different view of Time.

9. Information, Relativity and Perceptive Reality

In order to explore the concept of Internal or Perceptive reality we shall use the same thought experiment using the atom clocks. This time however we shall use a system that has billions of atom clocks each existing in a confined space and each transferring information between them. This system is the most complex in the known universe and it is in fact the Human Brain.

10. Internal or Perceptive Reality

There is a famous thought experiment called the Twin Paradox that is used in physics to demonstrate the effects of relativity. We shall use this thought experiment, analyzed from the now familiar informational aspect to discover just what I mean about Perceptive reality.

In the twin Paradox two Observers, Observer 1 and Observer 2 pass each other is space with uniform relative motion, with no other references except each other, relativity predicts what each observer shall experience.

10.0.1. *Observer 1 perspective.* Observer 1 sees Observer 2 approaching from a distances and sees Observer 2 pass by and recede into the distance. As Observer 1 looks at Observer 2 he notices that time for Observer 2 is running slow, he can see that his watch is running slow, not only that he can see that everything appears to run slow from the movements of Observer 2 , his watch and even the beat of his heart. Indeed the theory states that time for Observer 2 is indeed running slow from the point of view of Observer 1.

10.0.2. *Observer 2 perspective.* If we take the position from the point of view of Observer 2, he again sees, this time Observer 1, approaching and then passing him by to recede in the distance. Observer 2 also observes that everything about Observer 1 seems to run slow from his watch to the beat of his heart. This is the strange but true predictions of Special Relativity. It has no meaning to say which point of view is correct, they are both correct depending on which point of view is taken, that of Observer 1 or Observer 2.

10.0.3. *Explanation of the Twin paradox.* If there was no relative motion between our twin astronauts suspended in space the information transfer between them, in the form of photons would be dependent on c the constant of information transfer and both twins would perceive each other normally.
In the thought experiment the uniform motion between them introduces an extra distance that the photons have to travel. This causes the information to arrive at the eyes of each twin at a slower rate dependentent on this extra distance which in turn is dependent on the velocity v.
As the information arrives at a lower rate the minds of each twin creates their internal reality at a slower rate. This causes each twin to perceive the other as existing in a slower than normal state.

The perceived slow states that each twin sees the other can both be explained by the rate of reception of information, photons, and not the usual relativity explanation that time has actually slowed down from each twins perspective to the other.
So there is in fact no paradox the twins both receive their respective information spatially separated causing a slowed down view of each other.
The part of the famous paradox where one twin jets off in a spaceship to return years later can also easily be explained by the reception of information. In this part of the thought experiment the twin that has jetted of and thus undergone an acceleration it is found that when the twins finally meet the accelerated twin has aged less than the twin that did not undergo acceleration. The age difference is also due to the same fact, as the traveling twin accelerated it caused his bodily functions, which are of course billions of small atom clocks all working in harmony, to have a greater extra distance to transfer information - create - or in a word age. Therefore the creational ageing process proceeded at a slower rate as compared to the non accelerated twin - again no paradox , just information transfer over three dimensional space.

10.1. **Time and Information.** This, of course leads naturally to a very different definition of time. Time according to the theory put forward in this paper is a measurement of information transfer. This information transfer is the mechanism used to create reality, either Internal, Perceptive Reality in the twin Paradox or External reality that covers every transfer of information between atoms and molecules in the entire universe.
TIME is a measurement of information transfer and NOT a dimension as is believed in the current understanding of Physics and Relativity

10.2. **Reality and The Universe.** So what does this mean for the reality and the universe that we inhabit?
It means that there is no Past, no Present, no Future only The NOW. We are truly living in the moment in a universe that gives the illusion of time flowing by the creation and destruction of External physical Reality, matter, and internal reality , what we as sentient beings experience in our minds. Time as shown, is the measurement of the transfer of information, in all its forms governed by the constant of information transfer c.

11. Relativity and Quantum Theory

After reading this paper it's hard not to be struck by the fact that Relativity analyzed in this way has some striking similarities to Quantum theory which could be argued is also a theory of information. The examples chosen , the atom clocks , are the physics of the very small that quantum theory is concerned with though no quantum analysis has been introduced, leaving the photon and its mode of information transfer undefined. As all physicists know there are some very fundamental and intransigent problems when the attempt is made to unite Relativity supposedly the physics of the very large and quantum theory the physics of the very small. This paragraph is in no way intended to analyze this complex Field but it is worth re-looking at the theory conflicts in light of the proposals brought forward in this paper. It has happened before in science that two disparate theories, after one or more great insights have been made, have turned out in the end to be the same theory, Could that possibly be the case with relativity and quantum theory being combined to produce an overall Theory Of Information. Of course its slightly premature and possibly arrogant to be pondering this Physics holy grail but a little investigation, just for interest can do no harm

11.1. **Conflicts Between Relativity and Quantum Theory.** Some of the conflicts that have been irricincilable between these theories such as Quantum Superpositions, Quantum Entanglement and the "'Collapse of the state Vector"' can be looked at in a new light if Relativity is seen as a Theory of Information. Quantum Entanglement, for example, is partly difficult to reconcile with current relativity theory as it gives rise to "faster than light" communication between the entangled entities and Relativity states that nothing can travel faster than light.
This would now be less of a problem as using the arguments in this paper, Relativity seen as essentially the transmission of information states that c the constant of information is the limiting factor of information transfer. During this faster than light entanglement process, no information is actually transmitted, at least not in the sense as is understood in this paper. No new reality either external or internal is created and what is happening during entanglement does not transgress this hypothesis.
In the atom clocks used in this paper as examples , the photons , no doubt, take the form of

$$\psi \tag{11.1}$$

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the wavefunction as they are transmitted from one atom to another. Previously this presented tremendous problems as how can they be invariant under the Lorenz transform, previously a transform between space and time.
If now the Lorenz transform is seen as a transform between information between entities existing in 3 dimensional space, when a measurement is performed and the state vector collapses, the information it transfers is completely Lorenz invariant.

These are just a few initial thoughts about an extreemley complex and involved subject but initially it does look hopeful, much more so than the present impasse that has lasted for almost 100 years.

Conclusion 1. *This paper challenges the very heart of the conclusions that are the accepted norm when interpreting Relativity.*
By a simple clock experiment it has proved that clocks in motion are NOT orientationless, That bodies are moving through Space and NOT Time , Time no longer seen as being the fourth dimension. It presents a much simpler explanation of time vividly demonstrated by an informational explanation of the Twin Paradox Finally it states categorically that Time does not exists in the sense that is currently understood and it is simply the measurement of the transfer of information that is dependent on constants namely c, the constant of information transfer and distances. One last comment about the Lorenz time transfer. It contains the term

$$\frac{v}{c} \tag{11.2}$$

where v is a velocity and c is a constant. This could easily be replaced by a term that would be the ratio of the change of distance due to motion to the total distance. This then removes time completely from the equation showing that time is created from c and distances that information has to travel.

$$t' = \frac{(1 - \frac{S(motion)}{S(total)})t}{\sqrt{1 - \frac{S(motion)^2}{S(total)^2}}} \tag{11.3}$$

S(motion) - distance traveled due to motion. S(total) = total distance traveled.

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