Information Field instead of Relativity

(predicting almost the same results as Relativity - almost)

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Aug 27,2015

Abstract: We consider any physical field to be a scalar information field. Any acceleration is the result of using this field. We think of information as a sole foundational entity. We do *not* consider mass, light, gravity, relativity or quantum behavior to be foundational, but rather as emerging concepts. We will show that if we think of information spread out in space, then physical processes evolve faster or slower relative to other physical processes due to using more or less information. In other words, time dilation of Relativity is the result of changing throughput of information use, and not the change in time itself, which remains in constant flow forward. As a result, we first deduce that so-called kinematic and gravitational effects on clocks must exist, then the necessity for a limit of relative speeds, and only as a consequence the necessity for gravity itself. These conclusions are for the most part the same as in Relativity, but come from an independent and different set of premises, are derived in a different order and with different flow of cause and effect, and in some fringe cases the end results are different from Relativity (with experiments pending to confirm or deny their validity). In addition, due to finite information resources, we show that any physical process must inherently be indeterministic.

Keywords: information, nature of matter, relativity, gravity, time dilation, faster than light, artificial gravity, nature of determinism.

Introduction

Any physical field is comprised of scalar information, spread out in space. A point in space can hold a single, indivisible fact that originates in a physical particle, much in a way we think of a point in space to have electric potential originating in an electron. Each fact is scalar, without a direction attached to it. We call this information field simply the *field.*

Information and physical matter

Since the field exists in physical space, a physical particle has access to information in space. We say a particle *collects* information. All physical effects are the result of usage of collected information.

Usage of spatial information

Scalar information in space, by definition, has no direction. To move in a specific direction, a particle *must* use *two* information sets, from *two* different points in space, repeatedly. Acceleration of a particle is thus the result of using *two sets of facts*.

A particle hence, must collect information in successive moments in time t_1 and t_2, and then these two sets interact in the following moment t_3. And so on, continuously. The information from t_1 and t_2 is the *previous and current* information, respectively. **We use term *interact* to mean *information processing* withing a physical particle. Interaction between two information sets means processing of that information.**

Physical matter as information container

A physical particle possesses information, the amount of which we call *capacity*. The capacity of a physical particle is finite. A particle is the simplest possible in this regard, meaning that no fact contained in it depends on any other. We say that all facts in Nature are *independent.*

Information interaction

Information is always a set of facts. Consider two information sets (one with A and the other with B facts). *Interaction* means that all facts from one set are combined with all from the other. The number of fact pairs produced is $A \times B$.

Physical Space and Time

We do not assume 4-dimensional space-time as it is in Relativity, but rather assume N-dimensional space, with N being any positive integer. Time is considered moving forward at the same pace for interaction (of information). In other words, the time needed for two facts to interact is the same, and is called *period*.

Time measured by a clock of any construction is *clock-time*. We do not assume that clock-time and time are the same, nor we assume they are different.

Information is equal

The field around a particle has no preference for scale or direction. We consider space to be equal on any scale and in any direction. As a result, we can think of all of particle's information equally spread around it at any distance. This means virtually every surface around a particle contains all of its information, on average.

Because the particle's information is finite, there is a finite number of facts on a surface around it. In order to be equal spread, these facts randomly shift their position. We call this *randomization*. Randomization can happen at most once per period, since it is the shortest time in which any information can change.

A particle in space uses the field by collecting information from it consecutively. The collected information sets interact with one another – we explained the need for at least two information sets. **In more relaxed terms, information snapshot from one period ago interacts with the current one, producing the future one.**

Why there can be only 3 dimension of space

Physical space can have any number of dimensions to begin with. However, we said that any surface around a particle has the particle's information. We can, for simplicity, take this surface to be a sphere. This means that every sphere centered in a particle has particle's information. So, it is a trivial conclusion that the density of it falls with the power of *(N-1)*. What can this number *N* be, so that two isolated particles moving away from each other, always experience a finite interaction of information? We ask this because we assume the resources of a particle are finite.

The following expression sums up the basis for the amount of interaction, where *x* is the amount of information, and *R* is the initial distance between particles, and *N* is the variable:

$$\int_R^{\infty} \left(x^{N-1}\right)^{-1} dx$$

The above sum will be finite for any $N>2$. In a Universe in which we would want particles' information to have maximum (finite) interaction, we would look for *N* that satisfies:

$$\max\left[\int_R^{\infty} \left(x^{N-1}\right)^{-1} dx\right]$$

The trivial solution for the above is $N=3$. **Hence, the number of spatial dimensions must be three.**

The density of spatial information

Since we deduced the number of spatial dimensions to be three, the number of facts at some distance from a particle is:

$$i_R = a \times i / R^2 \quad (1)$$

i_R is the average number of facts at distance R from a particle in some small volume of space; i is the capacity of a particle; a is a dimensional constant. For simplicity, we henceforth omit a, and use only the dimensionless value R in further text.

Information usage varies

If a particle moves through the field, it will collect more information. This is as trivial as collecting more rain drops if you run through the rain. Equally, the amount of collected information is proportional to the relative speed.

We said that facts randomly change position through randomization, in order to equally spread facts in space. Because this will change the field, the randomization is equivalent to relative motion as it causes more information to be collected.

The conclusion is that the amount of collected information increases because of 1) relative motion and 2) randomization. The extra information collected by a particle is called *add-on*. Thus we have a *motion add-on*, and a *randomization add-on*.

The throughput

The most important quantity in information processing of any kind is throughput. We focus on throughput of information processing (i.e. interaction) in this paper.

If a particle's capacity is A, then there is an interaction of $A \times A$ pairs of facts, with A facts coming from previous and equally from the current information – again, we explained the necessity for *two* sets of information. The actual throughput is *A*, because that is the *current* amount of information collected during the cycle. Hence:

$$T_A = \sqrt{A \times A}$$

The set of $A \times A$ pairs of facts produced is called the *set*.

If there is a interaction between sets of different sizes (*A* and *B*, for example), the throughput is:

$$T_{AB} = \sqrt{A \times B} \quad (2)$$

This is because the set from either interaction is indistinguishable. A set of 36 fact pairs can be produced by the interaction of 6 previous and 6 current facts (6x6=36), but it can also be produced by the interaction of 2 past and 18 current facts (6×6=2×18=36). Being indistinguishable, the throughput must be the same.

The interaction of 1 pair of facts takes the same time as it does for 100 pairs of facts, because all facts are independent of each other. That is to say, there is no need for interaction of any pair to wait for interaction on any other pair of facts. **Facts interact in *parallel.* Thus a cycle takes the same time, regardless of how many facts are involved.**

The field

The field at a location of particle *k* comes from all particles and is, from Eq. (1):

$$I_k = \sum_{j=1}^{U} i_j \Big/ R_{jk}^2$$

where U is the number of all particles, anywhere in existence; i_j is the capacity of some particle *j*; R_{jk} is the distance from particle *k* to *j*, with R_{kk} being unity, i.e. the distance of a particle to itself is 1.

Since all facts from the field are independent, we can say that the portion of *k*'s capacity allotted for information from *m* is:

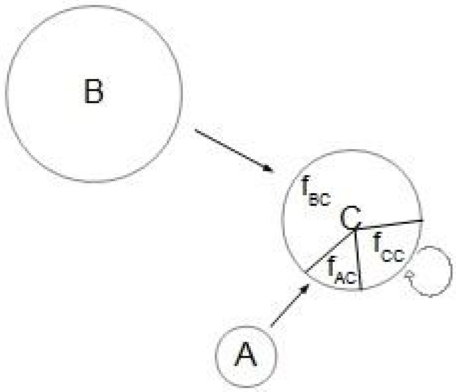
$$f_{mk} = \left(i_m / R_{mk}^2 \right) \Big/ \sum_{j=1}^{U} i_j / R_{jk}^2 \quad (3)$$

This is the *influence of m at k*. By definition, it has to be:

$$\sum_{j=1}^{U} f_{jk} = 1$$

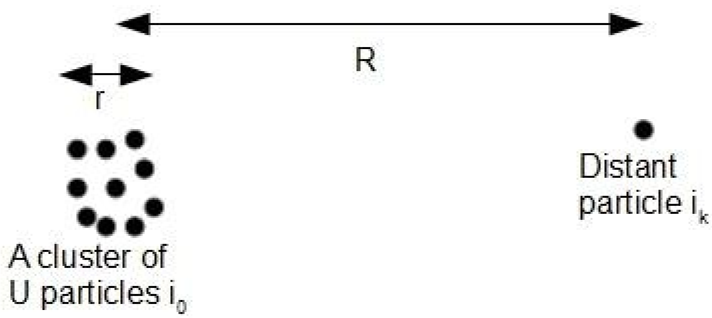
An example of three particles is shown below. The influence of each of (*A*, *B* and *C*) on *C* is shown, f_{AC} being influence of *A* on *C*, f_{BC} being influence of *B* on *C*, and f_{CC} being influence of *C* on itself.

Influence essentially tells us how much "importance" a particle has to another particle.



Group of particles

A number of distant particles grouped closely together is a *cluster*:



From the viewpoint of a distant particle *k*, a cluster can be approximated as the sum of its fields:

$$I_k \approx \frac{\sum_{j=1}^{U} i_j}{R^2}$$

where U is the number of elementary particles in a cluster far away from k, and I_k is the field of a cluster at the location of k.

The influence of distant particle k on any of the particles d comprising the cluster is:

$$f_{kd} = \frac{i_k / R^2}{\sum_{j=1}^{U} i_j / r_{jd}{}^2 + i_k / R^2}$$

$$\approx \frac{i_k / R^2}{U \times i_0 / r^2 + i_k / R^2}$$

Where i_0 is the capacity of any particle within a cluster, and r is a typical distance in the cluster, where $r << R$. Due to above assumptions:

$$i_k / R^2 << U \times i_0 / r^2$$

If we consider two clusters, with U_1 and U_2 particles, then we can compare the influence of particle *k* on a particle from the first cluster, versus the second cluster:

$$\frac{f_{k2}}{f_{k1}} \approx \frac{i_k / R^2 \times (U_1 \times i_0 / r^2 + i_k / R^2)}{i_k / R^2 \times (U_2 \times i_0 / r^2 + i_k / R^2)} \approx \frac{U_1}{U_2} \tag{4}$$

This means the influence of a distant particle *k* on any a cluster declines if the cluster grows. **That is to say: if information of a cluster is more “massive”, then *k* has less influence on it**.

Is a physical particle even relevant if it is too far?

In *N* cycles of particle *k* (where *N* is statistically large) the amount of information from particle *m*, that is actually used, is approximately:

$$N \times i_k \times f_{mk}$$

Here, i_k is the capacity of particle *k*, which is used to collect information. The meaning of influence is *statistical*, because all facts in the field have an equal chance to be collected.

Apparently, for *m* to mean anything to *k*, the above multiplication must be non-zero. If *m* is small and/or far away, it may actually be zero a good amount of time. In other words, *m* is as good as *non-existent* to *k* in these cases. If *m* means anything to *k* (i.e. the above multiplication is at least 1), we say that it belongs to *k's constraint group.*

If *m* and *k* are isolated, then from Eq. (3), then *m's* influence is:

$$f_{mk} \approx 1 \Big/ \left[1 + (i_k \,/\, i_m) \times R_{mk}^2 \big/ R_{kk}^2 \right]$$

If *m* is large and close, then it is $f_{mk} \approx 1$. When *m* is small and far away, then it is $f_{mk} \approx 0$. This means the influence of a particle determines how important it is.

In general, for a particle to be the part of the constraint group, we have to include its add-on (both motion and randomizing), so the total amount of information from particle *m* at the location of *k*, during *N* information cycles is:

$$N \times (i_k \times f_{mk} + \Delta i_{km})$$

where Δi_{km} is the add-on of particle *k* from particle *m*, due to both relative motion and randomization of *m*. **This means that a particle has more influence on another particle if it 1) is closer, or 2) is in relative motion, or 3) has more information.**

How motion affects the particle

We said that the motion add-on of *n* is proportional to its speed relative to *m*, so we write:

$$\Delta i_n = s \times v_{mn} \times f_{mn} \times i_n$$

Here, Δi_n is the motion add-on of *n* from the movement relative to *m*; i_n is the capacity of *n*, and $f_{mn} \times i_n$ is the information collected by *n* and originating in *m*; v_{mn} is the relative speed of *m* and *n*, achieved where f_{mn} can be considered constant; *s* is a dimensional constant of proportion. We can put this in another way that will be useful for us:

$$\Delta i_n / i_n = s \times v_{mn} \times f_{mn} \quad (5)$$

The exact equation for Δi_n would include all particles relative to which *n* moves. We have, where *U* is the number of all particles:

$$\Delta i_n / i_n = s \times \sum_{j=1}^{U} v_{jn} \times f_{jn} \quad (6)$$

The sum in above equation is a single number that is *not relative to any frame of reference*, i.e. it is a fixed value for a particle in a given moment in time. It is the *speed of a particle*:

$$v = \sum_{j=1}^{U} v_{jn} \times f_{jn} \quad (7)$$

Do not confuse *the speed* with the *spatial speed*, which is the relative speed of two specific particles. *The speed* of a particle is a fixed number which is the same no matter which frame of reference the observer occupies. Essentially, the speed represents add-on information, and it makes sense that the amount of this information *cannot* depend on where you are. For a particle, the speed is a weighted sum of *all of other particle's relative speeds*.

And we can write simply:

$$\Delta i_n / i_n = s \times v \quad (8)$$

We will calculate the speed due to add-on of randomization later in this paper. The above says that the more particles there are in motion relative to a particle, the more information a particle collects.

Note that *Δi* cannot become greater than capacity *i* because add-on has to fit in this finite capacity:

$$\Delta i_n \leq i_n \quad (9)$$

How particle has to deal with information collected

Let *Δt* be the duration of the cycle. *Δi* is the amount of add-on information collected during the period *Δt.* The only way this add-on can be used is if some of the previously collected information is discarded, at random, because the capacity is finite.

By definition what was the current information a moment ago is now a previous one:

$$i_{\mathrm{p}}(t) = i_{\mathrm{c}}(t - \Delta t) = i$$

Where i_p is the size of the previous information and i_c is the size of the current one, each equal to *i*, which is the capacity of a particle. Add-on information (due to motion or randomization) is by definition a part of the current information. Thus, the current information must expand, and the previous information must shrink:

$$i_{\mathrm{p}}(t+\Delta t) = i_{\mathrm{p}}(t) - \Delta i = i - \Delta i$$
$$i_c(t+\Delta t) = i_c(t) + \Delta i = i + \Delta i$$

We see that overall the capacity of a particle is unchanged:

$$i_c(t) + i_{\mathrm{p}}(t) = i + i = (i + \Delta i) + (i - \Delta i) =$$
$$i_c(t+\Delta t) + i_{\mathrm{p}}(t+\Delta t)$$

Usage of add-on information

When there is no add-on (that is $\Delta i=0$), the size of the set used for previous and current information is:

$$H_0 = i \times i = i^2 \quad (10)$$

In the case when there is add-on (*Δi>0*), we have:

$$H = (i - \Delta i) \times (i + \Delta i) = i^2 - (\Delta i)^2 \quad (11)$$

where *i* is the capacity.

The part of the set which is lost, is the difference between the two, i.e. Δi^2. Because of this information loss, *the result of information use by a physical particle is generally unpredictable*, or in other words, *the change of motion of physical matter* ***cannot*** *be deterministic*.

The throughput of information

We will use Eq. (2) to derive the throughput of a particle. When there is no add-on, i.e. when *Δi=0*, from Eq. (10):

$$T_0 = \sqrt{i \times i} / \Delta t = i / \Delta t$$

Where *Δt* is the duration of cycle and *i* is the capacity of a particle.

The throughput when there *is* add-on, i.e. when $\Delta i>0$, from Eq. (11):

$$T = \sqrt{(i-\Delta i)\times(i+\Delta i)} \Big/ \Delta t = \sqrt{i^2-(\Delta i)^2} \Big/ \Delta t \quad (12)$$

or:

$$T = T_0 \times \sqrt{1-(\Delta i)^2 / i^2}$$

For example, if the capacity of a particle is 20, it means that the size of previous information is 20, and the same for current information. When there is no add-on, i.e. when particle is infinitely far away from other particles, its throughput of information use is the square root of 20×20, or 20 per information cycle, which is what we expect. Suppose there is an add-on of 2 facts per cycle, for instance because a particle moves relative to other nearby particles. **Due to this, the throughput would now be the square root of (20+2)×(20-2), or approximately 19.89 per cycle**.

Particles cannot always accelerate

The dimensional constant *s* in Eq. (6) has to be an inverse of speed. Consider that add-on cannot be greater than the capacity of a particle, or from Eq. (9):

$$\max(\Delta i_n / i_n) = 1 \quad (13)$$

From Eq. (8), we can write:

$$\max(\Delta i_n / i_n) = 1 = \max(s \times v)$$

or:

$$\max(v) = \frac{1}{s}$$

Or if we substitute *1/s* with a new constant *c*:

$$s = 1 / c \quad (14)$$

we have:

$$\max(v) = c \quad (15)$$

This result means that ***the speed of a physical particle has a limit, equal to constant c***. Let us remember that speed is not relative to any frame of reference, but is an aggregate of all relative speeds of a particle (i.e. relative to all particles), with each such speed weighted by an influence factor - if for a moment here, we consider relative motion alone, and ignore the randomization effect.

Since the speed represents add-on information, this basically says that ***the capacity to collect add-on is finite***.

When the speed of a particle approaches *c*, its throughput approaches zero, as evident from Eq. (12) and Eq. (13):

$$T = \sqrt{i_n^{\,2} - (\Delta i_n)^2} \Big/ \Delta t \approx 0 \,/\, \Delta t = 0$$

In a system of two isolated particles *m* and *n*, where *m* has much more information then *n*, it will be $f_{mn} \approx 1$, and the influence of all other particles will be practically zero. In this case, the speed of particle *n* is v_n, and from Eq. (7):

$$v_n = \sum_{j=1}^{U} v_{jn} \times f_{jn} \approx v_{mn} \times 1 = v_{mn} \quad (16)$$

Or, the *speed* of particle *n* is approximately equal to the *spatial speed* relative to a nearby large isolated information source *m*, which is v_{mn}. In this case, the maximum spatial speed of *n* relative to *m* is equal to constant *c*, from Eq. (15) and the above Eq. (16):

$$\max(v_{mn}) = c \quad (17)$$

The conclusion is that there ***must exist a speed limit nearby large bodies***. We can reasonably assume that *c* we derived here is actually what we refer to as "the speed of light". It is much more than that. It is *the speed at which information use stops because there is too much add-on* information to use and the capacity is limited.

In general, the speed limit is reached when the following is true, according to Eq. (7) and Eq. (15):

$$c = \sum_{j=1}^{U} v_{jn} \times f_{jn} \quad (18)$$

This above equation describes a particle that always moves as close to the speed of *c* as possible. You can see that reaching the “speed of light” is ***meaningless*** unless the experiment takes place nearby large body, because *that is the only situation when the spatial speed and the speed are equal*. The maximum relative speeds in the sum in Eq. (18) can be anything, and can be ***far higher than the “speed of light”.***

Kinematic time dilation – without Relativity

Since the throughput *T* can vary, the rate at which a physical clock ticks, will vary. When the add-on information Δi varies, from Eq. (12), so does the throughput of a particle:

$$T_1(t) = \sqrt{i^2 - (\Delta i_1)^2} \Big/ t \quad ,$$

$$T_2(t) = \sqrt{i^2 - (\Delta i_2)^2} \Big/ t \quad ,$$

$$T_1(t) \neq T_2(t) \quad .$$

Let dt_1 and dt_2 be small increments of clock-time. Because the measurement of a local clock is, by definition, the same as the throughput of a particle, this throughput is always the same in clock-time:

$$T_1(dt_1) = T_2(dt_2)$$

We have:

$$\sqrt{i^2 - (\Delta i_1)^2} \Big/ dt_1 = \sqrt{i^2 - (\Delta i_2)^2} \Big/ dt_2$$

and

$$dt_1 = dt_2 \times \sqrt{i^2 - (\Delta i_1)^2} \Big/ \sqrt{i^2 - (\Delta i_2)^2}$$

From this and Eq. (8) and Eq. (14), we have:

$$dt_1 / dt_2 = \sqrt{\frac{1 - s^2 \times v_1^2}{1 - s^2 \times v_2^2}} = \sqrt{\frac{1 - v_1^2 / c^2}{1 - v_2^2 / c^2}} \quad (19)$$

dt_1 is a small clock-time interval when particle's speed is v_1, and dt_2 is a small clock-time interval with the speed of v_2 .

This represents the general transformation of clock-time. Note that *time does no longer figure* in this equation, and we have now obtained a testable result – because we use *clock-time* only. Remember, *the notion of "time" means time in which the field is used by particles, not the clock-time we measure*.

Consider a situation of a small moving particle *n* near large isolated *m*. The influence f_{mn} is nearly 1, and the influence of all other particles is nearly zero. Let us have t_1 and t_2 such that the two are at rest ($v=0$) for a unit of clock-time t_1, and the relative speed is uniform *v* for a unit of clock-time t_2:

$$v_1 = 0$$
$$v_2 = v$$

and from Eq. (19):

$$t_1 \approx t_2 \times \sqrt{\frac{1-0^2 / c^2}{1-(v+0)^2 / c^2}}$$
$$= t_2 \Big/ \sqrt{1-v^2 / c^2} \qquad (20)$$

This is ***the famous Einstein's kinematic time dilation formula***. Given we do not use relativity in any form, nor the notion of light, calling it "relativistic" in this context is a misnomer. Nevertheless, **the above Eq. (20) is the same as in Relativity, and with Relativity being a well-tested theory, the first testable result we obtained has been immediately confirmed.**

For a large *m*, the influence of particle *n* is practically zero, i.e. $f_{nm} \approx 0$, hence its throughput will not change much for *m*, and so from Eq. (7), we will have:

$$v_1 = 0$$
$$v_2 = 0$$

And it follows:

$$t_1 \approx t_2 \times \sqrt{(1 - 0^2 \ / \ c^2) \Big/ (1 - 0^2 \ / \ c^2)} = t_2$$

What this means is that a clock in motion relative to Earth will slow down, but the Earth itself will *not*. If we cast aside Relativity for a moment, this is ***exactly what experiments show.***

This also shows that the maximum spatial speed near large body is always *c*, i.e. the speed of light. ***A photon will always arrive at the speed of light***, irrespective of the source of light and its motion, as long as you're all nearby very large body like Earth. Away from it, we have to use generic Eq.(18) and it is no longer a simple matter.

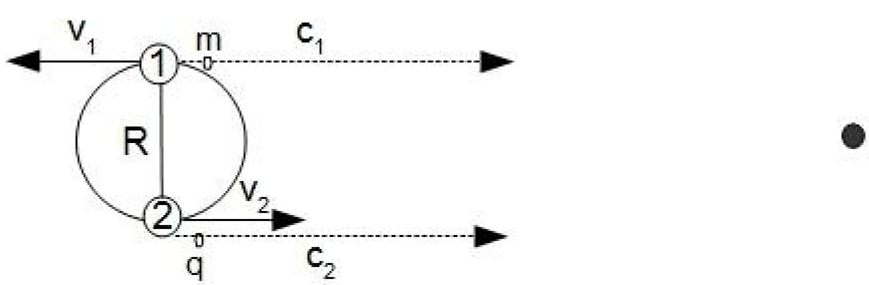
The Michelson-Morley experiment

Since we deduced that the speed of light near a large body is always *c* relative to it, measuring the speed of light in different directions in a lab on Earth must produce a null result. That is the explanation for MM experiment. Nothing else is needed to explain it.

For us, MM experiment is a *consequence*, and not the *basis* for the theory as it is in Relativity. **That is a much more satisfying state of affairs**.

24. The de Sitter effect, a lucky break for Relativity?

Two large bodies (1) and (2) orbit one another at fairly high spatial speeds v_1 and v_2 (speeds are shown relative to a distant observer on the right, represented by a black dot):



Since this is not the case of a single large isolated body, the limiting case of Eq. (17) does not hold. We will calculate spatial speeds c_1 and c_2 of photons *m* and *q* relative to a distant observer (small circle on the far right).

For a photon *m* emitted toward distant observer, Eq. (18) gives us, assuming axis *x* is in the direction toward the observer:

$$(c_1 + v_1) \times f_{1m} + (c_1 - v_2) \times f_{2m} = 1 / s$$

Similarly for photon *q*:

$$(c_2 + v_1) \times f_{1q} + (c_2 - v_2) \times f_{2q} = 1 / s$$

where f_{1m} is influence of (1) on *m*, f_{2m} is influence of (2) on *m*, f_{1q} is influence of (1) on *q*, f_{2q} is influence of (2) on *q*, c_1+v_1 is the relative speed between (1) and *m*, c_2-v_2 is the relative speed between (2) and *q*, c_2+v_1 is the relative speed between (1) and *q*, c_1-v_2 is the relative speed between (2) and *m*. Also, c_1, c_2, v_1 and v_2 are the speeds relative to the distant observer on the right.

In this case it is $f_{1m} \approx 1$, $f_{2m} \approx 0$ and $f_{1q} \approx 0$, $f_{2q} \approx 1$:

$$c_1 = \frac{1}{s} - v_1 = c - v_1$$

$$c_2 = \frac{1}{s} + v_2 = c + v_2$$

In the vicinity of (1) and (2) the speed of a photon (relative to us) is ***dependent on the relative speeds*** of (1) and (2). ***The two photons leave the large bodies at different speeds relative to us, but very soon the speeds become equal, and we measure them as equal because of the distance they travel to reach us (see below).***

Relativity says the *opposite* but that does not change anything in the final result. **Interestingly, since we cannot measure the spatial speed of these photons from where we are, it may very well be a *colossal serendipity* that Relativity can say the opposite and still achieve the observed result**s. To this, consider that what Relativity says is through postulation, which is a weak method of explanation to begin with.

When the distances d_1 and d_2 of both photons away from (1) and (2) are sufficiently larger than *R*, which happens rather quickly due to the spatial speed of photons, we have (assuming $d_1 \approx d_2$, $i_1 \approx i_2$, $i_q = i_m << i_1$, $v_1 \approx v_2$):

$$f_{1m} \approx \frac{i_1 / d_1^{\,2}}{i_m + i_1 / d_1^{\,2} + i_2 / d_2^{\,2}} = f_{1q} = f_{2m} = f_{2q} \approx 0.5$$

$$c_1 = c_2 = c + 0.5 \times (v_2 - v_1) \approx c$$

The photon spatial speeds away from (1) and (2) become ***equal soon enough***. It means, from the perspective of a black dot (i.e. us on Earth), **the light from orbiting stars will arrive at the same time**. It is clear that the explanation given by Relativity is the result of a number of “lucky breaks” due to the distance, mass and speed involved, and *not* due to either of the Relativity postulates.

Mass is throughput

For a large body, the influence of a distant particle on it declines with the body's size, per Eq. (4). Thus the rate at which the change in motion of body *k* happens in time is reversely proportional to the size of a cluster*:*

$$\frac{\Delta v_k}{\Delta t} = \frac{F(i_{kc}, i_{kp})}{i_k}$$

where i_{kc} and i_{kp} are the current and previous information available at the location of *k*, i_k is the capacity of *k*; v_k is the spatial speed relative to a distant particle, and $F(i_{kc}, i_{kp})$ is a function of interaction that produces change in velocity as a result of the information use if each particle in *k* were isolated on its own. We have from above:

$$F(i_{kc}, i_{kp}) = i_k \times \frac{\Delta v_k}{\Delta t}$$

When *k* is moving relative to a distant particle, its throughput will be *lower* per Eq. (12). Even though the capacity of *k* remains constant, in order to simplify the above equation, we can imagine that the throughput remains constant, but the capacity increases to become:

$$\frac{i_k}{\sqrt{1-\Delta i_k{}^2 / i_k{}^2}} \quad (21)$$

The change in velocity is a vector corresponding to the change in motion, so we can introduce a vector represented by $F(i_{kc},i_{kp})$. Finally we will make the duration of a time period very small, so we have:

$$\vec{F}(i_{kc}, i_{kp}) = \frac{d}{dt}\left(\frac{i_k \times \vec{v}_k}{\sqrt{1-\Delta i_k{}^2 / i_k{}^2}}\right)$$

In the corner case of a nearby large *k*, from Eq. (20), we have:

$$\vec{F}(i_{kc}, i_{kp}) = \frac{d}{dt}\left(\frac{i_k \times \vec{v}_k}{\sqrt{1-v_k{}^2 / c^2}}\right) \quad (22)$$

From the similarity with Newton's second law of motion, and with its relativistic version, we say that the capacity of a particle is linearly proportional to its inertial mass at rest, and in a proper system of measurements, they are identical:

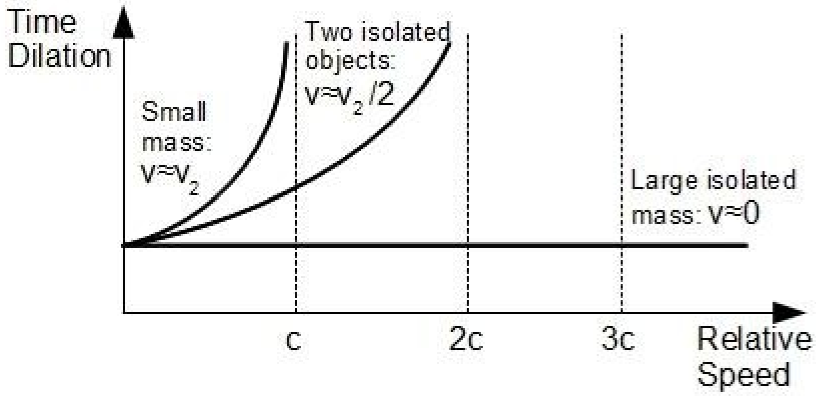
$$M = i \quad (22.1)$$

Solutions different from Relativity

From Eq. (7) and Eq. (22.1), the speed of a particle depends on the disposition of objects that comprise its constraint group. From Eq. (3), we can write for speed, in this case by accounting for relative motion only, and ignoring the randomization effect:

$$v = \frac{1}{\sum_{j=1}^{U} m_j / R_j^2} \times \sum_{j=1}^{U} v_j \times m_j / R_j^2 \quad (22.2)$$

If we consider only two isolated massive objects, and vary their size (to be equal, one much larger, one much smaller), we get the following diagram from Eq.(19):



Time dilation for a small mass nearby large isolated mass asymptotically grows larger, as it is in Relativity.

There is practically no time dilation for a large isolated mass like Earth.

A large object moving away from Earth on a trajectory far from other celestial bodies will experience practically no time dilation, and its ***maximum speed can be far above the "speed of light" - we explained earlier why the concept of "speed of light" has no firm meaning outside isolated bodies such as Earth.***

A ***space probe away from Earth*** is enough to confirm the theory, if we observe ***that its time dilation decreases, or that it reports anomalous readings (based on time/speed/distance) that we do not expect to see***.

Gravitational time dilation, and why it has nothing to do with gravity

Particle *n* is at some distance from particle *m*. We will consider the randomizing of *m*. During a cycle, randomizing of *m* information at the location of *n* causes add-on. This new information is collected by *n* and used. To calculate the amount of this add-on, we will consider an indirect method. We will look as to how much this add-on changes as particle *n* moves away from *m* by just a little bit, and then by summing it up, find the *equivalent* spatial speed at which particle *n* would have to move away from *m* in order to use the results we already have.

The longer it takes for *n* to move away radially from *m* by *dR*, the more of *m*'s add-on there will be, hence the change of add-on $d(\Delta i_n)$ is proportional to a small time interval *dt*. The more of *m*'s information is present at the location of *n*, the greater the amount of randomized information is, and the greater will the change of add-on be, thus the change is proportional to the density i_m/R^2. The higher the influence of *m* at *n* is, the more of the above change will be actually collected by *n*. So we write, with negative sign in front because the change of add-on will decline as *n* moves away from *m*:

$$d(\Delta i_n) = -w \times (i_m / R^2) \times i_n \times f_{mn} \times dt \quad (23)$$

There is no change due to the motion because the speed is uniform and f_{mn} is practically constant.

Now we will find the equivalent spatial speed for the same change.

Let *n* move away from *m* by a small distance *dR* with radial speed increasing by dv_R. Here we ignore the randomization effect and consider only the motion effect. The change in motion add-on due to the change of spatial speed dv_R is, from Eq. (5):

$$d(\Delta i_n) = s \times i_n \times dv_R \times f_{mn} \quad (24)$$

By equating Eq. (23) and Eq. (24), in order to find the equivalent spatial speed, we can substitute:

$$\Gamma = w / s \quad (25)$$

And further we have from above equations:

$$dv_R = -\Gamma \times (i_m / R^2) \times dt$$

Multiplying both sides by v_R, and with $dR = v_R \times dt$, we have (knowing that at distance of infinity the randomization effect vanishes and so the spatial speed is zero):

$$\int_v^0 v_R \times dv_R = -\int_R^\infty \Gamma \times (i_m / R^2) \times dR$$

The solution is:

$$v_R{}^2 = 2 \times \Gamma \times i_m / R \quad (25.1)$$

v_R is the *speed* of particle *n* nearby *m* when they are at rest, ***due to randomization alone***. We have already said that *the speed* is ***not*** tied exclusively to relative motion, but rather to information use within a particle. From the limiting case of Eq. (20):

$$dt_1 = dt_2 \Big/ \sqrt{1 - 2 \times \Gamma \times i_m \, / \, R \times c^2} \quad (26)$$

This is the slowdown of clock-time due to the randomization of *m*. All physical clocks tick slower, when closer to other physical matter. Evidently, this is gravitational time dilation from Relativity, but equally evidently, ***this has nothing to do with gravity***.

Gravity emerges

We think of particle's acceleration as incurring some cost *C.* At the same time, because decreased distance between particles lowers their throughput (see Eq. (26)), particles can *gain* resources because they will slow down everything they do – we will denote this gain as *Y*. We can write for the cost *C* as it relates to throughput:

$$dC = \frac{\partial T}{\partial v_R} \times dv_R$$

The gain *Y* is:

$$dY = \frac{\partial T}{\partial R} \times dR$$

The sum $C+Y$ represents the total expenditure of particle's acceleration (the cost C is negative and the gain Y is positive). We will find the conditions under which the total expenditure has a minimum:

$$\frac{d}{dt}(C+Y) = 0$$

or:

$$\frac{\partial T}{\partial v_R}\frac{dv_R}{dt} + \frac{\partial T}{\partial R}\frac{dR}{dt} = 0$$

and we can express this via add-on information Δi, consisting of motion and randomization components:

$$\frac{\partial T}{\partial(\Delta i)} \times \frac{d(\Delta i)}{dv_R} \times \frac{dv_R}{dt} + \frac{\partial T}{\partial(\Delta i)} \times \frac{d(\Delta i)}{dR} \times \frac{dR}{dt} = 0$$

If we name the two particles *n* and *m*, with *n* moving towards *m*, we have from the previous equation:

$$s \times i_n \times f_{mn} \times \frac{dv_R}{dt}$$
$$+w \times (i_m / R^2) \times i_n \times f_{mn} \times \frac{dt}{dR} \times \frac{dR}{dt}$$
$$= 0$$

and with the same constant as in Eq. (25):

$$\frac{dv_R}{dt} = -\frac{\Gamma \times i_m}{R^2}$$

This is the derivation of Newtonian gravity and so it must be:

$$\Gamma = G$$

where G is the gravitational constant. The Eq. (26) can now be written as, by keeping in mind that inertial rest mass M is the same as particle's information content, from Eq. (22.1):

$$dt_1 = dt_2 \Big/ \sqrt{1 - 2 \times G \times M \ / \ R \times c^2}$$

Gravity is the ***result of lowering permanent expenditure of whatever resources a physical particle has***.

Moreover, ***gravity is the result of so-called time dilation and not the other way around.***

Additionally, we see that “gravity” comes from the varying throughput in space, which can be manipulated by 1) mass and 2) relative motion of particles, much like add-on information comes from randomization and motion.

Thus, “gravity” as it exists here on Earth can be ***produced*** by spinning particles and/or rotational motion of particles in a confined area of space, effectively producing an “engine”. It is not an engine in a sense that it produces thrust, rather it produces inertial motion that “pulls” everything, much like naturally occurring gravity does. We say "inertial", because such motion *cannot be felt*, much like falling in natural gravity cannot be felt.

Conclusion

Relativity and Information Physics produce almost identical results. When it comes to situations where a very massive "observer" (such as Earth, and us on it) is present, the two produce *exactly the same* results. But, when outside of the anchoring effect of a large observer, there is a divergence of equations. We show that an observer *affects* the observation because it possesses information, and with information directing all physical effects, it clearly has to change the outcome of any experiment. But, at the same time, a physical process will unfold *according to the same information laws even without the presence of the observer – it will just unfold in a different way.* The laws are the same though in both cases, with or without an observer. We also deduced that *all physical laws must be non-deterministic – to imply otherwise would imply an unlimited information capacity of physical matter.* When it comes to relative speed, which is an essential quality of an observer, *the concept of relative speed loses its significance in favor of just "speed", which does not depend on any frame of reference, and is just a number associated with a particle at a given time and position in space.* This number is essentially a *sum of all relative speeds of a particle where objects that are closer and more massive count more.* Basically the “speed” accounts for *speeds relative to all other* objects by means of weighted factors associated to those objects. The speed of Earth relative to the Sun counts a great deal, but the speed of Earth relative to a distant galaxy doesn't count much. This notion *eliminates the question of whether all observers are equal or not – even if we think that they are, such assumption is no longer necessary.* We show that this weighted number (or just “speed”) has a limit equal to what we now call the “speed of light”. In special cases, such as near Earth, the “relative speed to Earth” and the “speed” (our weighted number independent of any observer) are one and the same, explaining why Relativity and Information Physics give the same results in most cases.

As some interesting side results, gravity is shown to come *naturally* (due to randomization of information in space), and this is what we experience on Earth for example, as well as from *relative motion of any kind*, which is the basis upon which it could be artificially produced. The relative motion in question can be produced by any means, but as far as it is known, the easiest method is to use electro-magnetic forces to produce high speed motion and/or rotation of particles in a heavy confined medium, such as for example with liquid metals. A craft using this propulsion could accelerate at seemingly impossible rates, because with artificial gravity the motion is inertial and the insides of the craft would not experience crushing G-forces.

Finally, restrictions Relativity imposes on the maximum possible speed hold only nearby large mass such as Earth. Out in deep space, the concept of the “maximum speed” and the “speed of light” is very much different, and a large vessel can accelerate far past the 300,000 km/s.