Universal Specificity Investigation 1: What is Time?

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Time is an important concept to understand properly to make scientific progress, just as understanding earth's location within our solar system, and its spheroidal shape was necessary for progress at earlier times in our history. It will be shown, from this investigative series into the theory of universal specificity, that our current conception of time is holding us back from further discoveries, just as the belief that the earth is the center of celestial motion or flat held our ancestors back.

1. Relativity vs Specificity

To begin, let us survey the scientific front lines involving this misconception of time I am referencing. A central idea within special relativity is the relativity of simultaneity. This is a concept where two distant events being simultaneous is not absolute and depends on the reference frame in which the measurements are taking place.

For example, suppose an observer is on a train car (precisely at the center of this car), and suppose he measures initial photons, from two light sources at either end of the car, arrive at the center at the same time. This car riding observer must conclude from his frame of reference that each light source turned on at the same time because the distance each photon traveled is equivalent, and the speed of each is equivalent. This is illustrated in Figure 1.

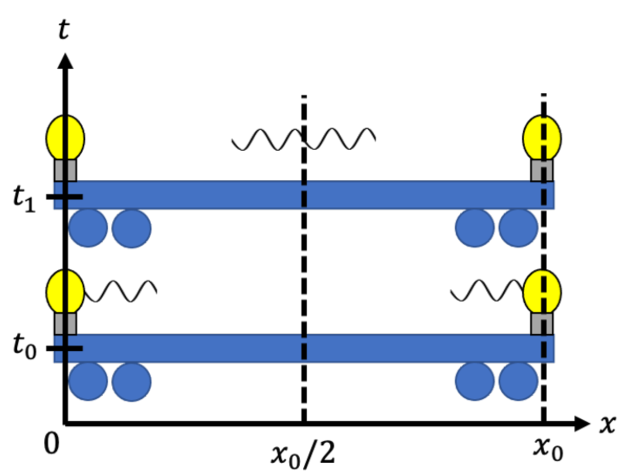

Figure 1. Train car observer's conclusion.

Now suppose another observer observing the same series of events is on a platform. He observes all this taking place on a moving train car. Both observers agree that the light arrives at the center at the same time—this event, the arrival of two photons at the same point in space and time, must agree for all observers. Because the speed of light is constant, the platform observer must conclude from his frame of reference that the lights turned on at different times. The light towards the rear turned on first, followed by the light towards the front. That way the photons would arrive at the same time at the center of the car. This is shown in Figure 2.

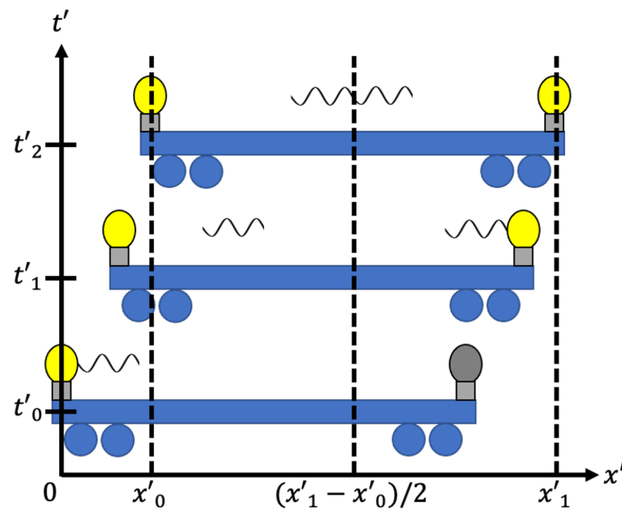

Figure 2. Platform observer's conclusion

The simultaneous event in dispute is whether or not the lights turned on at the same time. One observer reports yes, and the other reports no. Both observers are correct in their observations, which seems like a contradiction. Observations are always above reproach; however, interpretations and conclusions based on observations are never above reproach.

Presently, it is impossible to determine which (if either) observer's conclusion is true. Neither observer observed the instant the light was emitted, only the physical trace left behind from the emission, which takes time (and distance) to reach the observes from the source. One observer measures the event in the middle, and using a predictive physics model, he predicts the sources' emission time based on their location. The other observer measures when the light reaches the platform, and using the same predictive physics model (but different state of the train car), he predicts (1) that the light arrived simultaneously at the center of the train, and (2) they were emitted at different times. If we cannot determine which (if either) prediction is true, it is at least certain that both conclusions about the emission timing cannot be true. Contrary to common belief, contradictions do not exist in reality.

There is a reason both observations are made, and there is a reason why each unquestionable observation leads to contradictory conclusions. That reason is each observer is using different base units of measurement for measuring time (and length), and yet for the setup of this example it was tacitly assumed they were using the same base units. This would be like comparing how many minutes it took for an event to unfold, and comparing it to how many seconds it took, but without a unit conversion.

In addition, the need for a conversion goes undetected because identical instruments are making the measurements, and it assumed they are measuring the same base unit; therefore, each different base unit is given the same name name. Indeed, if either observer brought with them identical instruments that serve as standards of measurement, neither observer would detect a change in their experience. The atomic clock would appear to tick the same, the kilogram would appear to have the same mass, etc. But as will be shown in the next section, measuring devices can measure different base units under different initial conditions. A change in reference frame causes a change in base units in such a manner that makes the observer's unable to perceive the change.

As a metaphorical example, if you watch a movie at half speed, the movie's events unfold over twice the duration. The clocks in the scene appear to tick at half speed, the cars in the scene travel at half speed, etc. But what about the experience of the actors making the film during the time of filming? Do they experience things at half speed, and react on scene as if events are unfolding at half speed? No they experienced events unfolding at normal speed. I would appear insane if I suggested in both cases (half and normal speed) that the same clock in the scene (during shooting and during a slow replay) measures the same base unit of time. The same is true if I said identical clocks in different reference frames measured the same base unit it time. This analogy applies better to relativity than one might originally think.

It is not common practice to consider that identical measuring instruments, in different reference frames, are actually measuring different base units (or just units for short). If one thinks of it in this way, it is only possible (presently) to determine how the units differ between reference frames, via the Lorentz Transformation, but not which one is universally correct/incorrect. From our earlier example, the train car riding observer knows from this transformation, exactly what the platform observer must observe and conclude from their frame of reference, and vice versa. This transformation allows for "empathy", but fails to reveal a universal standard, which would require a reference frame that is universally accepted as stationary.

A common conclusion from these facts is that no universally accepted stationary reference frame exists. It is commonly believed that, even if such a frame existed, no one could know it. The best one can expect is for one observer to "empathize" with another, and then each to abandon as futile any attempt to discover absolute truth. Any reference frame is concluded to be as good as any other, in terms of serving as the universal standard, and any selection is arbitrary, much like selecting a ground is arbitrary in circuit analysis.

This belief that no absolute universal reference frame exists, because it is impossible to measure, confuses ignorance (a cognitive state) with a property of reality (a physical state). This confusion between cognition and reality has become common practice in modern physics and deserves immediate challenge whenever it occurs. In this case, it is certain, because of the law of identity, that everything that exists must exist in any instant in some state. The states may change from instant to instant, but the fact remains that all existents exist in any given instant in some state.

In our train example, as an example, at some instant in time, both light sources were off. In a later instant in time, one light was on (or both). This much is known to be true, even if the full truth cannot be determined. If we are not to reject the law of identity, and throw ourselves outside the domain of logic and reason (and science for that matter), then this implies a universal reference frame does exist even if it cannot be determined. If the lights on the train turned on in some specific sequence, as the law of identity dictates must happen, then the reference frame able to predict that sequence using current models is the universally stationary reference frame we seek to find.

The theory of universal specificity makes use of what knowledge we have, and asserts that events occur at specific instances in time and space and only appear relative because the units being measured by our instruments change right under our nose. This paper is the first of a series of investigations into this theory aiming to discover, among other things, an objective universal standard from which simultaneity can be specifically determined.

When discussing simultaneity, a natural place to start is with our conception of time, and then see where it leads from there.

2. On The Nature of Time

What is time? A google search for "define time" returns: time is the indefinite continued progress of existence and events in the past, present, and future regarded as a whole. This definition is circular since past, present and future are concepts that depend on a conception of time. This definition amounts to: time is the continued progress of existence and events in time. This definition is not helpful in gaining insight as to what time is. If Wikipedia could be considered as representing the common understanding, then time is what a clock reads [1]. This definition is also circular. Clocks are instruments that measure time, which means this definition translates to: time is the thing being measured when measuring time. This definition is not helpful either in gaining insight as to what time is. The best definition was found here [2]: *time* is the interval over which change occurs. This gives us a great clue as to what the proper conception of time is.

To ensure our preferred definition of time captures the essence of the concept, one has to answer the following question about the conception of time: what facts about reality give rise to the need for the concept? If one's conception of time is not based on any facts, then the concept itself becomes arbitrary, meaning it is outside reality, and therefore, it is useless in helping us understand reality.

The facts that give rise to this concept are interesting to study. Firstly, changes (in an existent or existents) from one state to another are never instantaneous. Despite what quantum physicists might say, it is certain, because of the law of non-contradiction, that both sates (the before and after) cannot exist at the same instance in the same respect. Consequently, this transition from one state to another, lasts for some duration (a series of instances). Secondly, given the same essential initial conditions, we know for certain that the same changes lasts for the same duration because of the law of causality. In fact, changes in duration (the effect) imply changes in essential initial conditions (the cause). For example, the time it takes your coffee to reach room temperature might change depending on the temperature of the room, the initial temperature of your coffee, and the cup its in; however, if all essential initial conditions are the same as before, then the coffee will reach room temperature over the same time period.

These two facts, change is not instant and its duration is repeatable under the same circumstances but not others, give rise to the need for the concept time to help quantify causal relationships. To underscore the need of this concept, without it certain causal relationships would remain unknowable, and therefore, uncontrollable. This conception of time is what allows us to cook our meals with reasonable certainty that it be completed at a predictable time to our liking; and it gives us a means to figure out why it does not, if it does not. It is what allows us to guide our present actions so that at some instant in time (ahead of now) people can meetup at a preplanned location and time. It is what allows us in countless other examples to control our lives for the better. To sum up, the primary need for this conception of time is to gain better command over reality created by improving our obedience to causality. Thus, our preferred definition of time as "the interval over which change occurs" aptly captures the essence of this concept.

Like all measurements, time too needs a standard. The best standards for time, depending on the requirements of precision, are changes that complete at regular intervals, which means the essential initial conditions are easily made to be invariant resulting in consistent measures of duration. For example, the arc length a sundial's shadow traverses, sand falling in an hourglass, pendulum swings in a grandfather clock, or light traveling some known distance can be, and have been, used to measure a standard unit of time. These standards can then be compared to other changes occurring to measure their duration in relation to the chosen standard. For example, when it takes two turns of an hourglass for your coffee to reach room temperature we say it took two hours. Tomorrow it could take three hours, and because of this standard we know it was longer than the day before and how much longer.

Of course, each method of measurement can be put in a different situation that changes essential initial conditions, which changes the duration these instruments are measuring. For example, the sundial could be taken to a different latitude, or the hourglass and grandfather clock could be taken to different altitude, and each would then measure a different duration when compared to its original measurement. Likewise, with this conception of time, the light clock that undergoes a change in kinetic or gravitational potential energy measures a different duration than before. It does not mean time sped up or slowed down, it only means the units being measured have changed. For example, the hourglass at a different altitude is measuring something other than an hour—i.e., the new "hour" being measured does not equal the original hour.

This conception of time causes us to challenge the common notion that time is a property of the Universe apart from the duration of any changes taking place, or as a property tied to space (as in spacetime) [2]. At no point do clocks measuring a different duration in different contexts suggest that time is a property of the Universe apart from the duration of any changes taking place, or as a property tied to space; it only suggests that changes in initial conditions caused a change in what unit is being measured. In other words, something about the difference in initial conditions caused the duration of a state change to speed up or slow down, not time itself—there is no time itself. To generalize that time is everywhere (as in it is a part of the Universe or an aspect of spacetime), because the changes in state could happen anywhere, suffers from the fallacy of hasty generalization.

Not to mention, a simple thought experiment, if you are familiar with special relativity, rules out space as being tied to how duration is measured. In this thought experiment, suppose two identical clocks can occupy the same region of space at the same time, as if they phase through each other. For example, say you have two light clocks whose mirrors are parallel and offset sufficiently to miss each other, as shown in Figure 3. This is tantamount to two different reference frames occupying the same space.

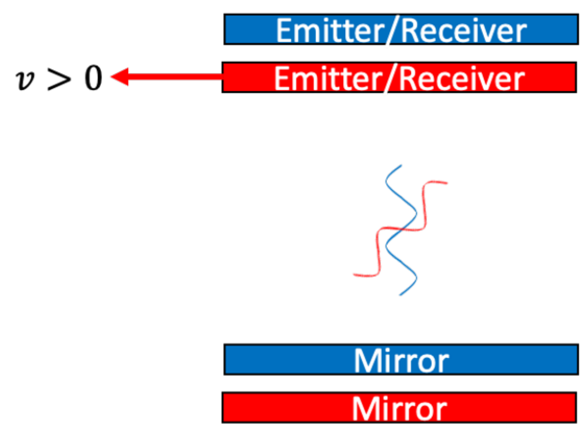

Figure 3. Two frames in one space.

Now, if the velocity of these clocks differ from each other, special relativity tells us they measure different duration for the light traveling the same distance. If the conception of spacetime is a correct, then this suggests the same region of space at the same instance of time is tied to two different passages of time. What is to limit the reference frames to just two? Why not an infinite (or some absurdly large number) such reference frames at the same instance in time and space? The method of difference, whereby different effects (different duration measured for same clocks) occur during the presence of the same antecedent factor (region of space and instance in time), proves that space does not effect how time is measured, meaning time is not tied to space. Really time is just a property of things in the Universe not of the Universe as a whole nor as an aspect of spacetime.

That is not to say spacetime, as a concept, must be thrown out. It has predictive value like assuming Ptolemy's planetary model, or assuming the earth is flat. Assuming Ptolemy's planetary model helped farmers of old plan out harvests, and assuming a flat earth helped armies of old predict cannon ball trajectories. Likewise, the spacetime model helps plan out duration changes for GPS to work. A model ought not be accepted as representing a salient fact about reality just because it seems true from its predictive power. There was a time when it seemed true enough that the earth was the center of celestial motion, and a time when it seemed flat too. But of course these models having predictive utility and seeming true does not mean the earth really is the center of celestial motion, nor does it mean the earth really is flat, nor does it mean that time really is a property of the Universe or an aspect of spacetime.

3. Conclusion

In conclusion, assuming time is a property of the Universe and an aspect of spacetime prevents us from fathoming important questions, which is holding us back from scientific progress. Some of these questions include: What is kinetic time dilation if not a change in spacetime? What then causes the kinetic time dilation? What then causes gravity if not the bending of spacetime? What then causes everything in the same reference frame to be effected by time dilation in the same way, if not the environment (spacetime) in which everything "sits"? These questions are the focus of further investigations into the theory of universal specificity. The findings in these investigations reveal deep truths about the Universe on a grand scale in terms of new discoveries and integrations never before possible.

References

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