Universal Specificity Investigation 2: Implications of a Universally Stationary Frame

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The results from the previous investigation into the nature of time revealed that time properly conceptualized is the interval over which change occurs, and is not a property of the universe apart from physical changes to things in the Universe. Additionally, it was revealed that changes to this interval over which identical changes occur implies a difference between their conditions. For example, when an hourglass or grandfather clock relocates to a different altitude, the interval over which the sands drops or the pendulum swings changes because of the difference in gravitational force at the two altitudes. This lead to the certainty in the existence of a universally stationary frame (USF), and now we investigate the implications if such a frame existed.

1. Implications of a Universally Stationary Frame

Recall that the theory of universal specificity 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 implies that events at distance have certain sequence in which they occur and their simultaneity is not relative, but only appear relative. The one frame that predicts the true sequence, given current models, is the USF we seek.

All of this implies the following:

- The speed of light is constant only in the USF, while light's relative speeds is less than that in all other frame [1].
- The speed of light appears to remain constant in any other frame due to the miscalibration of measuring instruments.

In order to see these implications consider any object traveling any speed less than c with respect to the USF, in any arbitrary direction. The x-axis could easily be rotated such that the velocity of the object aligns with an arbitrary x-axis in the USF, as shown in Figure (1) for two dimensions.

$$\begin{bmatrix} x'_{USF} \\ y'_{USF} \end{bmatrix} = \begin{bmatrix} \cos(\theta) & \sin(\theta) \\ -\sin(\theta) & \cos(\theta) \end{bmatrix} \begin{bmatrix} x_{USF} \\ y_{USF} \end{bmatrix}$$

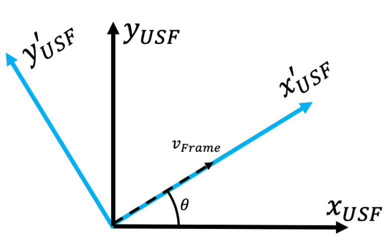

Figure 1. **Velocity aligns with any arbitrary USF x-axis.**

Now consider the Michelson–Morley experiment illustrated in Figure (2) [2]. In this experiment light would arrive from a direction, and split in two orthogonal directions relative to the apparatus's reference frame, reflect off mirrors and return to be combined again such that any interference in the combined rays can be detected. The length of the paths both rays take is made to be identical.

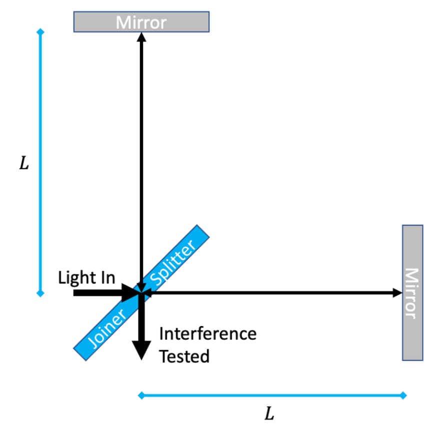

Figure 2. **Michelson–Morley experiment schematic.**

From this experiment if light traveled at a constant c only for the USF, it was hypothesized that this instrument would detect interference patterns if the apparatus were traveling some positive velocity in the USF. It failed to detect interference patters regardless of which part of earth's orbit this test was conducted, and regardless of the direction of measurement from distant stars. Many consider this proof that the speed of light is constant as Maxwell's equations seemed to suggest. A USF existing implies the speed of light can only be constant in the USF, so many take this to mean a USF does not exist.

If a USF exists we have to make sense of this experiment, and the first thing to realize is that interference detected by this experiment would only mean the time it took the light to travel both paths were not the same. With this understanding, the negative results only suggest that the light took the the same amount of time to travel both paths, not that its speed remained c relative the apparatus. Because the light travels a path to and from a mirror in the apparatus, then the average speed of light (in both directions) relative to the moving frame could easily be less than c. Therefore, a negative result could still be due to the average speed for both paths being identical.

Consider two cases. The first case the apparatus is not moving relative to the USF, as shown in Figure (3a), and the second case it is moving, as shown in Figure (3b). Consider the path the light takes in the USF in both cases.

In the first case it is easy to see the average speed of light rel-

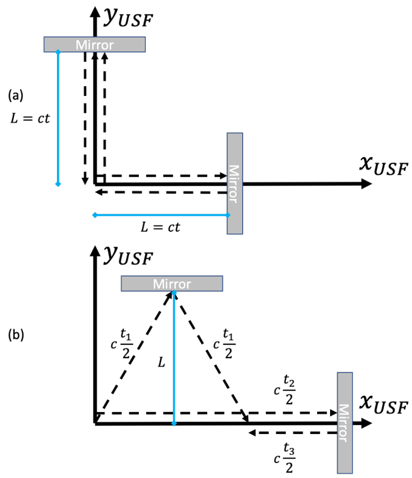

Figure 3. **(a) Stationary apparatus. (b) Moving apparatus.**

ative to the apparatus, since it is c in all directions; therefore, the light returns to the combiner at the same time.

In the second case the average speed of light is more complicated to derive. The average relative speed of light in the y-axis of the moving frame is $c_\perp = \sqrt{c^2 - v^2}$ based on trigonometric laws. The average relative speed of light in the x-axis is even more complicated to derive, as shown in Equation (1).

$$\text{Length There}: \; ct_2 = L + vt_2 \tag{1a}$$
$$t_2 = \frac{L}{c-v} \tag{1b}$$
$$\text{Length Back}: \; ct_3 = L - vt_3 \tag{1c}$$
$$t_3 = \frac{L}{c+v} \tag{1d}$$
$$\overline{v} = c_{||} = \frac{(c-v)t_2 + (c+v)t_3}{t_2 + t_3} \tag{1e}$$
$$c_{||} = \frac{(c-v)\frac{L}{c-v} + (c+v)\frac{L}{c+v}}{\frac{L}{c-v} + \frac{L}{c+v}} \tag{1f}$$
$$c_{||} = \frac{1+1}{\frac{1}{c-v} + \frac{1}{c+v}} \tag{1g}$$
$$c_{||} = \frac{2(c+v)(c-v)}{(c+v)+(c-v)} \tag{1h}$$
$$c_{||} = \frac{2(c^2 - v^2)}{2c} = c - \frac{v^2}{c} \tag{1i}$$
$$c_{||} = c\left(1 - \frac{v^2}{c^2}\right) \tag{1j}$$
$$\text{Let}: \; \gamma = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} \tag{1k}$$
$$\therefore c_{||} = \frac{1}{\gamma^2} c \; \blacksquare \tag{1l}$$

Comparing $c_{||}$ to $c_\perp$ gives us Equation (2).

$$c_{||} = \frac{1}{\gamma^2} c \tag{2a}$$
$$c_\perp = \sqrt{c^2 - v^2} = c\sqrt{1 - \frac{v^2}{c^2}} = \frac{1}{\gamma} c \tag{2b}$$
$$\therefore c_{||} = \frac{1}{\gamma} c_\perp \; \blacksquare \tag{2c}$$

The average relative speed of light in the moving frame is not equal for both the x-axis and the y-axis. Light travels slower in the x-axis by a factor of $\frac{1}{\gamma}$. This is because the mirror (or the combiner) travels away from the UIF, thus, artificially creating more distance for the light to travel. The only way for the light to travel both paths over the same duration, therefore, is for the distance along the x-axis to contract by a factor of $\frac{1}{\gamma}$ to compensate for the slower average speed of light, as shown in Equation (3).

$$t_1 = t_2 + t_3 \tag{3a}$$
$$\frac{2L}{c_\perp} = \frac{L_x}{c-v} + \frac{L_x}{c+v} \tag{3b}$$
$$\frac{2L}{\frac{1}{\gamma}c} = \frac{L_x(c+v) + L_x(c-v)}{c^2 - v^2} \tag{3c}$$
$$\frac{\gamma 2L}{c} = \frac{2L_x c}{c^2 - v^2} \tag{3d}$$
$$\frac{\gamma L}{c} = \frac{L_x}{c}\frac{1}{1 - \frac{v^2}{c^2}} = \frac{\gamma^2 L_x}{c} \tag{3e}$$
$$L_x = \frac{1}{\gamma} L \; \blacksquare \tag{3f}$$

Indeed, this is the exact value given to length contraction commonly mentioned in relativity [3].

The only remaining question to be answered in order to make sense of the negative results of this experiment is why would a relatively slower traveling light (on average) not be detected? Could not a modified experiment to measure the duration it took for light to show up at the combiner measure the longer time it took for light to arrive for higher velocities? Current orthodoxy says no because of something called time dilation, which is caused by a rotation in spacetime governed by the Lorentz Transformation [4]. Time dilation would make all duration for all changes within an inertial reference frame moving (relative to the USF) take longer. This means the clocks would take longer than a second to measure a second, which means the time it took for light to arrive at the combiner would be measured the same as if the apparatus were stationary.

The theory of specificity of course interprets time dilation as an undetected miscalibration of measuring instruments, however, time dilation does exist.

2. Conclusion

In conclusion, an existing USF has many implications among which are that the average speed of light for a moving frame is not constant and different in both the x-axis and y-axis. Length contraction allows the light to travel less distance in the x-axis to make up for the slower speed in the x-axis. This make the round trip times identical in both the x-axis and y-axis paths light takes in the moving frame. Lastly, the reason the longer travel times of light goes undetected is because of a phenomenon refered to a time dilation. That brings us to our next questions in this series of investigations into universal specificity which is: What is kinetic time dilation if not a change in spacetime? What then causes kinetic time dilation? Answering these quesionts is the focus of the next paper.

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