Motion Out of Time: Single Speed Hypothesis

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This study delves into the concept of velocity within the context of the physical interpretation of acceleration and deceleration for objects in motion through space. A thought experiment involving a marble and a photon is utilized to propose the hypothesis that all objects in space, inherently, do not take time to move from a specific source to a destination. Through a series of methodically structured thought experiments, this hypothesis and the accompanying conclusions are explored and validated. Newton’s first law of motion serves as the basis for these scenarios, enabling logical conclusions to be drawn. Based on the arguments presented, this hypothesis is used to provide a novel interpretation of quantum mechanics. The methodology emphasizes logical reasoning over detailed mathematical formulations, offering a more accessible presentation.

Consider two entities: a photon and a marble. Both the photon and the marble are set to travel 100 meters in a straight line within the same dimension and in a vacuum. Since a photon travels at the speed of light, it takes approximately 0.0000003336 seconds for the photon to cover the distance. In contrast, assuming the marble is initially traveling at a speed of 40 meters per second in this thought experiment, it takes 2.5 seconds for the marble to complete the 100 meters. This raises a question: The photon covered the distance in 0.0000003336 seconds, while the marble took 2.5 seconds. In other words, the marble took approximately 2.4999996664 additional seconds to complete the distance compared to the photon. What accounts for this extra time taken by the marble?

Consider the following analogy: Mrs. Bob has two sons, Eric and Smith, with Eric being the elder child in the household. Mrs. Bob typically sends Eric to buy groceries from a supermarket located a few blocks away from her house. Eric always takes about 20 minutes to purchase the groceries and return. One day, when Eric was unavailable, Mrs. Bob sent her younger son, Smith, instead. Smith left the house with a list of groceries, just as Eric would. However, unlike Eric, Smith returned after 45 minutes. Mrs. Bob noticed this significant difference in timing between the two and asked Smith the question: "Why did you take so long? Eric would return in 20 minutes." If Smith were to respond, he might say: "I couldn’t find some of the items, so I had to go to another supermarket, which is farther away," "There was a long line at the checkout," "It took me a while to locate some items in the supermarket," "The supermarket was closed, so I had to wait for 15 minutes until it opened," "I ran into a friend on the way and we chatted for a while," and so forth. Smith could provide multiple reasons to account for his delay. However, all the possible explanations he could offer would boil down to one or both of two factors: "Stop" and "Extra-Action." Assuming Eric's timing is the ideal and acceptable one from Mrs. Bob's perspective, the reason Smith took an extra 25 minutes is because he either stopped one or more times during his journey, performed additional actions that required more time, or both. For instance, reasons such as a long line at the checkout, the supermarket being closed, or running into a friend fall under the stop category because Smith had to stop carrying out his main task while time passed from his mother's point of view. The other reasons, such as walking to another supermarket or taking a while to locate the items, fall under the category of extra activity or action.

The case of Eric and Smith can be applied to the photon and the marble, leading to the same question posed to the marble. As shown in Fig. 1, the marble could not have performed any extra actions, as both the photon and the marble traveled along the same line in the vacuum of space, thereby ruling out the extra-action reason. The only remaining explanation for the additional time is "Stop." This suggests that during the 2.5 seconds in which the marble is observed moving, it was stationary for approximately 99.9999866574 percent of the time. Based on this simple observation, the next section will demonstrate how the marble remained stationary for the extra 2.4999996664 seconds, followed by the conclusions drawn from this argument.

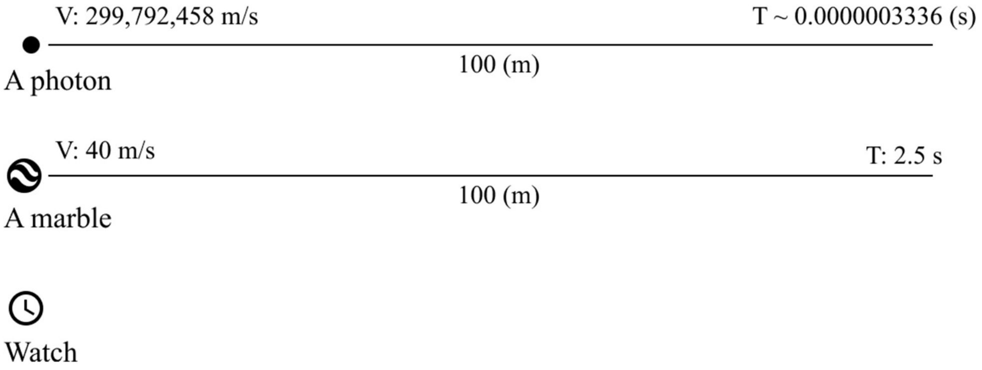

FIG. 1. Representation of the thought experiment in which a photon and a marble are set to travel 100 meters at a specific velocity in the vacuum of space.

To demonstrate that the marble remained stationary for the extra 2.4999996664 seconds out of the total time it took to cover the distance, another thought experiment is introduced to support this argument. The key concept employed is a hypothetical "space watch." This space watch functions similarly to a regular mechanical watch, with a continuous line of space in a vacuum and a photon representing the entire mechanism, where the photon acts as the single hand. A photon is set to travel in a straight line in the vacuum at the speed of light (299,792,458 meters per second). The operation of the space watch is such that as the photon traverses 299,792,458 meters, one second passes. As shown in Fig. 2, one can consider the end of every 299,792,458 meters from the starting point as a time marker on the space watch. Furthermore, each spatial point serves as the smallest unit of time when the photon passes through it.

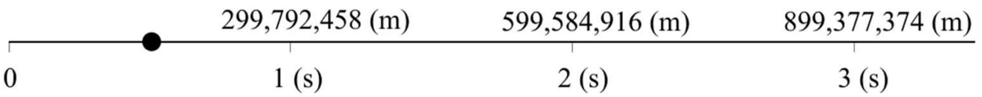

FIG. 2. A depiction of a hypothetical space watch utilizing a photon as its hand, analogous to the hand of a mechanical watch.

The space watch is used to locate the position of both the photon and the marble within the 100-meter distance at each point in time they take to traverse it. Beginning with the photon, Fig. 3 shows the mapping of its location along the 100-meter distance at each time interval according to the space watch, within the 0.0000003336 seconds it takes to complete the distance. Since both the photon in the watch and the photon in the experiment travel at the speed of light, each time point within the 0.0000003336 seconds correlates to a unique position of the photon along the 100-meter path. This demonstrates that the photon was at a distinct location at each time registered by the space watch during its travel.

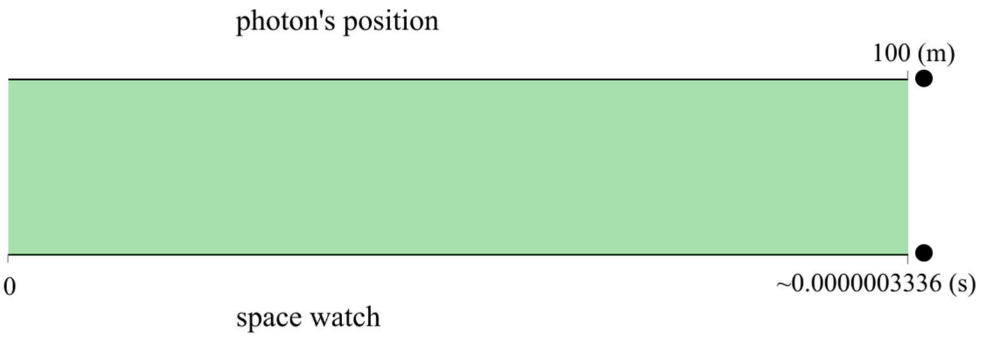

FIG. 3. The mapping of each point in time within 0.0000003336 seconds on the space watch (bottom axis) to the position of the photon along the 100-meter distance (top axis).

Conversely, when analyzing the marble's position at each point in time on the space watch during the 2.5 seconds it takes to traverse the distance, it is clear that the marble's position remains within the 100 meters for the entire duration. When mapping the time intervals of the 2.5 seconds on the space watch to the marble’s position, only a total of 0.0000003336 seconds—equivalent to the time it takes the photon to travel 100 meters—corresponds to unique positions of the marble along the path. Although it is not viable within this framework to pinpoint exactly where these 0.0000003336 seconds occur on the space watch, all points in time within the defined range that correspond to a unique location of the marble collectively add up to this duration. Similarly, while it is not feasible to define the exact location of the marble at each point within those 0.0000003336 seconds, it is apparent that the marble occupied a different position at each subsequent point in time during those seconds. This is deduced from the fact that the photon on the space watch must travel 749,481,145 meters in order for 2.5 seconds to pass while the marble remains within the 100-meter distance. The remaining 2.4999996664 seconds correspond to repeat positions of the marble, indicating that it was stationary during these intervals. A stop for any moving object can be defined as remaining in the same position during a period of time. The repeated mappings thus suggest that the marble experienced stops, as previously argued. Fig. 4 illustrates these stops, represented by gray bands consistently distributed along the marble's path, assuming a uniform velocity. The light-green bands denote the marble's unique position mappings over the 100 meters, while the gray bands represent its duplicate position mappings. This thought experiment leads to the inference that the marble was stationary for 2.4999996664 seconds during its journey.

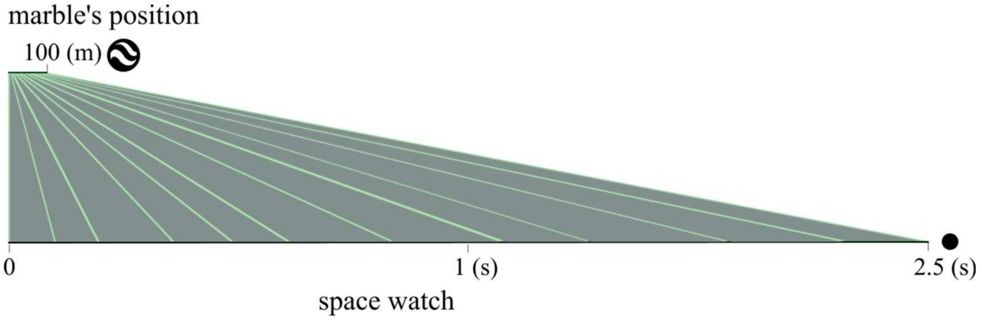

FIG. 4. The exemplary mapping of the marble's position along the 100-meter distance (top axis) relative to each point in time over the 2.5-second duration on the space watch (bottom axis).

The photon in the space watch can be replaced with the marble to draw a similar conclusion. To demonstrate, the hand on the space watch is substituted with the marble moving at the same velocity of 40 m/s in a vacuum of space. Similar to the photon in the space watch, as the marble covers 40 meters, one second elapses. Consequently, each point on the space watch represents a unit of time as the marble passes through it. When mapping the photon's position along the 100-meter distance with respect to each point in time it took the photon to traverse that distance, every time point on the space watch corresponds to a unique position of the photon. In other words, by the time the photon completes the 100 meters, approximately 0.0000003336 seconds have passed on the space watch. By mapping the photon's position at each point in time within those 0.0000003336 seconds on the space watch, each time point corresponds to a unique position of the photon along the 100-meter distance, given that the photon travels at the speed of light and covers significantly more distance. At 0.0000003336 seconds on the space watch, the marble, serving as the hand, will have traversed roughly 0.0000133426 meters, while the photon has already completed the entire 100 meters. This means that only a total of 0.0000133426 meters of the photon's position along the 100-meter distance corresponds to each time point on the space watch in 0.0000003336 seconds. However, the remaining 99.9999866574 meters of the photon's positions do not have corresponding unique time points on the space watch. Nonetheless, while the photon occupied those positions along the distance, the marble was still within the 0.0000003336 seconds on the space watch. As depicted in Fig. 5, if those positions of the photon are mapped against points in time on the space watch, they will correspond to duplicate time points, although this study does not specify which exact points in time each position maps to. These duplicate time points will add up to the total relative stops made by the marble as it moves on the space watch. If both the marble on the space watch and the photon continue moving until 2.5 seconds have passed on the space watch, the detectable stops made by the marble will total 2.4999996664 seconds. These basic thought experiments show that the marble remained stationary for 2.4999996664 seconds of the time it took to complete the 100 meters, without indicating where along the distance these stops occurred.

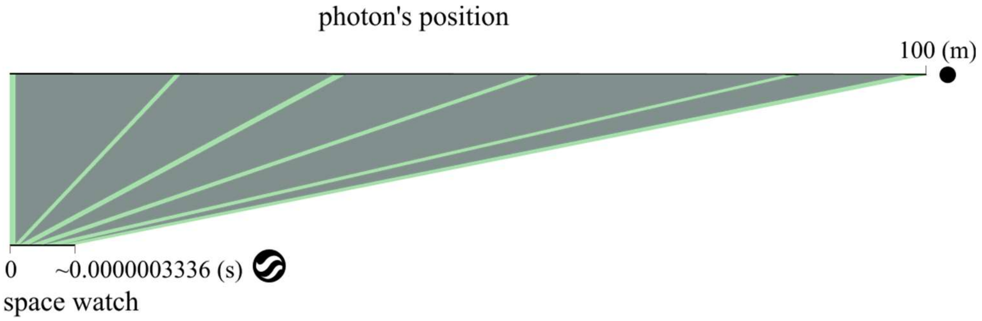

FIG. 5. Exemplary illustration depicting the mapping of the photon's position along the 100-meter distance (top axis) relative to each point in time within 0.0000003336 seconds on the space watch (bottom axis), operated by a marble moving at 40 m/s.

The argument thus far presented assumes that the photon travels without making any interruptions, thereby implying that the speed of light represents the ultimate maximum velocity achievable by any object or particle. The 0.0000003336 seconds during which both the photon and the marble are assumed to be in motion to complete the 100-meter distance can be subjected to further analysis with regard to their positions at each instant within these seconds. Each discrete point within the total 0.0000003336 seconds of motion corresponds to a specific position of both the marble and the photon along their respective trajectories. Although these unique positions indicate that the marble or photon has reached a new location compared to its previous position, this does not explicitly provide information about the act of moving, but rather about occupying a different location. The essential consideration is that occupying a unique position also suggests the possibility that the object was stationary at these points for an infinitesimally brief duration. Consequently, the total recorded time for both the marble and the photon is indicative of the duration during which they were stationary or halted, rather than actively in motion, as illustrated in Fig. 6. This leads to the hypothesis that the marble and the photon did not require any time to transition from their initial position to their final destination; instead, the recorded time reflects the frequency of stops encountered. Thus, the act of moving from start to finish inherently does not require time. This necessitates a redefinition of time for a moving object as a measure of the frequency of halts in its trajectory; the Single Speed Hypothesis puts forward the notion that time does not provide insight into the motion of objects as classically conceived.

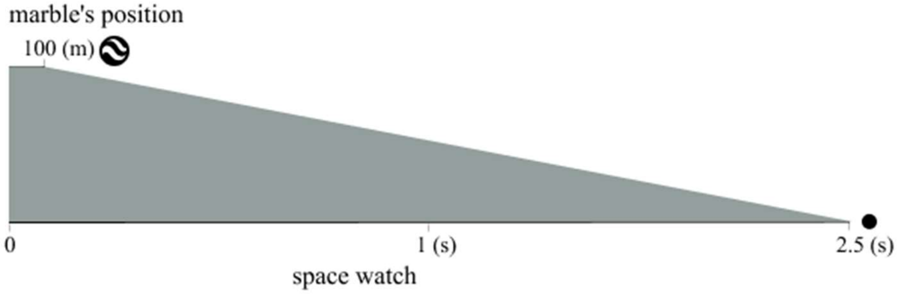

FIG. 6. The exemplary mapping of the marble's position along the 100-meter distance (top axis) relative to each point in time over the 2.5-second duration on the space watch (bottom axis). This mapping illustrates that each time interval represents a stop experienced by the marble.

When the motion of the marble is analyzed over the 100-meter distance, an observer watching the marble in a vacuum of space would perceive it as moving continuously across the 100 meters. According to Newton’s first law of motion (Newton, 1687), every object continues in its state of rest or uniform motion in a straight line unless acted upon by an external force. In this scenario, the marble starts moving, stops at some point along the path, and resumes movement after a certain duration of time. This process is inferred to repeat numerous times, giving the impression of a constant velocity. From this observation, one can infer the influence of an external force that intermittently halts and restarts the marble’s motion, indicating the presence of a force acting on the marble as it moves through a vacuum.

If these stops are caused by external forces, one might speculate about the marble’s motion if these forces were entirely absent. Without external forces, the marble would not stop, implying that no time would be recorded as it moves from start to finish, whether for the marble or the photon. By applying Newton’s first law again, one concludes that the marble would traverse the entire 100 meters without interruption if external forces were absent. This leads to the notion that any object in motion is effectively moving outside of time. Either the object is moving "out of time" or is stationary throughout its journey across 100 meters. This concept applies universally to all objects in space: when moving, they do so out of time.

As the initial force applied to the marble to initiate motion increases, the marble launches with a higher velocity, resulting in a reduction of the classical time required to cover the 100-meter distance. According to the arguments presented in this study, as the initial force increases, some of the stops the marble experiences are diminished, leading to a lower recorded time. The energy imparted to the marble can be seen as functioning to overcome the stops it encounters; as the force increases, more stops are surmounted. This interpretation redefines acceleration for a moving body as the reduction in the frequency of stops along its path of motion. While considering the effect of initial force on the marble, one can contemplate the force necessary to make the marble travel instantaneously between two points in a vacuum absent of external forces. Since the marble would not experience any time due to stops, it would travel out of time, regardless of the force applied to initiate its motion. An object retains its out-of-time or instantaneous speed, irrespective of the amount of force exerted in its direction of motion in a space devoid of opposing forces. This leads to the deduction that energy transferred to a moving object serves no purpose in terms of velocity when external forces resisting the object’s motion are absent.

Certain behaviors of particles in quantum mechanics can be reinterpreted through the lens of the Single Speed Hypothesis. This hypothesis suggests that the motion of objects in space occurs independently of time, providing a unique framework for understanding particle dynamics at the quantum level. By considering particle motion as occurring "out of time," this hypothesis offers a more intuitive explanation for some otherwise counterintuitive properties of subatomic particles. For instance, phenomena like quantum superposition and the measurement problem, which are traditionally difficult to interpret within time-based models, may become clearer when viewed through the Single Speed Hypothesis (Dirac, 1958; Wheeler & Zurek, 1983).

Wave-Particle Duality: Quantum entities, such as electrons and photons, exhibit both particle-like and wave-like behavior. In the double-slit experiment, for example, particles such as electrons produce an interference pattern when not observed (indicating wave-like behavior), but act as discrete particles when measured. According to the Single Speed Hypothesis, when a particle is confined in a space with minimal or no external forces acting upon it other than its confinement, it moves "out of time" within that space. It continues to do so until it encounters an external force that halts its motion at a specific frequency—time. Once it stops, it enters time and becomes detectable. While the particle is in motion, it cannot be detected, and its position or state cannot be determined. However, once measured or interacted with, contact is made with the particle, bringing it into time. When the particle comes into contact with external forces resulting from the measurement, it halts at a certain frequency, or "enters" time, making it detectable. This interpretation offers a distinct view of the measurement problem: the very act of measurement causes a particle to enter time, independent of who or what is measuring it (Schrödinger, 1935). The wave collapse can be understood as the particle or object emerging into time. This phenomenon applies not only to microscopic entities but also to macroscopic objects. However, macroscopic objects experience time more frequently because they encounter external forces more regularly due to their size.

Superposition: Quantum systems can exist in a superposition of multiple states simultaneously. For instance, a quantum particle can be in several places or have multiple energy levels at once until it is measured. Schrödinger's well-known thought experiment about a cat being both alive and dead at the same time illustrates this concept (Schrödinger, 1935). The Single Speed Hypothesis provides an intuitive explanation for this phenomenon by suggesting that the motion of objects occurs out of time. From the particle's perspective, if it is moving out of time and without any stops, it can reach any position without consuming time. This does not mean that the particle is in multiple places at once. However, from the observer's perspective—who is bound by time—the particle appears to occupy multiple positions at the same instant, creating the illusion that it is in different places simultaneously. The particle can traverse infinite positions until it encounters a force that halts its motion, bringing it into time, even though no time has passed from the observer's point of view. Overall, certain quantum mechanical behaviors can be better understood by reexamining the motion of objects and the role of time itself.

In conclusion, this study uses thought experiments involving a marble and a photon to analyze the motion of objects in space and to question conventional interpretations of velocity. It asserts that objects move instantaneously or "out of time" when in motion. The differences in speed observed in practice result from the stops imposed by external forces. Moreover, it argues that the energy imparted to a moving object does not influence its velocity in the absence of external forces. The hypothesis aims to address some of the counterintuitive issues in quantum mechanics by offering a new perspective based on the aforementioned concepts.

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