Relativity time dilation - a two signal time delay theory

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Abstract: Special relativity time dilation has until now a un-discovered physics disconnect, "t*he signals used to derive the expression for time dilation (1) are actually from fixed sources in space*". This observation presents a dilemma for the foundation of special relativity where it assumes a moving source emits the signals with time delay $\Delta t'$. The physics is shown that two fixed sources emit the signals independent of the velocity v of the supposed moving source.

Index Terms—Special relativity, time dilation, *e*xtinction shift principle, transverse relative time shift.

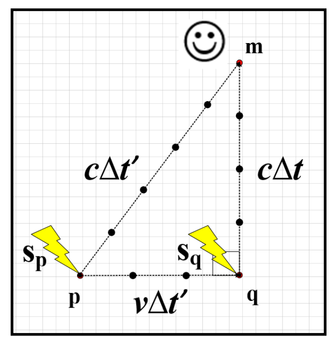
$$\Delta t' = \frac{\Delta t}{\sqrt{1-\frac{v^2}{c^2}}} \quad (1)$$

Introduction

Special relativity time dilation (SRTD) has captured the imagination of mankind for over a century. According to SR a moving source with velocity v emits two signals with a time delay $\Delta t'$, **Figure 1**. **p**, **q**, and **m** form a right triangle. The signals in SR are assumed to move at the velocity of light, c. The source emits signal s_p at location **p**. s_p reaches the location **m** at time $\Delta t'$. The source is located at **q** at time $\Delta t'$ and then emits signal s_q. The time delay for s_q to reach **m** is Δt. An observer located at **m** will see the signal delay, Δt, for receipt of s_p and s_q. From the Pythagorean theorem we get (2). Solving (2) for $\Delta t'$ we get (1). The relationship (1) between $\Delta t'$ and Δt in the famous SRTD derived in [1]. This work shows that the sources in SRTD are actually fixed in space with respect to the observer of the signals, i.e. the sources do not move.

$$(c\Delta t')^2 = (v\Delta t')^2 + (c\Delta t)^2 \quad (2)$$

Figure 1: Source with velocity v emits signals s_p and s_q.



Example 1 shows the progression of the source signals over time, observed signal time delay, and derives the formula relating $\Delta t'$ and Δt. **Example 2** develops the concept of velocity of a moving object using the geometry in Example 1. **Example 3** combines the signal emission and moving object concepts into the same frame of reference and *reveals where SRTD has introduced meta-physics into modern science*. In **Example 4** the moving object flips a switch on fixed sources to enable the signal emission. The conclusion provides observations and recommends a source that provides a physics based alternative to the observed signal time delay a *transverse relative time shift*[2] which is not a Special Relativity time dilation.

[1]Time dilation - Wikipedia, https://en.wikipedia.org/wiki/Time_dilation

[2] Introduction to the Extinction Shift Principle: A Pure Classical Replacement for Relativity, Dr. Edward Henry Dowdye Jr., https://www.semanticscholar.org/paper/Introduction-to-the-Extinction-Shift-Principle%3A-A-Dowdye/c1dee00cc1b71f91d32b4048046acc857142357c

Example 1: Light signals s_p and s_q emitted with time delay $\Delta t'$ are reach m with time delay Δt.
Let points **p**, **q**, **m** be fixed positions in empty space as shown in the right triangle in **Figure 2**. The distance **pm** is **D**, **pq** is **M**, **qm** is **L**. The velocity of light c is $3\text{x}10^8$ m/s. **D** is 5c equal to $15\text{x}10^8$ m. The observer (😀) its located at position **m**.

Figure 2: Position of p, q, m and distances M, L, D in right triangle.

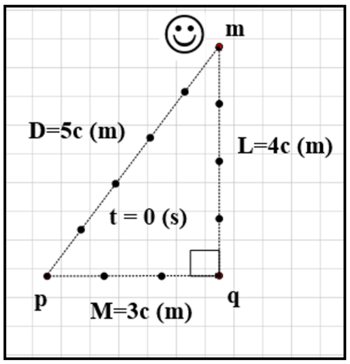


Figure 3: Source $\mathbf{S_p}$ emits signal $\mathbf{s_p}$ from location **p**.

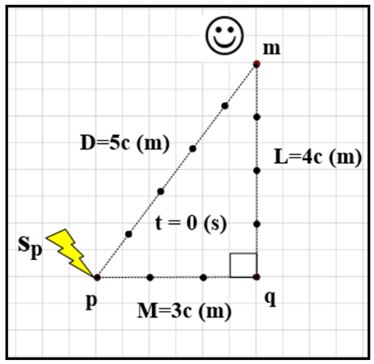
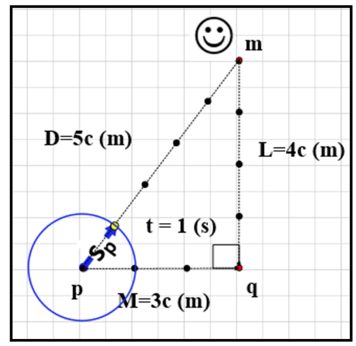


Figure 4: Signal $\mathbf{s_p}$ travels $1c$ m in 1s from location **p**.



Let fixed source $\mathbf{S_p}$ at location **p** emit a signal $\mathbf{s_p}$ with velocity ***c***, the speed of light, **Figure 3**. $\mathbf{s_p}$ will travel 1c m in 1 second, **Figure 4**, 2c m in 2s, **Figure 5**, 3c m in 3s, **Figure 6**, 4c m in 4s, **Figure 7**, and arrive at location **m** in time $\Delta t'$ (2) in 5s a distance of 5c m, **Figure 8**. **Figure 9** shows the progression of signal $\mathbf{s_p}$ from t=0s through t=5s.

$$\Delta t' = \frac{D}{c} \qquad (2)$$

Figure 5: Signal $\mathbf{s_p}$ travels $2c$ m in 2s from location **p**.

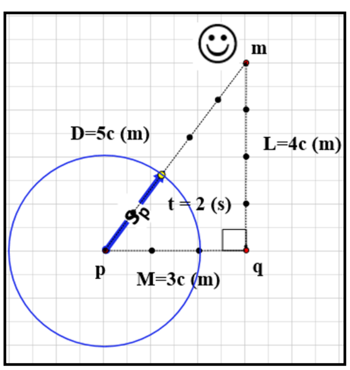


Figure 6: Signal $\mathbf{s_p}$ travels $3c$ m in 3s from location **p**.

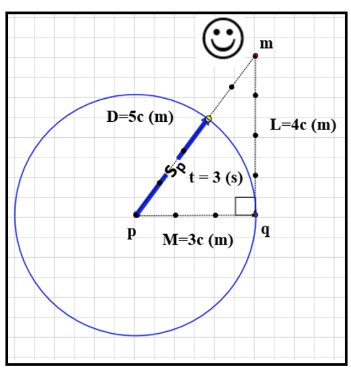
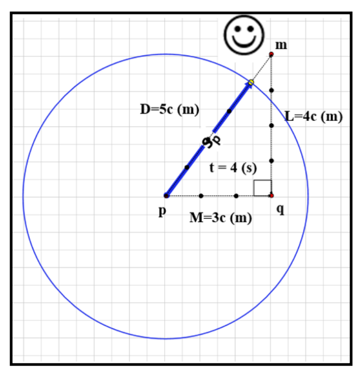


Figure 7: Signal $\mathbf{s_p}$ travels $4c$ m in 4s from location **p**.



At time $\Delta t'$ (t=5s) fixed source $\mathbf{S_q}$ located at **q** emits signal $\mathbf{s_q}$ with velocity c, **Figure 10**. Signal $\mathbf{s_p}$ will travel $1c$ m in 1 second, **Figure 11**, $2c$ m in 2s, **Figure 12**, $3c$ m in 3s, **Figure 13**, and arrive at location **m** in time Δt = 4s (3) a distance of $4c$ m, **Figure 14**.

Figure 8: Signal $\mathbf{s_p}$ arrives at m in time $\Delta t'$=5s.

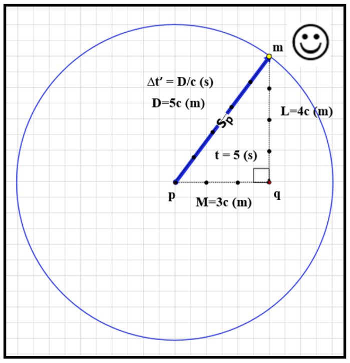


Figure 9: Signal $\mathbf{s_q}$ from t=0s through t=5s, a time difference of $\Delta t'$.

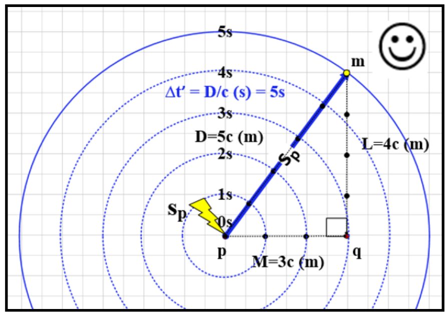


Figure 10: Fixed source $\mathbf{S_q}$ located at **q** emit signal $\mathbf{s_q}$ with velocity c time $\Delta t'$.

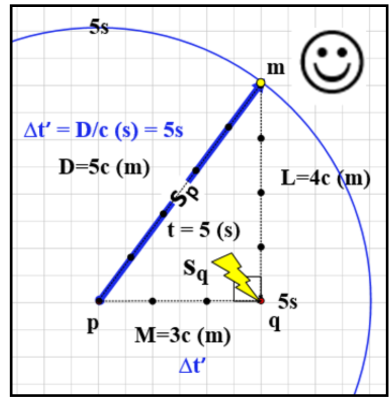


Figure 11: Signal $\mathbf{s_p}$ travels $1c$ m in 1s from location **q**.

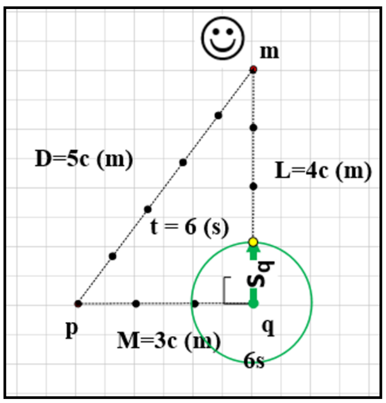


Figure 12: Signal $\mathbf{s_p}$ travels $2c$ m in 2s from location **q**.

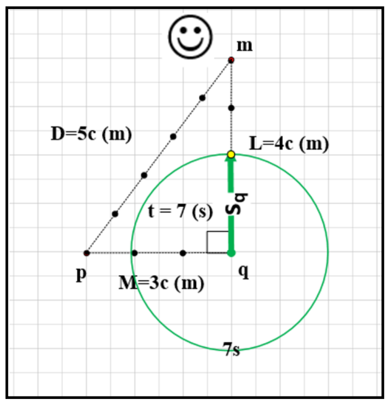
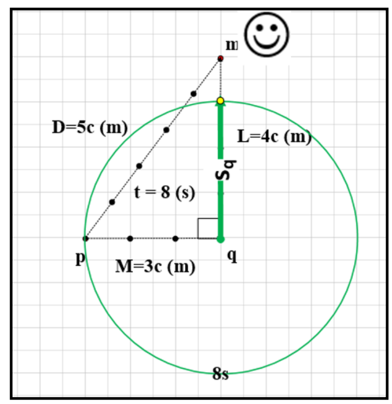


Figure 13: Signal $\mathbf{s_q}$ travels $3c$ m in 3s from location **q**.



$$\Delta t = \frac{L}{c} \quad (3)$$

Figure 14: Signal $\mathbf{s_q}$ arrives at **m** in 4s, t=9s, a distance of $4c$ m from location **q**.

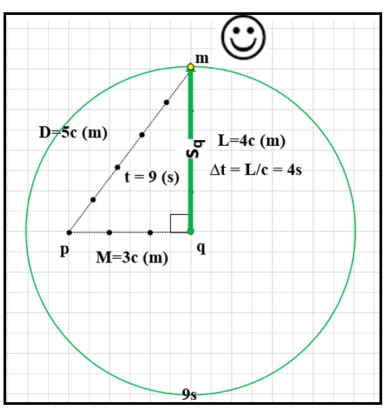
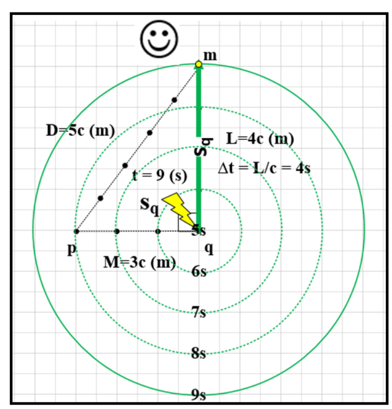


Figure 15 shows the evolution of signal $\mathbf{s_q}$ from t=5s through t=9s a travel time of Δt =4s. From (2)(3) we get (4)(5).

$$D = c\Delta t' \quad (4) \qquad L = c\Delta t \quad (5)$$

Now we notice that the time delay between emission of $\mathbf{s_p}$ and $\mathbf{s_q}$ is $\Delta t'$. The signal sources are located at difference positions is space and the signals are emitted at different times. *There is no causal relationship between $\mathbf{s_p}$ and $\mathbf{s_q}$.*

Figure 15: Signal $\mathbf{s_q}$ arrives at **m** in 4s, t=9s, a distance of $4c$ m from location **q**.

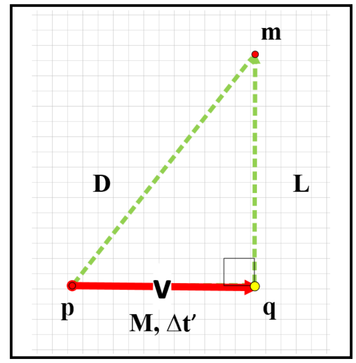


From the Pythagorean relation in **Figure 1** geometry we get (6). Combine (4)(5)(6) to get (7). Solve (7) for $\Delta t'$ to get (8). Notice that locations in space **p** and **q** are separated by a distance **M**.

$$D^2 = M^2 + L^2 \text{ (6)} \qquad (c\Delta t')^2 = M^2 + (c\Delta t)^2 \text{ (7)}$$

$$\Delta t' = \sqrt{\Delta t^2 + \frac{M^2}{c^2}} \text{ (8)}$$

Figure 16: Object travels distance **M** with velocity **v** in time $\Delta t'$.



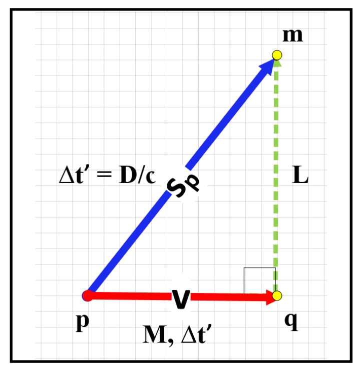
Example 2: Object moves with velocity v over distance M in time $\Delta t'$.

Let object traveling distance **M** with velocity v from point **p** to point **q** in time $\Delta t'$, **Figure 16**. The object does not send a signal in this example. The velocity v of the object is the distance traveled **M** divided by the time of travel $\Delta t'$ (9). The distance **M** is (10). From (9) the time of travel from **p** to **q** is $\Delta t'$ (11).

$$v = \frac{M}{\Delta t'} \text{ (9)} \qquad M = v\Delta t' \text{ (10)} \qquad \Delta t' = \frac{M}{v} \text{ (11)}$$

There is no causal relationship between the $\Delta t'$ in example 1 and example 2. There is a correlation with the velocity in examples 1 and 2. The time traveled by the object is the same.

Figure 17: Object travels distance **M** while signal $\mathbf{s_p}$ travels distance **D** in time $\Delta t'$.

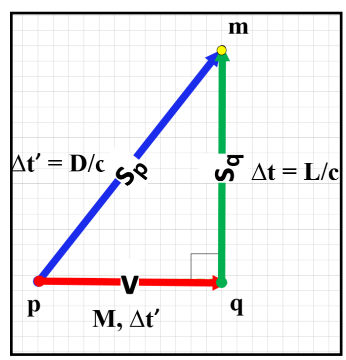


Example 3: Traveling object passes position p when source S_p emits signal s_p and travels distance M when source S_q emits signal s_q.

Let $\mathbf{S_p}$ emit $\mathbf{s_p}$ as a traveling object with velocity v passes position **p**. At time $\Delta t'$simultaneously $\mathbf{s_p}$ arrives at position **m** when the object travels distance **M** and arrives at position **q**, **Figure 17**.

Let the source $\mathbf{S_q}$ emit signal $\mathbf{s_q}$ when the object passes position **q**. The signal $\mathbf{s_q}$ will arrive at position **m** at time Δt, **Figure 18**.

Figure 18: Signal $\mathbf{s_q}$ travels distance **L** in time Δt.



In this example there is no causal relationship between the velocity v of the traveling object, the signal $\mathbf{s_p}$ emitted from the fixed source $\mathbf{S_p}$, and the signal $\mathbf{s_q}$ emitted from the fixed source $\mathbf{S_q}$. There is a coincidence in the emission of signal $\mathbf{s_p}$ and the position of the moving object as it passes location **p**. There is a coincidence in the emission of the signal $\mathbf{s_q}$ and position of the moving object as it passes location **q**.

Example 4: Let there be a switch at fixed sources S_p and S_q that is activated by the passing of a traveling object with velocity v.

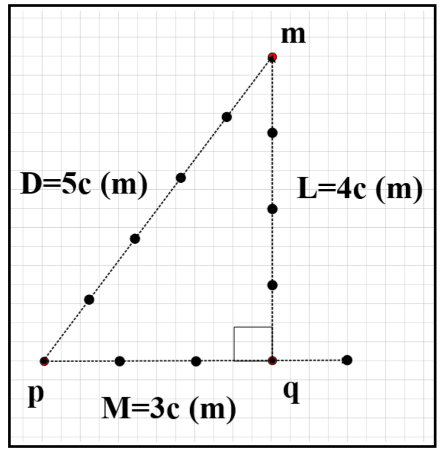
Let there be a switch at sources $\mathbf{S_p}$ and a switch at $\mathbf{S_q}$ that is activated by the passing of a traveling object with velocity v. The positions of **p**, **q**, **m** and sources $\mathbf{S_p}$ and $\mathbf{S_q}$ are fixed in space. Let the object moving with velocity v pass position **m** activate the switch at fixed source $\mathbf{S_p}$ which sends signal $\mathbf{s_p}$. The time delay $\Delta t'$ (2) for $\mathbf{s_p}$ to arrive at position **m** is defined by the velocity of the speed of the light signal c and is independent of the velocity v of the moving object.

Let $\Delta t'$ in (2) equal to the time of travel across distance **M** for the object in (11) to get (12). Solve (12) for v (13). The velocity v in (13) is the only velocity of the object where the object can be at location **q** and the signal $\mathbf{s_p}$ will simultaneously arrive at **m**. Both distanced **M** and **D** are constants, fixed positions in space.

$$\Delta t' = \frac{D}{c} = \frac{M}{v} \text{ (12)} \qquad v = \frac{M}{D}c \text{ (13)}$$

*There is only one velocity v (13) where the object can arrive at position **q** and signal $\mathbf{s_p}$ can arrive at position **m** so that signal $\mathbf{s_q}$ can be emitted at position **q** and arrive at position **m** in time Δt. Δt represents the signal delay at **m**. $\Delta t'$ is the time delay in emission of $\mathbf{s_p}$ and $\mathbf{s_q}$ from their fixed sources.*

Figure 19: D=5c, L=4c, M=3c in meters (m).



Analysis when the object velocity is less than and greater than v in (13)

Let M equal 3c meters (m), L equal 4c (m), and D equal to 5c (m), where c is equal to 3x10^8, **Figure 19**. In example 3 using (13) the object velocity v is equal to *(3/5)c* (m/s), meters per second. In 5 (s) seconds the object travels 3c (m). In 5 (s) the signal $\mathbf{s_p}$ travels 5c (m), **Figure 20**.

Let v_1 equal to (2/5)c **(**m/s). In 5 (s) the object travels 2c (m) while signal $\mathbf{s_p}$ travels 5c (m), **Figure 21**. The signal $\mathbf{s_p}$ arrives at **m** before the object with velocity v_1 travels to position **q**.

Let v_2 equal to (4/5)c (m/s). In 5 (s) the object travels 4c (m) while signal $\mathbf{s_p}$ travels 5c (m), **Figure 22**. The object with velocity v_2 passes position **q** before signal $\mathbf{s_p}$ arrives at **m**.

Figure 20: Velocity v is (3/5)c (m/s). $\Delta t'$ is 5 (s).

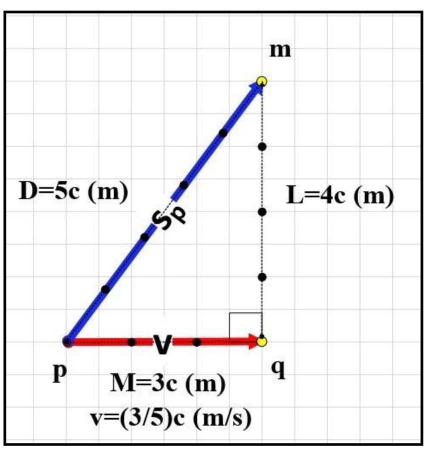


Figure 21: Velocity $\mathbf{v_1}$ is (2/5)c (m/s). $\Delta t'$ is 5 (s).

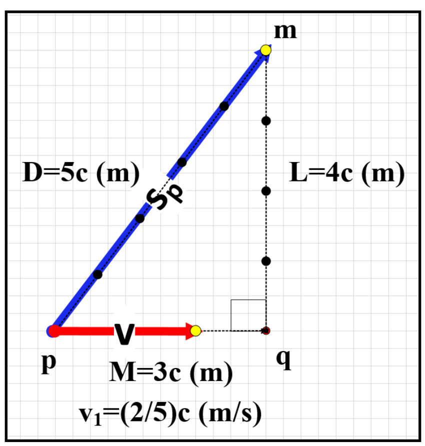
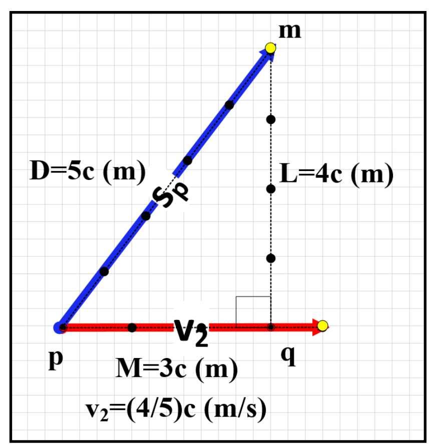


Figure 22: Velocity $\mathbf{v_2}$ is (4/5)c (m/s). $\Delta t'$ is 5 (s).



Special relativity time dilation

Combine (7) and (10) to get (14). Solve (14) for $\Delta t'$ to get (20).

$$(c\Delta t')^2 = M^2 + (c\Delta t)^2 \text{ (7)} \qquad M = v\Delta t' \text{ (10)} \qquad (c\Delta t')^2 = (v\Delta t')^2 + (c\Delta t)^2 \text{ (14)}$$

$$(c\Delta t')^2 - (v\Delta t')^2 = (c\Delta t)^2 \text{ (15)} \quad \frac{(c\Delta t')^2 - (v\Delta t')^2}{c^2} = \frac{(c\Delta t)^2}{c^2} \text{ (16)} \quad \Delta t'^2 - \frac{v^2}{c^2}\Delta t'^2 = \Delta t^2 \text{ (17)}$$

$$(1-\frac{v^2}{c^2})\Delta t'^2 = \Delta t^2 \quad (18) \qquad \Delta t'^2 = \frac{\Delta t^2}{(1-\frac{v^2}{c^2})} \quad (19) \qquad \Delta t'^2 = \frac{\Delta t^2}{\sqrt{1-\frac{v^2}{c^2}}} \quad (20)$$

It has already been shown that the velocity v of the object is independent of the signal velocities $\mathbf{s_p}$ and $\mathbf{s_q}$. Equation (20) does yield the correct calculation for $\mathbf{s_p}$ and $\mathbf{s_q}$ arrival at position **m** only when the object velocity is (13); however, v does not influence the speed of signals $\mathbf{s_p}$ and $\mathbf{s_q}$.

The derivation of (20) uses geometry similar to that found in **SR** time dilation[3] where only the upward travel of the light signal is considered in the moving clock bottom mirror A. Time dilation[3] shows a cause and effect for the moving mirror A and the light signal that travels along **D** of the right triangle. This clearly is an illusion presented by SR and cannot be true, see examples 1 through 4 above.

Concluding remarks

The examples 1 through 4 above show that in special relativity the velocity in (1) is independent of the signal source velocity in the geometry used to derive special relativity time dilation. The source velocity in SR time dilation has no physical meaning. **SR** (1) has a correlation for only one velocity if the time delays are coordinated and the traveling object flips a switch to activate the fixed signal sources. The velocity v in the special relativity time dilation (1) has no cause and effect on any light signal and cannot influence Δt or $\Delta t'$. In **SR** the speed of the light in a vacuum along path **D** is not dependent on the velocity of the object traveling with velocity v. This is obvious since the magnitude of the light signals is equal to c (m/s) in all directions with or without a moving source. The reality of Galilean Transformation where velocities of sources and emitted signal velocities are additive should be considered.

Suggested reading, "Introduction to the Extinction Shift Principle: A Pure Classical Replacement for Relativity", Dr. Edward Henry Dowdye, Jr.[4] section 5.2 On the Transverse Relative Time Shift.

Legend

SR - Special Relativity
SRTD - Special Relativity Time Delay
Δt - time of flight for signal $\mathbf{s_q}$ to travel from source $\mathbf{S_q}$ located at position **q** to **m**.
$\Delta t'$ - time of flight for signal $\mathbf{s_p}$ to travel from source $\mathbf{S_p}$ located at position **p** to **m**.
p, q, m - positions in space located on right triangle.
M - distance between points p and q, **pq**.
L - distance between points q and m, **qm**.
D - distance between points p and m, **pm**.
v - velocity of object
c - velocity of light ~3x10^8 m/s
m - distance in meters
s - time in seconds
$\mathbf{s_p}$ - signal emitted from source located at position **p**.
$\mathbf{s_q}$ - signal emitted from source located at position **q**.

[3] Time dilation - Wikipedia, https://en.wikipedia.org/wiki/Time_dilation

[4] https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.552.4186&rep=rep1&type=pdf