

Monday, October 21, 2024 at 17:31:34 Eastern Daylight Time

Subject: Meeting Schedule, Velocity Additions Reading, Code Comments for Modern Physics - Spacetime Java 2024
Date: Monday, October 21, 2024 at 17:31:30 Eastern Daylight Time
From: Taylor Brockman
To: Bennett, Jonathan, Justin Weng, Lofton, Brandon
Attachments: image001.png, image002.png

Hello! Justin and I were able to connect for an hour today. We code-reviewed the Worldline gamma and beta calculations and matched up the Java code to the formulas in the reading material that Dr. Bennett provided last Friday, 10/18.

A few things in this email:

1. Finding a time for our next meeting (Request to All)
2. Reference material on Velocity Additions (Request to Dr. Bennett)
3. GitHub commits with references to the “Modern Physics” textbook. (FYI)
4. YouTube Video of a Lorentz “Time Globe” (FYI)

Sincerely,
Taylor

1. Finding a time for our next meeting

Could you rank these meeting times in order of your preference? Are there any better options mid-week?

Monday 10/28 @ 4:00 PM
Friday 11/1 @ 2:00 PM (NCSSM Extended Weekend)
Monday 11/4 @ 4:00 PM
Friday 10/25 and 11/8 I'm unavailable.

2. Requesting reference material on velocity additions (Dr. Bennett)

Dr. Bennett, the reference materials you're scanning have been informative! I ordered a 2nd edition of *Modern Physics* that's on the way.

The next concept we've encountered is “Velocity Additions”, or “Beta Changes” which is outlined on Wikipedia: https://en.wikipedia.org/wiki/Velocity-addition_formula#Special_relativity

Do you have anything good that explains velocity additions?

Special relativity [\[edit \]](#)

According to the theory of [special relativity](#), the frame of the ship has a different clock rate and distance measure, and the notion of simultaneity in the direction of motion is altered, so the addition law for velocities is changed. This change is not noticeable at low velocities but as the velocity increases towards the speed of light it becomes important. The addition law is also called a **composition law for velocities**. For collinear motions, the speed of the object, u' , e.g. a cannonball fired horizontally out to sea, as measured from the ship, moving at speed v , would be measured by someone standing on the shore and watching the whole scene through a telescope as^[5]

$$u = \frac{v + u'}{1 + (vu'/c^2)}.$$

The composition formula can take an algebraically equivalent form, which can be easily derived by using only the principle of constancy of the speed of light,^[6]

$$\frac{c - u}{c + u} = \left(\frac{c - u'}{c + u'} \right) \left(\frac{c - v}{c + v} \right).$$

The cosmos of special relativity consists of [Minkowski spacetime](#) and the addition of velocities corresponds to composition of [Lorentz transformations](#). In the special theory of relativity Newtonian mechanics is modified into [relativistic mechanics](#).

3. Github commits with references to the “Modern Physics” textbook. (FYI)

Justin and Taylor had a 1-hour code review session today. You can see our commit on github of connecting the Java code back to the reference material: <https://github.com/ntbrock/spacetime-java/commit/e87831ffdae85a6bd51b56652bdbfd1cf555ebe2>

4. YouTube Video of a Lorentz “Time Globe” (FYI)

The Time Globe <https://youtu.be/Rh0pYtQG5wl?t=562>

YouTube Lorentz Transformations Special Relativity Ch. 3.

The entire video is informative. My notes:

Lorentz spacetime diagram: It's your reference frame if your worldline is a vertical line at $x = 0$.

To transform the diagram to a different reference frame, it's about translating the destination reference frame to $x = 0$ vertically.

Rotating the snapshots, make the angles between the two frames remain the same.

Shear transformations (Can't accommodate lightspeed constant) -> Boost Transformation.

(Maxwell's equations. Lorentz covariant work.)

The slope of the worldlines of c remains unchanged. Possible for all speeds to change except 1.
Squeeze rotations.

1sec vertical tick
299,492,458m horizontal tick

9m 23seconds - physical device = The time globe.

"Boost into the cat's perspective"

Sincerely,
Taylor

Taylor Brockman
Director of Information Technology
<https://brainpowersoftware.com/>
iPhone: 843-708-3840

brainpower
software