

# Logical Composition up to Special Relativity Theory

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## Abstract

Science theory is composed of definitions, logic and facts. Facts are real and not deniable. Logic could have multiple expressions. So we need to choose most appropriate expression. A composition from definitions, facts and logic to Special Relativity Theory is tried here.

### 1. Introduction

Report [1] has developed actual logic already from new definitions. This report is another version of it adding definitions, changing and sorting out logic expressions. Here sample systems, words, marks and others are inherited from [1] as long as these are not redefined.

### 2. Logical steps

#### Objective

Initially origin of  $S'$  system (0,0) is at origin of S system (0,0), and  $S'$  system is moving with velocity  $v$  relatively to S system.

On this situation objective is,

To describe  $S'$  system frame of reference on S system frame of reference.

To get formula of relation between S system indication and  $S'$  system indication for a time-space point.

#### Definitions

When time  $t$  is passed, time moves toward time direction also toward space direction with speed  $c$ . (1)

When a point in space moves  $x$  in space for time  $t$ , it also moves  $x$  toward time direction for time  $t$ . (2)

#### Premise

Frame of reference transformation can be done only when

About all related dimension, unit of value is same and meaning of its value is same. (3)

There could be various unit of value such as length, weight and others. When unit of value is length, for example, its value could mean a space position from origin or could

mean passed time from origin.

Possibility of Frame of reference transformation

As described on (1), when time  $t$  is passed, time moves  $ct$  along space axis. Also as described on (1), we recognize time moves  $ct$  along time axis when time  $t$  is passed.

In this case, time axis and space axis have

same unit of value; length(ex. Km)

same meaning of its value; time passed

Here premise (3) is satisfied.

Time axis of  $S'$  system

According to time  $t$  passing, time moves  $ct$  along time axis of  $S$  system. While this timing, space zero point of  $S'$  system moves  $x$  along space axis. Then its track could be

$$x = act$$

Possible point it have is  $(ct, vt)$ . Then

$$vt = act$$

$$a = \frac{v}{c}$$

So its track is

$$x = \frac{v}{c} ct \tag{4}$$

This is space zero line of  $S'$  system. Then this is time axis of  $S'$  system.

If a space point  $x$  of  $S$  system is space point  $x'$  of  $S'$  system, its relation is

$$x' = x - vt \tag{5}$$

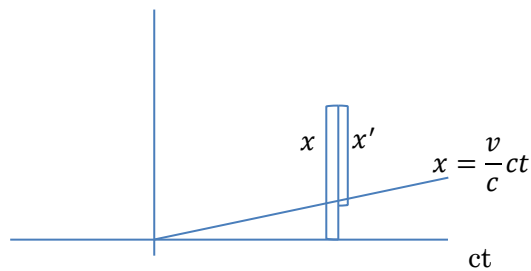


Fig. 1

### Space axis of $S'$ system

According to time passing, time moves  $x$  along space axis of  $S$  system. While this timing, based on (2), time zero point of  $S'$  system moves  $\frac{v}{c}x$  along time axis. Then its track could be

$$x = act$$

Possible point it have is  $(\frac{v}{c}x, x)$ . Then

$$x = a\frac{v}{c}x$$

$$a = \frac{c}{v}$$

So its track is

$$x = \frac{c}{v}ct \tag{6}$$

This is time zero line of  $S'$  system. Then this is space axis of  $S'$  system.

From (6),  $ct = \frac{v}{c}x$ . Then if a time point  $ct$  of  $S$  system is time point  $ct'$  of  $S'$  system, its relation is

$$ct' = ct - \frac{v}{c}x \tag{7}$$

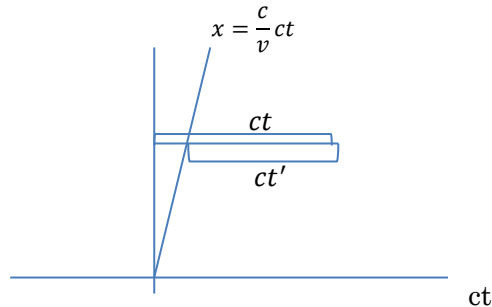


Fig. 2

### Scaling

To satisfy a fact light speed constancy for every inertia systems, (5)(7) are used. As elements to be determined,  $\alpha, \beta, \gamma$  are multiplied to (5)(7) [2]

$$x' = \alpha(x - vt) \tag{8}$$

$$t' = \beta t + \gamma x \tag{9}$$

Using these, we solve equations of light speed constancy.

Then we get following  $\alpha, \beta, \gamma$  determined.

$$\alpha = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} \tag{10}$$

$$\beta = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}} \quad (11)$$

$$\gamma = \frac{-v}{c^2 \sqrt{1-\frac{v^2}{c^2}}} \quad (12)$$

Comparing (7) (12),  $\frac{-v}{c^2}$  is multiplier of  $x$  included in (7).

Remained

$$\frac{1}{\sqrt{1-\frac{v^2}{c^2}}} \quad (13)$$

is same as  $\alpha, \beta$ . This is same value as scaling factor derived in [1] considering  $S'$  system is oblique system.

### 3. Background of definitions

We can accept definitions unconditionally if these have no contradiction with any facts, But these definition should have meaning why these can be definition Here we approach to such meanings.

About definition (1)

Space is expanding and newly expanded space have same time as existed space have. This means newly expanded space have no own time counted from zero. On this fact, we can recognize time moved in space from neighbor space.

About definition (2)

When time passed  $t$ , time reached to  $ct$  along time axis and space axis of  $S$  system. If origin of  $S'$  system moved  $vt$  along space axis, Regarding to  $S'$  system origin, about space axis, time passed(moved)  $ct - vt$ . But regarding to  $S'$  system origin, about time axis, time passed(moved)  $ct$ . This is contradiction a system have different time depending on axis. So we should recognize the origin of  $S'$  system also moved  $vt$  along time axis when it moved  $vt$  along space axis.

### 4. Conclusion

From any facts, correct development of logic should take us correct facts.

From any definitions, if correct development of logic take us correct facts, such definitions should be correct.

Logic is bridge to connect facts and facts.

It takes us discovery of facts, basic rules and solving problems.

Reference

[1] viXra:1611.0077

[2] Peter Gabriel Bergmann, *Introduction to the Theory of Relativity*, (Dover  
Publication, INC 1976),p19