Letter to Professor Franco Selleri {Franco.Selleri@ba.infn.it} about absolute and relative velocities

by Zbigniew Oziewicz
Universidad Nacional Autónoma de México
Facultad de Estudios Superiores
C.P. 54714 Cuautitlán Izcalli, Apartado Postal # 25
Estado de México, oziewicz@unam.mx

Home address: Ex-Hacienda San Miguel, Calle Roble 13A
C.P. 54715 Cuautitlán Izcalli, Estado de México
oziewicz.zbigniew@gmail.com

May 2, 2011

Contents

1   Dear Professor Selleri,

Again, many, many thanks to you and to your daughter (I guess) Diana Selleri, for sending so many your important publications on Particle physics, Quantum Mechanics, and three volumes 1990-2010 of your important publications on "inertial transformations" and on "weak relativity" that reject principle of relativity and postulate preferred reference system.

Important ideas, and important discoveries, frequently have many independent authors, being rediscovered and baptized under different names.

Absolute simultaneity that you advocate, absolute velocity and 'inertial transformations' in terms of pairs of absolute velocities has been known under different names before your publications since 1994. To my knowledge the brief history is as follows.

- **1961.** Tangherlini. This reference is frequent in your publications. Postulate privileged reference system, postulate absolute simultaneity, and reject principle of relativity.

- **1977.** Stefan Marinov at least since 1977, independently advocated the same transformations, the same postulates, and they are known frequently also as the Marinov transformations., or as 'Tangherlini - Marinov'.

- **1980.** Jakub Rembieliński (I guess you meet him in Bedlewo in 1990's?) published in 1980 your 'inertial transformations' in terms of a pair of absolute velocities, under the name 'non-linear Lorentz transformations', or 'non-linear representation of the Lorentz group'.

- **1980.** Jose Vargas published during 1980 - 1986, at least **ten** papers on your 'inertial transformations' (in terms of the pair of absolute velocities relative to preferred reference) under his name of 'para-Lorentzian transformations'.

- **1994.** Franco Selleri during 1990 - 2010. In your 1997-Review on page 423 you stated that the inverse of Tangherlini transformations, and 'inertial' composition (18) was 'obtained for the first time in 1994 by Salleri'. However these formulas one can find in publications by Rembielinski in 1980, and in publications by Vargas since 1980.

References

Marinov Stefan, Eppur si Muove, Bruxelles 1977

Rembieliński Jakub, Physics Letters **A 78** (1980) 33

Selleri Franco, Velocity-simmetrizing synchronization ..., in *Waves and Particles in Light and Matter*, Plenum Press 1994

Tangherlini F., Supplemento al Nuevo Cimento **20** (1961) 1

Vargas Jose G., Critics of Mansouri and Sexl, Revista Colombiana de Fisica **14** (1) (1980) 79–89

Vargas Jose G., Para-Lorentzian mechanics, Foundations of Physics **11** Nos. 3/4 (1981) 235-278; **12** No. 8 (1982) 765-779; **12** No. 9 (1982); ...; **16** No. 12 (1986) 1231-1261

Vargas Jose G., Preferred Reference Frame ..., Foundations of Physics, 1981 - 1986

2   Inertial transformation and weak relativity

By a reference system you mean a pair of letters (x, t). A privileged inertial system you denote by (x_0, t_0). I think that it is very important to specify the meaning of these letters. Questions:

1. Do I understand (I guess) correctly that these four symbols $\{x, t, x_0, t_0\}$ denote the real valued functions on the same domain of the space-time manifold? (we can work in two dimension for simplicity). Can reader be sure that you are not concerned with a space-manifold of places (usually three-dimensional), and that one-dimensional time manifold is not a domain of 't'? Or maybe you have Space, and Time, and your spacetime is Cartesian product? What is domain of functions x and t? (if these are real valued functions). Do I guess that a symbol t is a function that associate to every event as element of spacetime a real number? Frequently I meet in your texts a phrase:

   the theory of the physics of space and time ...
   E.g. Selleri 2004, page 522

Seems that there is no concept of spacetime (without space and without time) in your publications? Do you assume the unique three-dimensional space, and unique one-dimensional time? Do your x and t possesses the common domain?

2. I consider that every physical reference system must be material, *i.e.* with non vanishing rest mass, or with some energy-momenta tensor. Your reference system (x, t) is material? or it is 'geometrical' referring to empty spacetime, or to vacuum? Do you allows empty space? Do you allows empty spacetime?

3. I guess that your spacetime (if it is accepted) do not possess a metric tensor. When you talk about rods and clocks do you mean metrics on three-dimensional Space, and metric on one-dimensional Time, but **not** metric tensor on spacetime?

4. I guess that your pair of letters, (x, t), (probably jointly with clocks and rods), by definition, is characterizing completely your reference system? How in terms of this pair of letters, (x, t), you are distinguishing the difference among inertial and non-inertial reference system? In your 1996-paper in Foundation of Physics on page 641 you wrote 'inertial system on Earth', but Earth is non-inertial?

I suppose that these four letters-symbols $\{x, t, x_0, t_0\}$ possesses clear physical meaning, probably as the coordinates of every events as seen from two different reference systems. Then the Tangherlini [1961] expressed the absolute velocity v of a system (x, t) relative to privileged system (x_0, t_0) as in your publications. The most important is the meaning of this absolute velocity.

$$R \equiv \sqrt{1 - \beta^2} \neq 0, \quad x = \frac{1}{R}(x_0 - vt_0), \quad t = Rt_0, \tag{1}$$

$$t_0 = 0 \quad \Longleftrightarrow \quad t = 0. \tag{2}$$

This enforce us to consider the two cases (events) separately.

$$
\begin{aligned}
t_0 = 0 = t \quad &\Longleftrightarrow \quad \left(\frac{v}{c}\right)^2 = 1 - \left(\frac{x_0}{x}\right)^2, \\
t_0 \neq 0 \neq t \quad &\Longleftrightarrow \quad v = \frac{x_0}{t_0} - \frac{xt}{t_0^2}.
\end{aligned}
\tag{3}
$$

The expression (3) is an arithmetic consequence of (1), and can be considered as the **definition** of the absolute velocity in terms of probably directly measured coordinates.

2.1 Lemma. Let $t_0 \neq 0 \neq t$. Eliminating the absolute velocity from (1) one can discover the following 'invariant'

$$(ct_0)^2(t_0^2 - t^2) = (t_0 x_0 - tx)^2. \tag{4}$$

2.2 Definition (Tangherlini absolute velocity)**.** Given the privileged reference system $(x_0, t_0 \neq 0)$, then the absolute velocity of arbitrary (inertial?) reference system (x, t) relative to absolute system, is **defined** as follows

$$v \equiv \frac{x_0}{t_0} - \frac{t}{t_0}\frac{x}{t_0}. \tag{5}$$

Can we recover the Tangherlini transformation (1) starting from the above Definition 2.2 of the absolute velocity?

From Definition 2.2 it follows that

$$\frac{t}{t_0}x = x_0 - vt_0, \quad R \equiv \frac{t}{t_0}. \tag{6}$$

Therefore if $t \neq 0$,

$$x = \frac{1}{R}(x_0 - vt_0). \tag{7}$$

Using Lemma 2.1, one can proof that indeed $R^2 = 1 - \beta^2$.

We proved that if $t_0 \neq 0 \neq t$, then the Tangherlini absolute velocity is EQUIVALENT to the Tangherlini transformation (1). Therefore the Definition 2.2 of the absolute velocity is fundamental for Tangherlini-Marinov-Vargas-Rembielinski-Selleri relativity.

Within the Lorentz group isometry (identified with the special relativity a la Einstein - Minkowski) we have the following definition of the Einstein speed among two reference systems, and this definition of the relative velocity is completely equivalent to the Lorentz transformations

$$\mathbf{v} = 2\left\{1 + \frac{1}{c^2}\left(\frac{\mathbf{x} - \mathbf{x}'}{t + t'}\right)^2\right\}^{-1}\left(\frac{\mathbf{x} - \mathbf{x}'}{t + t'}\right), \tag{8}$$

$$-(ct)^2 + \mathbf{x}^2 = -(ct')^2 + \mathbf{x}'^2 = -1. \tag{9}$$

Here the Lorentz invariant (9) is an analogy of (4). And the Einstein speed (8) is an analogy of the Tangherlini speed Definition 2.2.

Therefore looks like that each 'theory of relativity' can be specified completely by the very definition of the relative velocity among reference systems, and transformation of coordinates appears to be less important consequence.

3   The inertial transformations is a groupoid, and not quasigroup

In Selleri 1996 paper published in Foundations of Physics, in Section 8, you observed that 'it is not possible compose any two transformations' (each in terms of a pair of absolute velocities). Such set with associative composition but not global, has a name "groupoid". A "quasigroup" is a set with global non-associative composition. Therefore you used incorrect name "quasigroup", instead of the right one "groupoid".

4   Special relativity do NOT negate privileged reference

5   Non-uniqueness of the Lorentz boost

Every Einsteinan speed is given not by the Lorentz transformation alone as was believed dogmatically during last 100 years, and still this virus-dogma will persists next thousand years if we do not present this correctly, but for the given Lorentz transformation, changing X one can got infinite many Einsteinian speeds $v(L, X)$. The Lorentz boost $H_{L,X}$ **is not unique!**

In 2008 Emilija Celakoska in her publication confirmed my results (I am enclosing this paper). She wrote 'the statement that the Lorentz boost is unique is incorrect as was pointed by Oziewicz [2006]'. Celakoska wrote to me email that 'my paper is most important in this matter'.

At the end of Celakoska paper she wrote

> The non-uniqueness of the Lorentz boost have a significant influence on the theory of relativity as was pointed out in [Oziewicz 2006]. . . . This non-uniquennes can be considered as the primary source of the Thomas precession and a source of various SR paradoxes.
>
> Celakoska 2008, page 171

References

Celakoska Emilija G., On isometry links between 4-vectors of velocity, Novi Sad Journal of Mathematics, Volume **38** (3) (2008) 165–172

Celakoska Emilija G., Kostadin Trencevski, and Dusan Cakmakov, On Lorentz links between 4-vectors in Minkowski space, 2010

Oziewicz Zbigniew (2005) How do you add relative velocities? In: Pogosyan George S., Luis Edgar Vicent and Kurt Bernardo Wolf, Editors, **Group Theoretical Methods in Physics** (Bristol: Institute of Physics, Conference Series Number 185, ISBN 0-7503-1008-1), pages 439-444. Full version http://www.worldnpa.org/pdf/group25.pdf

Oziewicz Zbigniew (2006) The Lorentz boost-link is not unique http://www.arxiv.org, arXiv math-ph/0608062 http://www.worldnpa.org/pdf/Merida.pdf

Oziewicz Zbigniew (2007) Ternary relative velocity: astonishing conflict of the Lorentz relativity group with the relativity principle?", In: M. C. Duffy and V. O. Gladyshev, Editors, **Physical Interpretations of Relativity Theory** (Moscow: Bauman Moscow State Technical University), pp. 292–303. http://www.worldnpa.org/pdf/ternaryvelocity.pdf

Oziewicz Zbigniew (2007) Relativity groupoid instead of relativity group, International Journal of Geometric Methods in Modern Physics **4** (4) (2007) 1-11; http://www.arxiv.org, arXiv math.CT/0608770 http://www.worldnpa.org/pdf/ijgmmpOziewicz.pdf

6   Lorentz group in terms of rotation subgroups

> Any general transformation L from the Lorentz group can be written, $L = HU$ or $L = UH$.

This is truth after you chooses some rotation subgroup inside of the Lorentz group. There is no 'abstract' rotation subgroup inside of the Lorentz group! Each choice of the rotation subgroup is exactly equivalent to the choice of the extra third-observer X as I discussed this in my bad-English since 2005. Therefore your statement must read:

> Any general transformation L from the Lorentz group, after the *choice* of some rotation subgroup $SU(X)$, can be written,

$$L = H_{L,X} \circ U_X \qquad \text{or} \qquad L = U_X \circ H_{L,X}. \qquad (10)$$

In (10) the Lorentz transformation on the left is totally X-free. Instead the rotation on the right is X-dependent. Therefore the boost H depends on two independent variables, the choice of observer X and the choice of the Lorentz transformation V,

$$L = U_X \circ H_{L,X} \quad \Longrightarrow \quad L^\dagger \circ X \circ L = (H_{L,X})^2, \qquad (11)$$

$$H_{L,X} = \pm(L^\dagger \circ X \circ L)^{1/2} \qquad (12)$$

References

Penrose Roger, and Wolfgang Rindler, Spinors and Space-Time, Cambridge University Press 1984, ..., 1995.
    See Volume 1, §1.2, pages 15-21, especially page 20