Relativistic Transformations In Standard Prime Metric And/ Or Reverse Prime Metric Within Some Selected Domains Of Complementable Bounds

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Author: **Ramesh Chandra Bagadi**
Founder, Owner, Co-Director And Advising Scientist In Principal
Ramesh Bagadi Consulting LLC, Madison, Wisconsin-53715, United States Of America.
Email: rameshcbagadi@netscape.net

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Ramesh Bagadi Consulting LLC, Advanced Concepts & Think-Tank,
Technology Assistance & Innovation Center, Madison, Wisconsin-53715,
United States Of America

Abstract

In this research manuscript, the author has presented a certain scheme in which one can establish *Relativistic Connection Of Transformations Between Standard Prime Metric* [29], [30] *And/ Or Reverse Prime Metric Within Some Selected Domains Of Complementable Bounds* [22].

Theory

Firstly, we consider a supposedly *Local Reference Frame* $x_L y_L z_L$ from which some *Object Of Concern*'s motion is observed as

$$\overline{x}_L = \overline{\rho}_L(t_L) \qquad \text{Equation (1)}$$

Also, we consider another Reference Frame which we refer to as the *Global Reference Frame* $x_G y_G z_G$ from which the motion of the *Local Reference Frame* $x_L y_L z_L$ is observed as

$$\overline{x}_G = \overline{\rho}_G(t_G) \qquad \text{Equation (2)}$$

We also consider two other *Velocity Of Light Reference Frames* (i.e., these are moving at the *Speed Of Light*, but *not necessarily* in the *same directions*) called $x_{C_1} y_{C_1} z_{C_1}$ and $x_{C_2} y_{C_2} z_{C_2}$ from where the *Global Reference Frame* $x_G y_G z_G$ is observed as

$$\overline{x}_{C_1} = \overline{\rho}_{C_1}(t_{C_1}) \qquad \text{Equation (3)}$$

and

$$\overline{x}_{C_2} = \overline{\rho}_{C_2}(t_{C_2}) \qquad \text{Equation (4)}$$

respectively.

Therefore, we can write

$$\overline{x}_{C_1} = \overline{\rho}_{C_1}(t_{C_1}) + \overline{\rho}_G(t_G) + \overline{\rho}_L(t_L) \qquad \text{Equation (5)}$$

as the motion co-ordinate of the *Object Of Concern as* observed from the *Velocity Of Light Reference Frame* $x_{C_1} y_{C_1} z_{C_1}$.

Similarly, we can write

$$\overline{x}_{C_2} = \overline{\rho}_{C_2}\left(t_{C_2}\right) + \overline{\rho}_G\left(t_G\right) + \overline{\rho}_L\left(t_L\right) \qquad \textit{Equation (6)}$$

as the motion co-ordinate of the *Object Of Concern as* observed from the *Velocity Of Light Reference Frame* $x_{C_2}y_{C_2}z_{C_2}$.

One can also note that, the *Velocity Of Light Reference Frames,* $x_{C_1}y_{C_1}z_{C_1}$ and $x_{C_2}y_{C_2}z_{C_2}$ are connected by a *Rotational Operator* $\overline{R}\left(\overline{\Theta}\right)$ and also a *Translational Operator* $\overline{L}\left(\overline{l}\right)$ (the latter may be *Redundant* in some situations).

That is, we can write

$$\overline{x}_{C_2} = \overline{L}\left(\overline{l}\right)\overline{R}\left(\overline{\Theta}\right)\overline{x}_{C_1} \qquad \textit{Equation (7)}$$

Using Equation (7), one can re-write Equation (6) as

$$\overline{L}\left(\overline{l}\right)\overline{R}\left(\overline{\Theta}\right)\overline{x}_{C_1} = \overline{\rho}_{C_2}\left(t_{C_2}\right) + \overline{\rho}_G\left(t_G\right) + \overline{\rho}_L\left(t_L\right) \qquad \textit{Equation (8)}$$

We now subtract Equation (5) from Equation (8) and get

$$\left\{\overline{L}\left(\overline{l}\right)\overline{R}\left(\overline{\Theta}\right) - \mathbf{1}\right\}\overline{x}_{C_1} = \left\{\overline{\rho}_{C_2}\left(t_{C_2}\right) + \overline{\rho}_G\left(t_G\right) + \overline{\rho}_L\left(t_L\right)\right\} - \left\{\overline{\rho}_{C_1}\left(t_{C_1}\right) + \overline{\rho}_G\left(t_G\right) + \overline{\rho}_L\left(t_L\right)\right\} \qquad \textit{Equation (9)}$$

where $\mathbf{1}$ is an *Identity Operator*.

Using Equation (9) one can write

$$\overline{x}_{C_1} = \left[\left\{\overline{L}\left(\overline{l}\right)\overline{R}\left(\overline{\Theta}\right) - \mathbf{1}\right\}\right]^{-1}\left\{\overline{\rho}_{C_2}\left(t_{C_2}\right) + \overline{\rho}_G\left(t_G\right) + \overline{\rho}_L\left(t_L\right)\right\} - \left\{\overline{\rho}_{C_1}\left(t_{C_1}\right) + \overline{\rho}_G\left(t_G\right) + \overline{\rho}_L\left(t_L\right)\right\} \qquad \textit{Equation (10)}$$

Where the -1 in the exponent term of $\left[\left\{\overline{L}\left(\overline{l}\right)\overline{R}\left(\overline{\Theta}\right) - \mathbf{1}\right\}\right]^{-1}$ denotes simply an *Inverse* of $\left\{\overline{L}\left(\overline{l}\right)\overline{R}\left(\overline{\Theta}\right) - \mathbf{1}\right\}$.

We now enforce the *Restriction* that

$$\dot{\overline{x}}_{C_1} \leq c \qquad \textit{Equation (11)}$$

which is the *Speed Of Light*. One should note that the *Differentiation* must be carried out with respect to some *Time Co-ordinate* t_L as shown below

$$\frac{d}{dt_L}\left(\bar{x}_{C_1}\right) \le c \qquad \textit{Equation (12)}$$

i.e.,

$$\frac{d}{dt_{C_1}}\frac{dt_{C_1}}{dt_G}\frac{dt_G}{dt_L}\left(\bar{x}_{C_1}\right) \le c \qquad \textit{Equation (13)}$$

Now, one can render the above, algebraically, in a Certain *Prime Metric* (of some desired *Order Space*) [1], [2], [24], [29], [30] of concern. Furthermore, one can construct a corresponding *Reverse Direction Prime Metric Metric* (of some desired *Order Space*) within some desired *Selected Domains* of the *Complementable Bounds* [22] offered by the *Prime Metric* (of some desired *Order Space*) of concern. From such relations, one can see the desired *Relativistic Connection (Transformation)* therein.

Conclusion

One can note that a *Similar Analysis* can be conducted for *Rotational Co-ordinates* $\bar{\theta}_L$ and $\bar{\theta}_G$. Also, one can solve the aforementioned *Relativistic Transformations* for *Asymmetric Spins* of $x_L y_L z_L$ and $x_G y_G z_G$. For the accurate *Time Dependent Analysis* of this case, one should consider the *Cumulative Instantaneous Moment Of Inertia* (see author's work on the same).

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