

## Boson Progressions

Charles Keyser

3/16/2024

[Working Document](#)

[The Relativistic Unit Circle](#)

The general expression for an invariant boson is that of a prime number, where

$(ct) = (ct) \left( \frac{ct}{ct} \right) = (ct)(1_{ct})$  where  $(ct)$  can be interpreted as:

1.  $c$  is interpreted as “ruler creation rate”,  $t$  as “ruler creation time” so that  $\lambda = ct$  is interpreted as “ruler” length.
2.  $c$  is interpreted as “force creation rate”,  $t$  as “force creation time”, so that  $f = ct$  is interpreted as a force.
3.  $c$  is interpreted as a velocity,  $t$  is interpreted as time, so that  $x = ct$  is the relation between space and time.

The transition expression  $(ct') = (ct) \pm (vt')$ ,  $0 \leq vt' \leq ct$  expresses the transition from the initial state  $(ct)$  where  $vt' = 0$  to a final state  $2(ct)$  where  $vt' = ct$ . The initial state can be expressed as  $ct' = ct$  where  $t' = t$ . The transition expression can also be expressed as:

$$ct' = (ct) \cos(\theta) + (vt') \sin \theta, \quad 0 \leq \theta \leq \frac{\pi}{4}$$

In the first order expression,  $[(ct) \cos(\theta)] \vec{i}$  and  $[(vt') \sin \theta] \vec{j}$  represent non-interacting vectors,

$$\text{where } (ct') := \text{Tr} \begin{vmatrix} (ct) \cos(\theta) & 0 \\ 0 & (vt') \sin \theta \end{vmatrix}$$

$$\text{For the initial state } vt' = 0, \text{ so } (ct') := \text{Tr} \begin{vmatrix} (ct) \cos(\theta) & 0 \\ 0 & 0 \end{vmatrix} = \text{Tr} |(ct) \cos(\theta)| = (ct) \cos(\theta), \quad v = 0, \quad t' = t$$

For the final state  $vt' = ct$ , so that

$$(ct') := Tr \begin{vmatrix} (ct) \cos(0) & 0 \\ 0 & (ct) \sin(\frac{\pi}{4}) \end{vmatrix} = (ct) \cos(0) + (ct) \sin\left(\frac{\pi}{4}\right)$$

$$= (ct) \cos(0) + (ct) \cos(0) = 2(ct) \cos(0), v = 2c, t' = t$$

However, the vectors  $[(ct) \cos(0)]\vec{i}$  and  $[(vt') \sin \theta]\vec{j}$  are affine, meaning they have no common origin, so the vector “dot” product  $[(ct) \cos(0)][(vt') \sin \theta](\vec{i} \cdot \vec{j}) = 0$  and the vector cross product

$$\begin{vmatrix} [(ct) \cos(0)] & 0 & 0 \\ 0 & [(vt') \sin \theta] & 0 \\ 0 & 0 & 0 \end{vmatrix} \Rightarrow [(ct) \cos(0)] \otimes [(vt') \sin \theta] \Rightarrow \begin{vmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & [(ct) \cos(0)][(vt') \sin \theta] \end{vmatrix}$$

replaces the additive relation  $(ct') = Tr \begin{vmatrix} (ct) \cos(0) & 0 \\ 0 & (ct) \sin(\theta) \end{vmatrix}$  with the multiplicative relation

$$(ct') = Tr \begin{vmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & [(ct) \cos(0)][(vt') \sin \theta] \end{vmatrix} = [(ct) \cos(0)][(vt') \sin \theta] \text{ where the “interactive”}$$

product is specified, but not the “existence” sum is zero.

In order that both the existing elements and their interaction be expressed, the “equal and opposite” resulting force must be expressed as:

$$(ct')^2 = ((ct) \cos(0) + (vt') \sin \theta)^2 = [(ct)^2 + \{(vt') \sin \theta\}^2] + [2(ct)\{(vt') \sin \theta\}] \text{ where}$$

$$[(ct)^2 + \{(vt') \sin \theta\}^2] \text{ represents the existence of the interacting terms and } [2(ct)\{(vt') \sin \theta\}]$$

represents their interaction. Note that the interaction term

$$[2(ct)\{(vt') \sin \theta\}] = 4 \left[ \frac{1}{2} \{(ct)(vt') \sin \theta\} \right] \text{ characterizes the total area of the included triangles in all}$$

four quadrants of the [RUC](#) where  $-\sin(\theta) = \sin(-\theta) = \sin|\theta| = |\sin \theta|$  so that each of the quadrants add an increasing or decreasing contribution. For an increasing contribution, the rotation is ccw in q(I) and q(III) and cw in q(II) and q(IV). Similarly, for a decreasing contribution, the rotation is cw in q(I) and q(III) and ccw in q(II) and q(IV)

The general transition for a single integer increment is from  $\# = n$  to  $\# = m = n \pm 1$ ,  $n \geq 2$ . At each integer, there is no interaction, so that each integer step represents a boson (as a prime number).

For the general case, note that every number is prime relative to its own base:

$$n = n \binom{n}{n} = n(1_n) \quad \text{so that every even number is the sum of two primes:}$$

$$n + n = 2n \quad (\text{Goldbach's conjecture}).$$

Because  $|\sin \theta| = \left| \frac{d \cos \theta}{d\theta} \right|$  is continuous, the transitions are continuous.

Finally, assigning all transition elements to one "dimension" results in:

$$\begin{aligned} (ct') \vec{i} &= (ct) \cos(0) \vec{i} + (vt') \sin \theta \vec{i} \\ (ct')^2 (\vec{i} \cdot \vec{i}) &= \left[ (ct)^2 + \{(vt') \sin \theta\}^2 \right] (\vec{i} \cdot \vec{i}) + [2(ct) \{(vt') \sin \theta\}] (\vec{i} \cdot \vec{i}) \\ (ct')^2 (1)^2 &= \left[ (ct)^2 + \{(vt') \sin \theta\}^2 \right] (1)^2 + [2(ct) \{(vt') \sin \theta\}] (1)^2 \\ (ct')^2 &= \left[ (ct)^2 + \{(vt') \sin \theta\}^2 \right] + [2(ct) \{(vt') \sin \theta\}] \end{aligned}$$

Dividing the latter by  $(ct)^2$  results in the expression of addition of an element from an initial condition:

$$\frac{(ct')^2}{(ct)^2} = \left[ 1_{(ct)^2} + \left\{ \left( \frac{vt'}{ct} \right) \sin \theta \right\}^2 \right] + \left[ \frac{2(ct) \{(vt') \sin \theta\}}{(ct)^2} \right]$$

The complete transition from  $n = n$  to  $m = n + 1$  is given by

$$\begin{aligned} (\gamma)^2 (4(1_{c^2})) &= \left[ 1_{(ct)^2} + \{(\beta\gamma) \sin \theta\}^2 \right] + [2(1_{ct}) \beta\gamma \sin \theta], \quad \gamma := \frac{t'}{t}, \beta = \frac{v}{c}, \theta = \frac{\pi}{4}, \frac{3\pi}{4} \\ &\equiv 4(1^2) = (1+1)^2 = [(1)^2 + (1)^2] + [2(1)(1)] \\ &= [(1)^2 + (1)^2] + [2(1)^2] \end{aligned}$$

$$m(ct)^2 = (n+1)(ct)^2, \quad m = n+1$$

$$m(ct')^2 = (n+1)(ct')^2, \quad m = n+1, \quad t' = t$$

These steps can be incremented or decremented as diagonal elements in a matrix, with the interacting terms collapsing two dimensions into one during the transition with the integer result increasing the trace of the matrix (and thus its dimension) at the integer waypoints.

$$\begin{aligned}
(ct')^2 &= \text{Tr} \begin{vmatrix} 1_{(ct)^2} & 0 \\ 0 & \{(\beta\gamma)\sin\theta\}^2 \end{vmatrix} + \text{Det} \begin{vmatrix} 1_{(ct)} & 1_{(ct)} \\ -\{(\beta\gamma)\sin\theta\} & \{(\beta\gamma)\sin\theta\} \end{vmatrix} \\
&= \left[ 1_{(ct)^2} + \{(\beta\gamma)\sin\theta\}^2 \right] + \left[ 2(1_{(ct)})\beta\gamma\sin\theta \right], \quad \gamma := \frac{t'}{t}, \quad \beta = \frac{v}{c}, \quad \theta = \frac{\pi}{4}, \frac{3\pi}{4}
\end{aligned}$$

Complex Numbers