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Incorporation of Bondi K–factor into Exponential Function, and Some Related Problems

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This study investigated the incorporation of Bondi K–factor into exponential function, and some related problems. The results obtained were as follows. The incorporation of Bondi K–factor suggested another description of exponential function and of Euler's formula. The incorporation into Euler's formula of Bondi K–factor under the condition of $v \to \infty$ led to '$\boldsymbol{i}$ to the power of $\boldsymbol{i}$', namely many–valued function described by powers of 10. Mysterious wave phenomena described using complex numbers were discussed using the mysterious imaginary unit breaking Lorentz factor. Hypothetic relationships among some natural phenomena were suggested. This study suggested a possibility of incorporating Bondi K–factor into exponential function in both real and complex numbers.

Key words: Bondi K–factor, Euler's formula, exponential function, imaginary unit, wave–matter

INTRODUCTION

There are many studies that relate Bondi K–factor (Bondi, 1964) to exponential function. Shimojo (2011a, 2011b) and Shimojo and Nakano (2012, 2013a, 2013b) also investigated the relationship between exponential function and Bondi K–factor. However, there still remains investigation to be done from other different viewpoints.

The present study investigated the incorporation of Bondi K–factor into exponential function, and some related problems.

BONDI K–FACTOR INCORPORATION INTO EXPONENTIAL FUNCTION

Incorporation of Bondi K–factor into exponential function

Relating hyperbolic function to Lorentz factor gives expression (1) that connects Bondi K–factor (Bondi, 1964) and exponential function,

$$\exp(\theta) = \sqrt{\frac{1 + v/c}{1 - v/c}}\ , \tag{1}$$

where $0 \leq \theta < \infty$, v = velocity of matter, c = speed of light in vacuum, $0 \leq v < c$.
Does expression (1) seem to suggest a hypothesis that exponential function and Bondi K–factor come out simultaneously and need the mutual existence (coexistence of expansion and motion)? The following are relationships to differential equations,

$$\frac{df(\theta)}{d\theta} = f(\theta) \rightarrow f(\theta) = \exp(\theta), \tag{2–1}$$

$$\frac{dg(v)}{dv} = \frac{1}{c}\left(\frac{1}{\sqrt{1-(v/c)^2}}\right)^2 g(v)$$

$$\rightarrow g(v) = \sqrt{\frac{1 + v/c}{1 - v/c}}\ . \tag{2–2}$$

Incorporating Bondi K–factor into exponential function gives,

$$\exp(\theta) = \exp\left(\ln\sqrt{\frac{1 + v/c}{1 - v/c}}\right), \tag{3}$$

where ln = natural logarithm.
Expression (3) seems to suggest another description of exponential function.

The replacement of $\exp(\theta)$ by $\exp(rt)$ suggested by Shimojo and Nakano (2012, 2013b) will rewrite expression (3) as follows,

$$\exp(rt) = \exp\left(\ln\sqrt{\frac{1 + v/c}{1 - v/c}}\right), \tag{4}$$

where r = relative growth rate, t = time.
Does expression (4) seem to suggest a hypothesis that light, space, time, matter and motion come out simultaneously and the kinetic energy has something to do with the space expansion? If so, does the state of $v \approx c$ have something to do with the exponential expansion of space in a very short period of time? Those hypotheses will be severely criticized or disregarded.

Incorporation of Bondi K–factor into Euler's formula

Incorporating Bondi K–factor into Euler's formula (5) gives expression (6),

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$$\exp(\boldsymbol{i}\theta) = \cos\theta + \boldsymbol{i}\sin\theta\,, \qquad (5)$$

$$\exp(\boldsymbol{i}\theta) = \exp\left(\boldsymbol{i}\ln\sqrt{\frac{1+v/c}{1-v/c}}\right)$$

$$= \cos\left(\ln\sqrt{\frac{1+v/c}{1-v/c}}\right) + \boldsymbol{i}\sin\left(\ln\sqrt{\frac{1+v/c}{1-v/c}}\right), \qquad (6)$$

where $\boldsymbol{i}$ = imaginary unit.
Expression (6) seems to suggest another description of Euler's formula.

As suggested previously (Shimojo and Nakano, 2013a, 2013b), expression (7) also seems to suggest another description of Euler's formula,

$$\exp(\boldsymbol{i}\,\theta) = \left(\sqrt{\frac{1+v/c}{1-v/c}}\right)^{\boldsymbol{i}}. \qquad (7)$$

Incorporation into Euler's formula of Bondi K–factor under the condition of $v \to \infty$

The incorporation into Euler's formula of Bondi K–factor under the condition of $v \to \infty$ leads to '$\boldsymbol{i}$ to the power of $\boldsymbol{i}$' (8) that is many–valued function (9) described by powers of 10,

$$\exp\left(\left(\pm\lim_{v\to\infty}\left(\sqrt{\frac{1+v/c}{1-v/c}}\right)\right)\cdot\ln\left(\lim_{v\to\infty}\left(\sqrt{\frac{1+v/c}{1-v/c}}\right)\right)\right)$$

$$= \exp((\pm\,\boldsymbol{i})\cdot\ln(\boldsymbol{i}))$$

$$= \boldsymbol{i}^{\pm\boldsymbol{i}} \qquad (8)$$

$$= \exp\left(\mp\left(\frac{1}{2}+2n\right)\pi\right). \qquad (9)$$

Does this seem to suggest a hypothetic relationship to physical constants described by powers of 10, apart from their dimensions? Those hypotheses will be severely criticized or disregarded.

Mysterious imaginary unit

The imaginary unit is a mysterious number that is essential to complex numbers. The wave function described using complex numbers suggests the simultaneous existence of two different states or the nonlocal correlation between two different states. These two mysterious phenomena might look like the phenomenon suggested by hypothetic expression (10),

$$v = \frac{x_2 - x_1}{t_1 - t_1} = \frac{x_2 - x_1}{0} = \infty. \qquad (10)$$

As suggested previously (Shimojo, 2011a, 2011b; Shimojo and Nakano, 2013a, 2013b), expression (10) might be associated with expression (11) that hypothetically relates $v \to \infty$ to $\boldsymbol{i}$,

$$\lim_{v\to\infty}\left(\sqrt{\frac{1+v/c}{1-v/c}}\right) = \lim_{v\to\infty}\left(\sqrt{\frac{c/v+1}{c/v-1}}\right)$$

$$= \sqrt{-1} = \boldsymbol{i}. \qquad (11)$$

However, expressions (10) and (11) are prohibited from coming out because of breaking Lorentz factor, which might be a mathematical phenomenon that is not observed actually. If based on expression (11), does the right–hand side of expression (7) show a contradiction because of including both Bondi K–factor ($0 \leq v < c$) and $\boldsymbol{i}$ ($v \to \infty$) or including both matter and wave?

$$\exp(\boldsymbol{i}\,\theta) = \left(\sqrt{\frac{1+v/c}{1-v/c}}\right)^{\boldsymbol{i}}. \qquad (7)$$

Therefore, those hypotheses suggested will be severely criticized or disregarded.

Hypothetic relationships among some natural phenomena

The following are hypothetic relationships among some natural phenomena that include just playing with expressions,

$$0 = 1 + \boldsymbol{i}^2, \qquad (12)$$

$$= 1 + \exp(\boldsymbol{i}\,\pi), \qquad (13)$$

$$= 1 + \frac{\boldsymbol{i}(xp - px)}{\hbar}, \qquad (14)$$

$$= 1 + \left(\boldsymbol{i}\hbar\frac{\partial\psi}{\partial t} - \mathrm{V}\psi\right) \Big/ \left(\frac{\hbar^2}{2m}\frac{\partial^2\psi}{\partial x^2}\right), \qquad (15)$$

$$= 1 + \frac{\sqrt{m^2c^4 + p^2c^2}}{-\sqrt{m^2c^4 + p^2c^2}}, \qquad (16)$$

$$= 1 + \frac{G_{\mu v} - \kappa T_{\mu v}}{\Lambda g_{\mu v}}, \qquad (17)$$

$$= 1 + 12\zeta(-1), \qquad (18)$$

$$= 1 + \left(\frac{1+\sqrt{5}}{2}\right)\left(\frac{-1}{(1+\sqrt{5})/2}\right), \qquad (19)$$

Those hypotheses suggested will be severely criticized or disregarded.

Conclusions

The present study suggests a possibility of incorporating Bondi K–factor into exponential function in both real and complex numbers.

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