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Relativistic Behaviour of Distance and Time in Heracletean world (from Philosophy to Physics)

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Abstract: *In this paper one tries to explain the relativistic behaviour of the distance and time in Heracletean world described by the force model $F = dp/dt + d(k/p)/dt$.Then −points-disintegrationis proposed to be the cause for the relativistic consequences. It makes available the imaginary energy $-\sqrt{k(lnk-1)}c$needed for the transformation of the infinite imaginary distance $\pm\infty\, x\, i$between neighbour points into the finite imaginary one $s_n = -G\frac{\sqrt{k(lnk-1)}}{n\ x\ c^3}$. The latter can be passed by the imaginary speed $v_i = \frac{c}{\sqrt{(lnk-1)}}$ in the positive real time$t_n = -G\frac{\sqrt{k}(lnk-1)}{n\ x\ c^4} > 0$where G, k, c and $n$denote the gravitational constant, energy-mass equivalence constant, dynamic constant, and number of points-disintegration, respectively. The shortest absolute so-called intra-points distance $|s_n|$ and intra-points time $t_n$in the altered frame of the mass body is expected to be achieved at the maximal mass-equivalent$m_{max} = \frac{\sqrt{e^{\frac{m_0^2c^2}{k}+1}-k}}{c}$ which is of the self-mass $m_0$dependent. Consequently in the frame of ground circumstances the absolute intra-points distance should be relatively longer and intra-points time to become relatively longer should run faster.*

Keywords: *Philosophy and Physics, Heracletean and classic relativistic dynamics, point disintegration, intra-points distance and intra-points time, gravitational constant, dynamics constant, energy-mass equivalence constant, imaginary inner-mass and self-mass, maximal mass equivalent, super relativistic speed.*

1. The Intra-Points Distance and Intra-Points Time between Whole Points

Geometrically a point is an exact dimensionless place not a thing.[1] For the purpose of this paper – dealing with Heracletean world [2], [3], [4], {5}–the point is defined as a place with a physical connotation. That is: *"The point is a physical body with the zero mass-equivalent $m = 0$ and finite momentum $p = \sqrt{k}$having no real size but possesses the imaginary self-mass $m_0 = \frac{\sqrt{k(lnk-1)}}{c}$ coming from elsewhere with the infinite speed $v = \infty$ where c and k means the energy-mass equivalence constant and dynamic constant, respectively."* Using the relation between the inner-mass m_{inner} and self-massm_0, i.e.:$m_{inner}\, c^2 = c\sqrt{k(1-lnk)+m_0^2c^2} - m_0c^2$[2] the inner-mass of the pointm_{inner} is given:

$$m_{inner} = -m_0 = -\frac{\sqrt{k(lnk-1)}}{c} \quad (1)$$

The mass-equivalent of the point m is thus the zero-sum of the imaginary constituents: inner-massm_{inner} and self-massm_0:

$$m = m_{inner} + m_0 = 0. \quad (2)$$

Using the equation $p_{max} = \sqrt{e^{\frac{m_0^2c^2}{k}+1}}$[4], [5]the maximal momentum of the point is given:

$$p_{max} = \sqrt{k}. \quad (4)$$

Using the equation $p_{min} = \frac{k}{p_{max}}$[2]the minimal momentum of the point is given:

$$p_{min} = \sqrt{k}. \quad (5)$$

Both extreme moment a p_{min} *and* p_{max} are identical and according to the equation $k = p_{min}\, x\, p_{max}$ [2]equal the ground momentum $p = \sqrt{k}$ so no other momentum of the point is possible:

$p_{min} = p_{max} = p = \sqrt{k}$. (6)

According to the relation $v = \frac{p}{m}$ at the constant mass equivalent m also no other speed of the point than $v = \infty$ is possible:

$v_{min} = v_{max} = v = \infty$. (7)

The point is an inexhaustible source of points since the zero mass-equivalent $m = 0$ can be divided to an arbitrary number n of zero mass-equivalents:

$m = n\ x\ 0 = 0, \quad n\epsilon\mathrm{N}$. (8)

No energy $E^{maintenace} = \pm 0\ x\ m_0c^2$ is needed to be input neither output for the maintenance of the distance between neighbour points, so according to Newton gravitational law the so-called intra-points distance is $\pm$infinite imaginary:

$$\pm 0\ x\ m_0c^2 = E^{maintenance} = G\frac{m_0\ x\ m_0}{s} \rightarrow s = \pm\infty\ x\ i. \quad (9)$$

Here m_0 is the self-mass of the point, s is the intra-points distance after the zero input-output of the imaginary energy $E^{maintenance} = \pm 0\ x\ m_0c^2$ and G is the gravitational constant.

The infinite imaginary intra-points distance between whole points is passed with the infinite speed $v = \infty$ in an arbitrary imaginary intra-points time:

$$t = \frac{s}{v} = \frac{\pm\infty\ x\ i}{\infty} \in (\mathbb{R}\ x\ i). \quad (10)$$

The real intra-points time between the whole points does not exist:

$t \in \mathbb{R} = 0$. (11)

Then the real time between any non-neighbour points does not exist, too, since it is n-multiple of that time:

$t = n\ x\ 0 = 0, \quad n\epsilon\mathrm{N}$. (12)

If time is not real but only arbitrary imaginary, clocks can measure nothing useful in such a world consisting of only whole points.

2. The Point Disintegration

Although the point as a whole cannot be divided to smaller (lighter) points it can be disintegrated to its imaginary constituents(2), i.e. inner-mass$m_{inner} = -\frac{\sqrt{k(lnk-1)}}{c}$ and self-mass$m_0 = \frac{\sqrt{k(lnk-1)}}{c}$:

$$0 = -\frac{\sqrt{k(lnk-1)}}{c} + \frac{\sqrt{k(lnk-1)}}{c}. \quad (13)$$

Apparently nothing changes so far in this process since the released imaginary self-mass m_0 gaining the imaginary speed $v_i = \frac{c}{\sqrt{(lnk-1)}}$ conserves the momentum $p = \sqrt{k}$ as follows:

$$p = mv_i = \frac{\sqrt{k(lnk-1)}}{c}\ x\ \frac{c}{\sqrt{(lnk-1)}} = \sqrt{k}. \quad (14)$$

The number of points is arbitrary many and the number of point-disintegrations can be consequently arbitrary many, too.

2.1. The N-Points Disintegration

After the $n-$points disintegration the inner energy $n\ x\ (-m_0c^2)$ is released from the points and put between them, i.e.$E_{released} = E_{input} = n\ x\ (-m_0c^2)$. Then the distance between neighbour points, let us call it intra-points distance denotings_n, according to Newton gravitational law is the next:

$$s_n = G\frac{m_0\ x\ m_0}{E_n^{input}} = G\frac{m_0\ x\ m_0}{n\ x\ (-m_0c^2)} = -G\frac{m_0}{n\ x\ c^2}. \quad (15)$$

Having in mind $m_0 = \frac{\sqrt{k(lnk-1)}}{c}$ the next expression is given:

$$s_n = -G\frac{\sqrt{k(lnk-1)}}{n\ x\ c^3} < 0\ x\ i. \tag{16}$$

The intra-points distance between disintegrated points is negative imaginary and is inversely proportional to the number of disintegrations n.The more points disintegrated the shorter the absolute intra-points distance$|s_n|$.It is passed by the imaginary speed $v_i = \frac{c}{\sqrt{(lnk-1)}}$ in the positive real time:

$$t_n = \frac{s_n}{v_i} = \frac{-G\frac{\sqrt{k(lnk-1)}}{n\ x\ c^3}}{\frac{c}{\sqrt{(lnk-1)}}} = -G\frac{\sqrt{k}(lnk-1)}{n\ x\ c^4} > 0. \tag{17}$$

The intra-points time t_n– regarded as the time in which a point could meet the neighbour point – is inversely proportional to the number of disintegrations n and is directed forward.The more points disintegrated the shorter the intra-points time. It implies that Heracletean world needs some sacrifice for the birth of time. That is, at least one single disintegration of point. If the sacrifice is too great the time's withered.

2.2. The Single-Point Disintegration

After the single-point disintegration according to the relation $(16)$the absolute intra-points distance $\lfloor s_1 \rfloor$ becomes the longest amongst the finite ones since:

$$\lfloor s_1 \rfloor = \left| -G\frac{\sqrt{k(lnk-1)}}{1\ x\ c^3} \right| > s_{n+1} = \left| -G\frac{\sqrt{k(lnk-1)}}{(n+1)\ x\ c^3} \right|, \qquad for\ n \in \mathbb{N}. \tag{18}$$

According to the relation $(17)$the corresponding intra-points time $t_1$is the longest, too, since:

$$t_1 = -G\frac{\sqrt{k}(lnk-1)}{c^4} > t_{n+1} = -G\frac{\sqrt{k}(lnk-1)}{(n+1)\ x\ c^4}, \qquad for\ n \in \mathbb{N}. \tag{19}$$

2.3. The Infinite-Points Disintegration

After the hypothetical infinite-points disintegration according to the relation $(16)$the absolute distance between points $\lfloor s_\infty \rfloor$shrinks to zero and becomes the shortest amongst the finite ones:

$$|s_\infty| = |0 - 0i| = 0. \tag{20}$$

According to the relation (17) the corresponding intra-points time $t_\infty$is the shortest, too, and stops running since:

$$t_\infty = 0. \tag{21}$$

Clocks can measure nothing in such a world consisted of the only disintegrated points in comparison with the world consisted of the only whole points$(12\ )$where clocks are able to measure something but nothing real and useful.

2.4. The Intra-Points distance Ratio and Intra-Points time Ratio

The arbitrary intra-points distance$s_n$can be expressed$(16)$with the longest intra-points distance achieved at the single-point disintegration s_1:

$$s_n = \frac{1}{n}s_1. \tag{22}$$

Since $t = \frac{s}{v}$ the same pattern is applied for the time. The arbitrary intra-points time $t_n$can be expressed$(17)$with the longest intra-points time achieved at the single-point disintegration t_1:

$$t_n = \frac{1}{n}t_1. \tag{23}$$

The inverse number of disintegrated points $\frac{1}{n}$then equals the intra-points distance ratio as well as the intra-points time ratio:

$$\frac{1}{n} = \frac{s_n}{s_1} = \frac{t_n}{t_1}. \quad (24)$$

2.5. The Intra-Points Distance Ratio, Intra-Points time Ratio and Mass-Equivalents Ratio

Let us assume that the inner energy of the point could be released because of the interaction between the mass equivalents of an arbitrary mass body and point(s) in a way that the number of disintegrations n is proportional to the mass-equivalent $m$of the mass-body. Then the inverse number of disintegrated points $\frac{1}{n}$ equals the inverse mass-equivalents ratio$\frac{m_{ground}}{m_n}$so applying the relation(24) holds:

$$\frac{s_n}{s_1} = \frac{t_n}{t_1} = \frac{1}{n} = \frac{m_{ground}}{m_n}. \quad (25)$$

The intra-points distance ratio $\frac{s_n}{s}$ and intra-points time ratio$\frac{t_n}{t_1}$equal the inverse number of point disintegrations$\frac{1}{n}$as well as the inverse mass-equivalents ratio$\frac{m_{ground}}{m_n}$.Here m_{ground} denotes the mass-equivalent of the mass body in the ground state$[2]$:

$$m_{ground} = \frac{\sqrt{k(1 - lnk) + m_0 c^2}}{c}. \quad (26)$$

And m_n is the mass-equivalent in the circumstances of an arbitrary composed kinetic energy$[2]$:

$$m_n^2 v^2 = e^{\frac{m_0^2 c^2 + m_n^2 (v^2 - c^2)}{k}}. \quad (27)$$

2.6. The Intra-Points Distance and Intra-Points Time Ratio in the Ground Circumstances

In the ground circumstances$[2]$ where the mass-equivalent possesses the minimal value $m_n = m_{ground}$ the inverse mass-equivalents ratio$\frac{m_{ground}}{m_n}$is the greatest and unique so the inverse number of disintegrations$\frac{1}{n}$as well as the intra-points distance ratio$\frac{s_n}{s_1}$ and intra-points time ratio$\frac{t_n}{t_1}$should be the greatest and unique, too:

$$1 = \frac{m_{ground}}{m_n} = \frac{1}{n} = \frac{s_n}{s_1} = \frac{t_n}{t_1}. \quad (28)$$

There's no intra-points distance change neither intra-points time change in the ground circumstances since $s_1 = s_n$ and $t_1 = t_n$. The same is true without exception for an empty space since points possessing zero mass-equivalents may exist only in the ground circumstances(6).

2.7. The Smallest Intra-Points Distance Ratio and Intra-Points Time Ratio

In the maximal mass-equivalent circumstances$[2]$ where the mass-equivalent possesses the maximal value $m_n = m_{max}$ the inverse mass-equivalent ratio$\frac{m_{ground}}{m_{max}}$ is the smallest so the inverse number of disintegrations$\frac{1}{n}$ as well as the intra-points distance ratio$\frac{s_n}{s_1}$ and intra-points time ratio $\frac{t_n}{t_1}$ should be the smallest, too:

$$1 \geq \frac{m_{ground}}{m_{max}} = \frac{1}{n_{max}} = \frac{s_{min}}{s_1} = \frac{t_{min}}{t_1} \geq 0. \quad (29)$$

Let us recall the value of the maximal mass-equivalent m_{max} which is of the self-mass$m_0$of the mass body dependent$[4], [5]$:

$$m_{max} = \frac{\sqrt{e^{\frac{m_0^2 c^2}{k} + 1} - k}}{c}. \quad (30)$$

The smallest inverse number of disintegrations$\frac{1}{n_{max}}$as well as the smallest intra-points distance ratio $\frac{s_{min}}{s_1}$ and intra-points time ratio$\frac{t_{min}}{t_1}$of the mass body is then expected to be the next:

$$\frac{1}{n_{max}} = \frac{s_{min}}{s_1} = \frac{t_{min}}{t_1} = \frac{m_{ground}}{m_{max}} = \frac{\frac{\sqrt{k(1-lnk) + m_0^2 c^2}}{c}}{\frac{\sqrt{e^{\frac{m_0^2 c^2}{k}+1} - k}}{c}} = \sqrt{\frac{k(1 - lnk) + m_0^2 c^2}{e^{\frac{m_0^2 c^2}{k}+1} - k}} \quad (31)$$

It can be examined that the smallest– zero – ratiois achieved by the infinite self-mass$m_0 = \infty$; and the greatest – unique– one by the self-mass of the point $m_0 = \frac{\sqrt{k(lnk-1)}}{c}$.

2.8. The Intra-Points Distance and Intra-Points Time Ratio at the Non-Super-Relativistic Speed

At the non-super-relativistic speed, i.e. the speed being less but not too close to the energy-mass equivalence constant c,the inverse number of point disintegrations$\frac{1}{n}$can be expressed with the next approximate formula[4], [5]:

$$\frac{1}{n} = \frac{s_n}{s_1} = \frac{t_n}{t_1} = \frac{m_{ground}}{m_n} \approx \frac{m_0}{\frac{m_0}{\sqrt{1-\frac{v^2}{c^2}}}} = \sqrt{1-\frac{v^2}{c^2}}, \ for \ v < c. \tag{32}$$

At the low speed$\frac{v}{c} \approx 0$the inverse number of the point disintegrations $\frac{1}{n}$ as well as the intra-points distance ratio$\frac{s_n}{s_1}$ and intra-points time ratio$\frac{t_n}{t_1}$is unique since the number of disintegrations should be a natural number. The shrinkage is quantized so the first one is expected to happen at $n = 2$ and consequently at the speed $v \approx \frac{\sqrt{3}}{2}c$.

2.9. The Predicted Value of the Greatest Intra-Point Time

Respecting from the gamma ray delay predicted dynamic constant $k = 6 \ x \ 10^{-46} kg^2 m^2 s^2$[5] and applying the equation (17) the predicted value of the longest intra-point time in Heracletean world is given:

$$t_{max} = t_1 \approx 2 \ x \ 10^{-65} s. \tag{33}$$

In the macroscale the concerned time should be regarded as the time-unit in the ground circumstances of any mass body including the point defined as an exact place with the physical connotation.

3. Conclusion Remarks

Some sacrifice should be done in the form of point-disintegration in Heracletean world for the intra-points distance to become finite imaginary and intra-points time to begin to run. The absolute intra-points distance$|s_n|$as well as intra-points time $t_n$shrinks with the increase of the point disintegrations n.At the infinite point disintegrations the distance should become zero and the time would stop running again. In this paper the point disintegrations are related to the mass-equivalent of the mass body $m^2v^2 = e^{\frac{m_0^2c^2+m^2(v^2-c^2)}{k}}$ and as a result the quantized Heracletean relativistic dynamics is given. At the ordinary relativistic speeds not too close to the energy-mass equivalence constant c the concerned dynamics approximately transforms to the classic relativistic dynamics. At the super relativistic speeds for the finite self-masses $m_0$only the limited shrinkage of absolute intra-points distance and intra-points time is allowed in the altered frame.

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Dedication

This fragment is dedicated to my parents: mother Regina† and father Janez†.

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