Nokton Theory

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Abstract

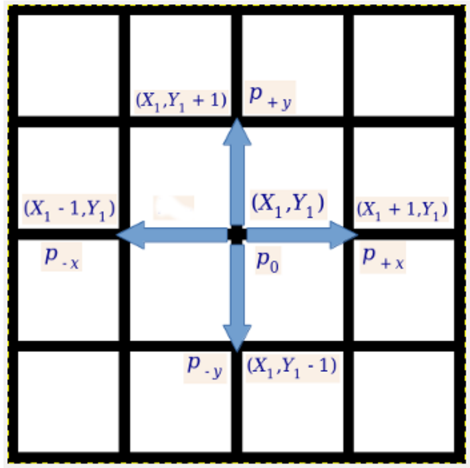
It is a new theory based on an algorithmic approach. Its only element is called nokton. These rules are precise. The infinities are completely absent whatever the system studied. It is a theory with discrete space and time. The theory is only at these beginnings.

Contents

1 Introduction

For centuries physicists unsuccessfully seek a theory that works everywhere. Currently some theories are good candidates to see this search through, but everyone knows there's still some way to go. As a computer scientist I was tempted by a different approach stemming my domain. Why not the universe which we know is only a huge computer which works according to its own rules ? The current document is an introduction certainly without revolutionary results

Figure 1: Evolution of the position of a nokton



but at least describes a theory which works everywhere that I baptized nokton theory.

The nokton theory is inspired by a computer operation where the core is a simple program based on elements called noktons. At its start, the computer loads a finite number of noktons. Each Nokton has an initial state. Then in every iteration its status evolves according to precise rules. There is a rule that describes the evolution of the position, a rule that describes the evolution of the speed ...

To illustrate an example of a evolution rule of the position, we are going to imagine (in 2D) a nokton initially at a well defined position saying (X_1, Y_1). In the next step, we assume that the evolution rule of position does not allow to choose any position but one of the closest positions and equidistant. If we suppose that the space is discreet with a step equal to 1, then the closest positions and equidistant are (X_1-1, Y_1), (X_1+1, Y_1), (X_1, Y_1-1) et (X_1, Y_1+1). Thus the nokton sees choosing one of the five positions (X_1, Y_1), $(X_1 - 1, Y_1)$, $(X_1 + 1, Y_1)$, $(X_1, Y_1 - 1)$ or $(X_1, Y_1 + 1)$. But how choose one among these positions. We add then a method of random choice. Let us say that this nokton chooses the position :

$$
\begin{cases}
(X_1 - 1, Y_1) & \text{with probability } p_{-x} \\
(X_1 + 1, Y_1) & \text{with probability } p_{+x} \\
(X_1, Y_1 - 1) & \text{with probability } p_{-y} \\
(X_1, Y_1 + 1) & \text{with probability } p_{+y} \\
(X_1, Y_1) & \text{with probability } p_0 = 1 - (p_{-x} + p_{+x} + p_{-y} + p_{+y})
\end{cases}
$$

2 Definitions and notations

Let be a number between 1 and 3. If this number is rational, then we can present it accurately using a finite number of bits (bits of information). If instead it is irrational as $\sqrt{2}$ then it is impossible to present it with a finite number of bits.

Definition 1. A representable is a mathematical object such as exists an algorithm which accurately gives that object in a finite time.

Definition 2. We give a list of n sets noted $E_1, E_2 ... E_n$. We note E the result set of the Cartesian product of this list. For an element $e \in E$ and an integer $1 \leq i \leq n$, the the function projection $\gamma_E(i, e)$ gives the i-th term of e.

Definition 3. A nokton is an element of the set $M = \{Q_{-1}, Q_0, Q_{+1}\}$.

- Q_{-1} is called negative nokton.
- Q_0 is called null nokton.
- Q_{+1} is called positive nokton.

Definition 4. For $N \in \mathbb{N}^*$, a gross universe with width N is N-uplet of set $U_N^* = M^N$.

Definition 5. A position is a triplet[1] of the set $R = \mathbb{Z}^3$.

Definition 6. A pulse is a 6-tuple of the set $\mathbb{Q}^6$ such that the sum of these terms is ≤ 1. The set of pulses is noted V.

Definition 7. A status is couple of the set $S = R \times V$.

Definition 8. For $N \in \mathbb{N}^*$, a status with width N is a N-uplet of the set $S_N = S^N$.

Definition 9. For $T \in \mathbb{N}^*$ and $N \in \mathbb{N}^*$, a status with width *(T,N)* is a T-uplet of the set $S_{T,N} = S_N^T$.

[1]The study of random walks shows that in a space of 1 or 2 dimensions, the probability of return to the origin equal to 1 if the observation time goes to infinity.

Definition 10. A unit displacement is a element of the set $\Delta = \{\Delta_{-x}, \Delta_{+x}, \Delta_{-y}, \Delta_{+y}, \Delta_{-z}, \Delta_{+z}, \Delta_0\}$.

- Δ_{-x} is called unit displacement according to the negative X axis.
- Δ_{+x} is called unit displacement according to the positive X axis.
- Δ_{-y} is called unit displacement according to the negative Y axis.
- Δ_{+y} is called unit displacement according to the positive Y axis.
- Δ_{-z} is called unit displacement according to the negative Z axis.
- Δ_{+z} is called unit displacement according to the positive Z axis.
- Δ_0 is called null unit displacement.

Definition 11. For $N \in \mathbb{N}^*$, a displacement with width N is a N-uplet of the set $\Delta_N = \Delta^N$.

Definition 12. For $T \in \mathbb{N}^*$ and $N \in \mathbb{N}^*$, a path with width *(T,N)* is a T-uplet of the set $\Delta_{T,N} = \Delta_N^T$.

Definition 13. For $N \in \mathbb{N}^*$, a universe with width N is couple of the set $U_N = U_N^* \times S_N$.

Definition 14. For $T \in \mathbb{N}^*$ and $N \in \mathbb{N}^*$, a window with width *(T,N)* is a couple of the set $W_{T,N} = U_N \times \triangle_{T,N}$.

3 Image

Given two integers $T \in \mathbb{N}^*$ and $N \in \mathbb{N}^*$.

Definition 15. We define the function image f as follows $f : W_{T,N} \to S_{T,N}$.

In the following we give a universe $\omega = (\mu, s)$ with width N and a window $\Gamma = (\omega, \Omega)$ with width *(T,N)* and we note :

- $\lambda = f(\Gamma)$
- $\phi_U = \gamma_{U_N^*}$
- $\phi_\triangle = \gamma_{\triangle_N}$
- $\varphi_\triangle = \gamma_{\triangle_{T,N}}$
- $\phi_S = \gamma_{S_N}$
- $\varphi_S = \gamma_{S_{T,N}}$

3.1 Contributions

Definition 16. For a nokton $q \in M$, the charge function c is defined as follows :

$$c(q) = \begin{cases} -1 & \text{if q} = Q_{-1} \\ 0 & \text{if q} = Q_0 \\ +1 & \text{if q} = Q_{+1} \end{cases}$$

Definition 17. For a unit displacement $\delta \in \Delta$, the displacement function u is defined as follows $u(\delta) = (u_x(\delta), u_y(\delta), u_z(\delta))$ where

$$u_x(\delta) = \begin{cases} -1 & \text{if } \delta = \triangle_{-x} \\ +1 & \text{if } \delta = \triangle_{+x} \\ 0 & \text{otherwise} \end{cases}$$

$$u_y(\delta) = \begin{cases} -1 & \text{if } \delta = \triangle_{-y} \\ +1 & \text{if } \delta = \triangle_{+y} \\ 0 & \text{otherwise} \end{cases}$$

$$u_z(\delta) = \begin{cases} -1 & \text{if } \delta = \triangle_{-z} \\ +1 & \text{if } \delta = \triangle_{+z} \\ 0 & \text{otherwise} \end{cases}$$

Definition 18. For a status $\theta = (a, b) \in S$, the function position ρ is defined as $\rho(\theta) = a$ and the function pulse υ is defined as $\upsilon(\theta) = b$.

Given two integers $1 \leq i \leq N$ and $0 \leq t \leq T$.

Definition 19. For $1 \leq t \leq T$, the function unit displacement ψ_Δ is defined as follows $\psi_\Delta(i, t, \Gamma) = \phi_\triangle(i, \varphi_\triangle(t, \Omega))$.

Definition 20. The function unit status ψ_S is defined as follows :

$$\psi_S(i, t, \Gamma) = \begin{cases} \phi_S(i, s) & \text{if } t = 0 \\ \phi_S(i, \varphi_S(t, \lambda)) & \text{otherwise} \end{cases}$$

In the case where $t = 0$ we omit the argument Γ and we note $\psi_S(i, 0, \Gamma) = \psi_S(i, s)$.

Definition 21. The function punctual position r is defined as follows :

$$r(i,t,\Gamma) = (x(i,t,\Gamma), y(i,t,\Gamma), z(i,t,\Gamma)) = \rho(\psi_S(i,t,\Gamma)) \tag{1}$$

In the case where $t = 0$ we omit the argument Γ and we note $r(i, 0, \Gamma) = r(i, s)$.

According to this definition, and for $1 \le t \le T$, punctual position can be calculated as follows :

$$r(i,t,\Gamma) = \rho(\psi_S(i,s)) + \sum_{j=1}^{t} u(\psi_\triangle(i,j,\Gamma)) \tag{2}$$

Given three integers $1 \le i \le N$, $1 \le j \le N$ and $0 \le t \le T$.

Definition 22. The function difference d is defined as follows :

$$d(i,j,t,\Gamma) = (d_x(i,j,t,\Gamma), d_y(i,j,t,\Gamma), d_z(i,j,t,\Gamma)) = r(i,t,\Gamma) - r(j,t,\Gamma)$$

In the case where $t = 0$ we omit the argument Γ and we note $d(i, j, 0, \Gamma) = d(i, j, s)$.

Definition 23. The function total difference D is defined as follows :

$$D(i,j,t,\Gamma) = \begin{cases} 1 & \text{if } d_x(i,j,t,\Gamma) = d_y(i,j,t,\Gamma) = d_z(i,j,t,\Gamma) = 0 \\ \sqrt{d_x(i,j,t,\Gamma)^2 + d_y(i,j,t,\Gamma)^2 + d_z(i,j,t,\Gamma)^2} & \text{otherwise} \end{cases}$$

In the case where $t = 0$ we omit the argument Γ and we note $D(i, j, 0, \Gamma) = D(i, j, s)$.

Definition 24. The gravitational coupling functions g_{-x}, g_{+x}, g_{-y}, g_{+y}, g_{-z} and g_{+z} are defined as follows :

$$g_{-x}(i,j,t,\Gamma) = \begin{cases} 1 & \text{if } d_x(i,j,t,\Gamma) > 0 \\ 0 & \text{otherwise} \end{cases}$$

$$g_{+x}(i,j,t,\Gamma) = \begin{cases} 1 & \text{if } d_x(i,j,t,\Gamma) < 0 \\ 0 & \text{otherwise} \end{cases}$$

$$g_{-y}(i,j,t,\Gamma) = \begin{cases} 1 & \text{if } d_y(i,j,t,\Gamma) > 0 \\ 0 & \text{otherwise} \end{cases}$$

$$g_{+y}(i,j,t,\Gamma) = \begin{cases} 1 & \text{if } d_y(i,j,t,\Gamma) < 0 \\ 0 & \text{otherwise} \end{cases}$$

$$g_{-z}(i,j,t,\Gamma) = \begin{cases} 1 & \text{if } d_z(i,j,t,\Gamma) > 0 \\ 0 & \text{otherwise} \end{cases}$$

$$g_{+z}(i,j,t,\Gamma) = \begin{cases} 1 & \text{if } d_z(i,j,t,\Gamma) < 0 \\ 0 & \text{otherwise} \end{cases}$$

In the case where $t = 0$ we omit the argument Γ and we note $g_{-x}(i,j,0,\Gamma) = g_{-x}(i,j,s)$, $g_{+x}(i,j,0,\Gamma) = g_{+x}(i,j,s)$, $g_{-y}(i,j,0,\Gamma) = g_{-y}(i,j,s)$, $g_{+y}(i,j,0,\Gamma) = g_{+y}(i,j,s)$, $g_{-z}(i,j,0,\Gamma) = g_{-z}(i,j,s)$ and $g_{+z}(i,j,0,\Gamma) = g_{+z}(i,j,s)$.

Definition 25. The electric coupling functions e_{-x}, e_{+x}, e_{-y}, e_{+y}, e_{-z} and e_{+z} are defined as follows :

$$e_{-x}(i,j,t,\Gamma) = \begin{cases} 1 & \text{if } d_x(i,j,t,\Gamma).c(\phi_U(i,\mu))c(\phi_U(j,\mu)) < 0 \\ 0 & \text{otherwise} \end{cases}$$

$$e_{+x}(i,j,t,\Gamma) = \begin{cases} 1 & \text{if } d_x(i,j,t,\Gamma).c(\phi_U(i,\mu))c(\phi_U(j,\mu)) > 0 \\ 0 & \text{otherwise} \end{cases}$$

$$e_{-y}(i,j,t,\Gamma) = \begin{cases} 1 & \text{if } d_y(i,j,t,\Gamma).c(\phi_U(i,\mu))c(\phi_U(j,\mu)) < 0 \\ 0 & \text{otherwise} \end{cases}$$

$$e_{+y}(i,j,t,\Gamma) = \begin{cases} 1 & \text{if } d_y(i,j,t,\Gamma).c(\phi_U(i,\mu))c(\phi_U(j,\mu)) > 0 \\ 0 & \text{otherwise} \end{cases}$$

$$e_{-z}(i,j,t,\Gamma) = \begin{cases} 1 & \text{if } d_z(i,j,t,\Gamma).c(\phi_U(i,\mu))c(\phi_U(j,\mu)) < 0 \\ 0 & \text{otherwise} \end{cases}$$

$$e_{+z}(i,j,t,\Gamma) = \begin{cases} 1 & \text{si } d_z(i,j,t,\Gamma).c(\phi_U(i,\mu))c(\phi_U(j,\mu)) > 0 \\ 0 & \text{otherwise} \end{cases}$$

In the case where $t = 0$ we omit the argument Γ and we note $e_{-x}(i,j,0,\Gamma) = e_{-x}(i,j,\omega)$, $e_{+x}(i,j,0,\Gamma) = e_{+x}(i,j,\omega)$, $e_{-y}(i,j,0,\Gamma) = e_{-y}(i,j,\omega)$, $e_{+y}(i,j,0,\Gamma) = e_{+y}(i,j,\omega)$, $e_{-z}(i,j,0,\Gamma) = e_{-z}(i,j,\omega)$ and $e_{+z}(i,j,0,\Gamma) = e_{+z}(i,j,\omega)$.

Given three constants $H \in \mathbb{Q}$, $H_g \in \mathbb{Q}$ and $H_e \in \mathbb{Q}$ where H is the constant of contribution, H_g is the constant of gravitational coupling and H_e is the constant of electric coupling.

Definition 26. The functions partial contributions k_{-x}, k_{+x},k_{-y}, k_{+y},k_{-z} and k_{+z} are defined as follows :

$$
\begin{aligned}
k_{-x}(i,t,\Gamma) &= H.\sum_{j=1}^{N}(H_g.g_{-x}(i,j,t,\Gamma)+H_e.e_{-x}(i,j,t,\Gamma)).d_x(i,j,t,\Gamma)^2/D(i,j,t,\Gamma)^4 \\
k_{+x}(i,t,\Gamma) &= H.\sum_{j=1}^{N}(H_g.g_{+x}(i,j,t,\Gamma)+H_e.e_{+x}(i,j,t,\Gamma)).d_x(i,j,t,\Gamma)^2/D(i,j,t,\Gamma)^4 \\
k_{-y}(i,t,\Gamma) &= H.\sum_{j=1}^{N}(H_g.g_{-y}(i,j,t,\Gamma)+H_e.e_{-y}(i,j,t,\Gamma)).d_y(i,j,t,\Gamma)^2/D(i,j,t,\Gamma)^4 \\
k_{+y}(i,t,\Gamma) &= H.\sum_{j=1}^{N}(H_g.g_{+y}(i,j,t,\Gamma)+H_e.e_{+y}(i,j,t,\Gamma)).d_y(i,j,t,\Gamma)^2/D(i,j,t,\Gamma)^4 \\
k_{-z}(i,t,\Gamma) &= H.\sum_{j=1}^{N}(H_g.g_{-z}(i,j,t,\Gamma)+H_e.e_{-z}(i,j,t,\Gamma)).d_z(i,j,t,\Gamma)^2/D(i,j,t,\Gamma)^4 \\
k_{+z}(i,t,\Gamma) &= H.\sum_{j=1}^{N}(H_g.g_{+z}(i,j,t,\Gamma)+H_e.e_{+z}(i,j,t,\Gamma)).d_z(i,j,t,\Gamma)^2/D(i,j,t,\Gamma)^4
\end{aligned}
$$

In the case where $t = 0$ we omit the argument Γ and we note $k_{-x}(i,0,\Gamma) = k_{-x}(i,\omega)$, $k_{+x}(i,0,\Gamma) = k_{+x}(i,\omega)$, $k_{-y}(i,0,\Gamma) = k_{-y}(i,\omega)$, $k_{+y}(i,0,\Gamma) = k_{+y}(i,\omega)$, $k_{-z}(i,0,\Gamma) = k_{-z}(i,\omega)$ and $k_{+z}(i,0,\Gamma) = k_{+z}(i,\omega)$.

Definition 27. The function of total contribution k is defined as sum of the partial contribution functions :

$$
k(i,t,\Gamma) = k_{-x}(i,t,\Gamma)+k_{+x}(i,t,\Gamma)+k_{-y}(i,t,\Gamma)+k_{+y}(i,t,\Gamma)+k_{-z}(i,t,\Gamma)+k_{+z}(i,t,\Gamma)
$$

In the case where $t = 0$ we omit the argument Γ and we note $k(i,0,\Gamma) = k(i,\omega)$.

Definition 28. The contribution function K is defined as follows :

$$
K(i,t,\Gamma) = (k_{-x}(i,t,\Gamma), k_{+x}(i,t,\Gamma), k_{-y}(i,t,\Gamma), k_{+y}(i,t,\Gamma), k_{-z}(i,t,\Gamma), k_{+z}(i,t,\Gamma))
$$

In the case where $t = 0$ we omit the argument Γ and we note $K(i,0,\Gamma) = K(i,\omega)$.

Definition 29. The function partial pulses x_{-1}, x_{+1}, y_{-1}, y_{+1}, z_{-1}, z_{+1} and w_0 are defined as follows :

$$x_{-1}(i,t,\Gamma) = \gamma_V(1, v(\psi_S(i,t,\Gamma)))$$

$$x_{+1}(i,t,\Gamma) = \gamma_V(2, v(\psi_S(i,t,\Gamma)))$$

$$y_{-1}(i,t,\Gamma) = \gamma_V(3, v(\psi_S(i,t,\Gamma)))$$

$$y_{+1}(i,t,\Gamma) = \gamma_V(4, v(\psi_S(i,t,\Gamma)))$$

$$z_{-1}(i,t,\Gamma) = \gamma_V(5, v(\psi_S(i,t,\Gamma)))$$

$$z_{+1}(i,t,\Gamma) = \gamma_V(6, v(\psi_S(i,t,\Gamma)))$$

$$w_0(i,t,\Gamma) = 1-(x_{-1}(i,t,\Gamma)+x_{+1}(i,t,\Gamma)+y_{-1}(i,t,\Gamma)+y_{+1}(i,t,\Gamma)+z_{-1}(i,t,\Gamma)+z_{+1}(i,t,\Gamma))$$

In the case where $t = 0$ we omit the argument Γ and we note $x_{-1}(i,0,\Gamma) = x_{-1}(i,\omega)$, $x_{+x}(i,0,\Gamma) = x_{+1}(i,\omega)$, $y_{-1}(i,0,\Gamma) = y_{-1}(i,\omega)$, $y_{+1}(i,0,\Gamma) = y_{+1}(i,\omega)$, $z_{-1}(i,0,\Gamma) = z_{-1}(i,\omega)$, $z_{+1}(i,0,\Gamma) = z_{+1}(i,\omega)$ and $w_0(i,0,\Gamma) = w_0(i,\omega)$.

Definition 30. For $1 \le t \le T$, the pulses images of a nokton are calculated recursively as follows :

$$v(\psi_S(i,t,\Gamma)) = \frac{v(\psi_S(i,t-1,\Gamma)) + K(i,t-1,\Gamma)}{1 + k(i,t-1,\Gamma)}$$

Proposition 1. $x_{-1}(i,t,\Gamma)+x_{+1}(i,t,\Gamma)+y_{-1}(i,t,\Gamma)+y_{+1}(i,t,\Gamma)+z_{-1}(i,t,\Gamma)+z_{+1}(i,t,\Gamma) \le 1$.

Proof. We shall try to show by recurrence on t this proposal.

For $t = 0$, by definition $x_{-1}(i,0,\Gamma)+x_{+1}(i,0,\Gamma)+y_{-1}(i,0,\Gamma)+y_{+1}(i,0,\Gamma)+z_{-1}(i,0,\Gamma)+z_{+1}(i,0,\Gamma) \le 1$.

For $t \ge 0$,

$$\begin{gathered}
x_{-1}(i,t+1,\Gamma)+x_{+1}(i,t+1,\Gamma)+y_{-1}(i,t+1,\Gamma)+y_{+1}(i,t+1,\Gamma)+z_{-1}(i,t+1,\Gamma)+z_{+1}(i,t+1,\Gamma) = \\
(x_{-1}(i,t,\Gamma)+k_{-x}(i,t,\Gamma))/(1+k(i,t,\Gamma))+ \\
(x_{+1}(i,t,\Gamma)+k_{+x}(i,t,\Gamma))/(1+k(i,t,\Gamma)) \\
(y_{-1}(i,t,\Gamma)+k_{-y}(i,t,\Gamma))/(1+k(i,t,\Gamma)) \\
(y_{+1}(i,t,\Gamma)+k_{+y}(i,t,\Gamma))/(1+k(i,t,\Gamma)) \\
(z_{-1}(i,t,\Gamma)+k_{-z}(i,t,\Gamma))/(1+k(i,t,\Gamma)) \\
(z_{+1}(i,t,\Gamma)+k_{+z}(i,t,\Gamma))/(1+k(i,t,\Gamma)) = \\
(x_{-1}(i,t,\Gamma)+x_{+1}(i,t,\Gamma)+y_{-1}(i,t,\Gamma)+y_{+1}(i,t,\Gamma)+z_{-1}(i,t,\Gamma)+z_{+1}(i,t,\Gamma)+ \\
k_{-x}(i,t,\Gamma)+k_{+x}(i,t,\Gamma)+k_{-y}(i,t,\Gamma)+k_{+y}(i,t,\Gamma)+k_{-z}(i,t,\Gamma)+k_{+z}(i,t,\Gamma))/(1+k(i,t,\Gamma)) = \\
(x_{-1}(i,t,\Gamma)+x_{+1}(i,t,\Gamma)+y_{-1}(i,t,\Gamma)+y_{+1}(i,t,\Gamma)+z_{-1}(i,t,\Gamma)+z_{+1}(i,t,\Gamma)+k(i,t,\Gamma))/(1+k(i,t,\Gamma))
\end{gathered}$$

However

$$x_{-1}(i,t,\Gamma)+x_{+1}(i,t,\Gamma)+y_{-1}(i,t,\Gamma)+y_{+1}(i,t,\Gamma)+z_{-1}(i,t,\Gamma)+z_{+1}(i,t,\Gamma) \leq 1$$

Thus

$$x_{-1}(i,t,\Gamma)+x_{+1}(i,t,\Gamma)+y_{-1}(i,t,\Gamma)+y_{+1}(i,t,\Gamma)+z_{-1}(i,t,\Gamma)+z_{+1}(i,t,\Gamma)+k(i,t,\Gamma) \leq 1+k(i,t,\Gamma) \Rightarrow$$

$$(x_{-1}(i,t,\Gamma)+x_{+1}(i,t,\Gamma)+y_{-1}(i,t,\Gamma)+y_{+1}(i,t,\Gamma)+z_{-1}(i,t,\Gamma)+z_{+1}(i,t,\Gamma)+k(i,t,\Gamma))/(1+k(i,t,\Gamma)) \leq 1 \Rightarrow$$

$$x_{-1}(i,t+1,\Gamma)+x_{+1}(i,t+1,\Gamma)+y_{-1}(i,t+1,\Gamma)+y_{+1}(i,t+1,\Gamma)+z_{-1}(i,t+1,\Gamma)+z_{+1}(i,t+1,\Gamma) \leq 1$$

□

Proposition 2. *For* $1 \leq t \leq T$, $w_0(i,t,\Gamma) = w_0(i,t-1,\Gamma)/(1+k(i,t-1,\Gamma))$.

Proof.

$$\begin{aligned}
w_0(i,t,\Gamma) &= 1-(x_{-1}(i,t,\Gamma)+x_{+1}(i,t,\Gamma)+y_{-1}(i,t,\Gamma)+y_{+1}(i,t,\Gamma)+z_{-1}(i,t,\Gamma)+z_{+1}(i,t,\Gamma)) \\
&= 1-((x_{-1}(i,t-1,\Gamma)+k_{-x}(i,t-1,\Gamma))/(1+k(i,t-1,\Gamma))+ \\
&\quad (x_{+1}(i,t-1,\Gamma)+k_{+x}(i,t-1,\Gamma))/(1+k(i,t-1,\Gamma))+ \\
&\quad (y_{-1}(i,t-1,\Gamma)+k_{-y}(i,t-1,\Gamma))/(1+k(i,t-1,\Gamma))+ \\
&\quad (y_{+1}(i,t-1,\Gamma)+k_{+y}(i,t-1,\Gamma))/(1+k(i,t-1,\Gamma))+ \\
&\quad (z_{-1}(i,t-1,\Gamma)+k_{-z}(i,t-1,\Gamma))/(1+k(i,t-1,\Gamma))+ \\
&\quad (z_{+1}(i,t-1,\Gamma)+k_{+z}(i,t-1,\Gamma))/(1+k(i,t-1,\Gamma))) \\
&= 1-(x_{-1}(i,t-1,\Gamma)+x_{+1}(i,t-1,\Gamma)+y_{-1}(i,t-1,\Gamma)+y_{+1}(i,t-1,\Gamma)+ \\
&\quad z_{-1}(i,t-1,\Gamma)+z_{+1}(i,t-1,\Gamma)+ \\
&\quad k_{-x}(i,t-1,\Gamma)+k_{+x}(i,t-1,\Gamma)+k_{-y}(i,t-1,\Gamma)+k_{+y}(i,t-1,\Gamma)+ \\
&\quad k_{-z}(i,t-1,\Gamma)+k_{+z}(i,t-1,\Gamma))/(1+k(i,t-1,\Gamma)) \\
&= 1-(1-w_0(i,t-1,\Gamma)+k(i,t-1,\Gamma))/(1+k(i,t-1,\Gamma)) \\
&= w_0(i,t-1,\Gamma)/(1+k(i,t-1,\Gamma))
\end{aligned}$$

□

Proposition 3. *For* $1 \leq t \leq T$, $w_0(i,\omega) = 0 \Leftrightarrow w_0(i,t,\Gamma) = 0$.

Proof. Proof by recurrence for $w_0(i,\omega) = 0 \Rightarrow w_0(i,t,\Gamma) = 0$. $\forall\ 1 \leq t \leq T$ $w_0(i,t,\Gamma) = 0 \Rightarrow w_0(i,1,\Gamma) = 0 = w_0(i,0,\Gamma)/(1+k(i,0,\Gamma))$, so $w_0(i,0,\Gamma) = 0 = w_0(i,\omega)$. □

Corollary 1. *For $1 \leq t \leq T$ if $w_0(i,\omega) \neq 0$ then $w_0(i,t,\Gamma) \neq 0$.*

Proposition 4. *For $1 \leq t \leq T$ if $w_0(i,\omega) \neq 0$ then $w_0(i,t,\Gamma)$ is decreasing.*

Proof. For $1 \leq t \leq T$, $w_0(i,t,\Gamma) = w_0(i,t-1,\Gamma)/(1+k(i,t-1,\Gamma)) \Rightarrow w_0(i,t,\Gamma)/w_0(i,t-1,\Gamma) = 1/(1+k(i,t-1,\Gamma))$ however $k(i,t-1,\Gamma) \geq 0$ then $1/(1+k(i,t-1,\Gamma)) \leq 1$, we deduct that $w_0(i,t,\Gamma) \leq w_0(i,t-1,\Gamma)$. $\square$

Definition 31. The mobility Θ is defined as follows $\Theta(i,t,\Gamma) = 1 - w_0(i,t,\Gamma)$.

In the case where $t = 0$ we omit the argument Γ and we note $\Theta(i,0,\Gamma) = \Theta(i,\omega)$.

Proposition 5. *The mobility is increasing*[2].

Proof. Using the fact that w_0 is decreasing we prove that Θ is increasing. $\square$

3.2 Probabilities

Given two integers $1 \leq i \leq N$ and $1 \leq t \leq T$.

Definition 32. The probability of displacement p_Δ is defined as follows :

$$p_\Delta(i,t,\Gamma) = \begin{cases} x_{-1}(i,t-1,\Gamma) & \text{if } \psi_\Delta(i,t,\Gamma) = \Delta_{-x} \\ x_{+1}(i,t-1,\Gamma) & \text{if } \psi_\Delta(i,t,\Gamma) = \Delta_{+x} \\ y_{-1}(i,t-1,\Gamma) & \text{if } \psi_\Delta(i,t,\Gamma) = \Delta_{-y} \\ y_{+1}(i,t-1,\Gamma) & \text{if } \psi_\Delta(i,t,\Gamma) = \Delta_{+y} \\ y_{-1}(i,t-1,\Gamma) & \text{if } \psi_\Delta(i,t,\Gamma) = \Delta_{-z} \\ y_{+1}(i,t-1,\Gamma) & \text{if } \psi_\Delta(i,t,\Gamma) = \Delta_{+z} \\ w_0(i,t-1,\Gamma) & \text{otherwise} \end{cases}$$

Definition 33. The window probability p_λ is defined as follows $p_\lambda(\Gamma) = \prod_{i=1}^{N} \prod_{t=1}^{T} p_\Delta(i,t,\Gamma)$.

Lemma 1. *Given an integer $n \geq 1$, E is finite set and $(p_i)_{1 \leq i \leq n}$ is family of functions from E to $\mathbb{Q}$ such $\forall\ 1 \leq i \leq n\ \sum_{e \in E} p_i(e) = 1$ then*

$$\sum_{x \in E^n} \prod_{i=1}^{n} p_i(\gamma_{E^n}(i,x)) = 1 \tag{3}$$

[2]The increasing of the mobility can be the key to the explanation for the accelerated expansion of the universe.

Proof. We shall try to show by recurrence on n this lemma.

For $n = 1$

$$\begin{aligned}
\sum_{x\in E}\prod_{i=1}^{1} p_i(\gamma_E(i,x)) &= \sum_{x\in E} p_1(\gamma_E(1,x)) \\
&= \sum_{e\in E} p_1(\gamma_E(1,e)) \\
&= \sum_{e\in E} p_1(e) \\
&= 1
\end{aligned}$$

For $n \geq 1$, we define the operator $|$ which for an element $y \in E^n$ and $z \in E$, gives the element $x \in E^{n+1}$ result of the concatenation to the right of the elements y and z.

$$\begin{aligned}
\sum_{x\in E^{n+1}}\prod_{i=1}^{n+1} p_i(\gamma_{E^{n+1}}(i,x)) &= \sum_{y|z\in E^{n+1}}\prod_{i=1}^{n+1} p_i(\gamma_{E^{n+1}}(i,y|z)) \\
&= \sum_{y\in E^n}\sum_{z\in E}\prod_{i=1}^{n+1} p_i(\gamma_{E^{n+1}}(i,y|z)) \\
&= \sum_{z\in E}\sum_{y\in E^n}\prod_{i=1}^{n+1} p_i(\gamma_{E^{n+1}}(i,y|z)) \\
&= \sum_{z\in E}\sum_{y\in E^n} p_{n+1}(\gamma_{E^{n+1}}(n+1,y|z))\prod_{i=1}^{n} p_i(\gamma_{E^{n+1}}(i,y|z)) \\
&= \sum_{z\in E}\sum_{y\in E^n} p_{n+1}(\gamma_{E}(1,z))\prod_{i=1}^{n} p_i(\gamma_{E^{n}}(i,y)) \\
&= \sum_{z\in E} p_{n+1}(\gamma_{E}(1,z))\sum_{y\in E^n}\prod_{i=1}^{n} p_i(\gamma_{E^{n}}(i,y)) \\
&= \sum_{z\in E} p_{n+1}(\gamma_{E}(1,z)) \\
&= 1
\end{aligned}$$

□

Corollary 2. $\sum_{\Omega\in\Delta_{T,N}} p_\lambda((\omega,\Omega)) = 1.$

Proof. By using the lemma 3, by posing $E = \triangle$, $n = N.T$ and we define the family of functions p_{iT+j} as follows :

$$\begin{cases} p_{iT+t}(\Delta_{-x}) = x_{-1}(i,t-1,\Gamma) \\ p_{iT+t}(\Delta_{+x}) = x_{+1}(i,t-1,\Gamma) \\ p_{iT+t}(\Delta_{-y}) = y_{-1}(i,t-1,\Gamma) \\ p_{iT+t}(\Delta_{+y}) = y_{+1}(i,t-1,\Gamma) \\ p_{iT+t}(\Delta_{-z}) = y_{-1}(i,t-1,\Gamma) \\ p_{iT+t}(\Delta_{+z}) = y_{+1}(i,t-1,\Gamma) \\ p_{iT+t}(\Delta_{0}) = w_{0}(i,t-1,\Gamma) \end{cases}$$

and the fact that $p_{\triangle}(i,t,\Gamma) = p_{iT+t}(\psi_{\triangle}(i,t,\Gamma))$, we prove the corollary. $\square$

4 Symmetries

Given two integers $T \in \mathbb{N}^*$ and $N \in \mathbb{N}^*$.

Definition 34. A transformationζ is bijective function on the set $W_{T,N}$.

$$\zeta : W_{T,N} \to W_{T,N}$$

Definition 35. A transformation ζ is symmetric if and only if $\forall\ \Gamma \in W_{T,N}$ $p_{\lambda}(\Gamma) = p_{\lambda}(\zeta(\Gamma))$.

Definition 36. Given Γ a window with width *(T,N)*. A transformation ζ is strongly symmetric if and only if $\forall\ 1 \leq i \leq N$, $\forall\ 0 \leq t \leq T$ and $\forall\ \Gamma \in W_{T,N}$ we have $v(\psi_S(i,t,\Gamma)) = v(\psi_S(i,t,\zeta(\Gamma))$.

Definition 37. A weakly symmetric transformation is a symmetric transformation which is not strongly symmetric.

Proposition 6. *Given $\Gamma = (\omega, \Omega)$ a window with width* (T,N) *and ζ a transformation. We note $\zeta(\Gamma) = \Gamma^{'} = (\omega^{'}, \Omega^{'})$. If $\forall\ 1 \leq i \leq N$, $\forall\ 0 \leq t \leq T$ we have $v(\psi_S(i,\omega)) = v(\psi_S(i,\omega^{'}))$ and $K(i,t,\Gamma) = K(i,t,\Gamma^{'})$, then ζ is strongly symmetric transformation.*

Proof. For $t = 0$, by hypothesis $v(\psi_S(i,0,(\omega,\Omega))) = v(\psi_S(i,\omega)) = v(\psi_S(i,\omega^{'})) = v(\psi_S(i,0,(\omega^{'},\Omega))) = v(\psi_S(i,0,(\omega^{'},\Omega^{'}))) = v(\psi_S(i,0,\zeta((\omega,\Omega))))$.

For $t \geq 1$, if $K(i,t,\Gamma) = K(i,t,\Gamma^{'})$ then $k(i,t,\Gamma) = k(i,t,\Gamma^{'})$. We have $v(\psi_S(i,t,\Gamma)) = \frac{v(\psi_S(i,t-1,\Gamma))+K(i,t-1,\Gamma)}{1+k(i,t-1,\Gamma)} = \frac{v(\psi_S(i,t-1,\Gamma^{'}))+K(i,t-1,\Gamma^{'})}{1+k(i,t-1,\Gamma^{'})} = v(\psi_S(i,t,\Gamma^{'})) = v(\psi_S(i,t,\zeta(\Gamma)))$. $\square$

5 Observables

5.1 Definition

According to the definition 33 a probability is associated with a window. By consequence the terms of the image of a window are observed with a probability equal to that of their window.

Given two integers $T \in \mathbb{N}^*$ and $N \in \mathbb{N}^*$.

Definition 38. Given E and A two non empty sets. An observable $\hat{A}_{T,N}$ is a function from the set $E \times W_{T,N}$ to the set A :

$$\hat{A}_{T,N} : E \times W_{T,N} \to A$$

A is called the set of observable values.

For an observable value we can only calculate its probability. Given ω a universe with width N and e an element of E, the function $P_{\hat{A},T,N}$ which gives the probability of an observable value a is calculated as follows :

$$P_{\hat{A},T,N}(e,a) = \sum_{\Omega \in \Delta_{T,N}} U_E(\hat{A}_{T,N}(e,(\omega,\Omega)),a).p_\lambda((\omega,\Omega)) \tag{4}$$

where

$$\begin{array}{rcl} U_A : A^2 & \to & \{0,1\} \\ (a_1,a_2) & \to & \begin{cases} 1 & \text{if } a_1 = a_2 \\ 0 & \text{otherwise} \end{cases} \end{array}$$

If the set E contains only a single element then we omit to specify this element. In this case the observable becomes a function from $W_{T,N}$ to A and $P_{\widehat{A},T,N}$ takes only a single argument.

Proposition 7. $\sum_{a\in A} P_{\hat{A},T,N}(e,a) = 1$.

Proof. If we pose $a' = \hat{A}_{T,N}(e,(\omega,\Omega))$ then $\sum_{a\in A} U_A(\hat{A}_{T,N}(e,(\omega,\Omega)),a) = \sum_{a\in A} U_A(a',a) = 1$. According to the definition 4 :

$$\begin{aligned} \sum_{a\in A} P_{\hat{A},T,N}(e,a) &= \sum_{a\in A} \sum_{\Omega\in\Delta_{T,N}} U_A(\hat{A}_{T,N}(e,(\omega,\Omega)),a).p_\lambda((\omega,\Omega)) \\ &= \sum_{\Omega\in\Delta_{T,N}} \sum_{a\in A} U_A(\hat{A}_{T,N}(e,(\omega,\Omega)),a).p_\lambda((\omega,\Omega)) \\ &= \sum_{\Omega\in\Delta_{T,N}} p_\lambda((\omega,\Omega)).\sum_{a\in A} U_A(\hat{A}_{T,N}(e,(\omega,\Omega)),a) \\ &= \sum_{\Omega\in\Delta_{T,N}} p_\lambda((\omega,\Omega)) \end{aligned}$$

Yet according to the corollary 2, $\sum_{\Omega\in\Delta_{T,N}} p_\lambda((\omega,\Omega)) = 1$, we deduce that from it $\sum_{a\in A} P_{\hat{A},T,N}(e,a) = 1$. □

5.2 Classical observables

Given two integers $T \in \mathbb{N}^*$ and $N \in \mathbb{N}^*$, and a universe $\omega = (\mu, s)$ with width N. We give $\overline{D}$ and $\overline{T}$ two real constants and we note $\overline{c} = \overline{D}/\overline{T}$. We also note :

- $\tilde{T} = \{t \in \mathbb{N}^* | 1 \le t \le T\}$, $\tilde{N} = \{i \in \mathbb{N}^* | 1 \le i \le N\}$ and $\Psi = \tilde{N} \times \tilde{T}$.
- $\vartheta = \mathbb{R}^3$, $\vartheta_N = \vartheta^N$ and $\vartheta_{T,N} = \vartheta_N^T$.
- $\bar{\vartheta} = \mathbb{R}$, $\bar{\vartheta}_N = \vartheta^N$ and $\bar{\vartheta}_{T,N} = \vartheta_N^T$.

5.2.1 Observable position

Definition 39. The observable position noted $\hat{R}_{T,N}$ is defined as follows :

$$\begin{aligned} \hat{R}_{T,N} : \Psi \times W_{T,N} &\to \vartheta_{T,N} \\ ((i,t),\Gamma) &\to \hat{R}_{T,N}((i,t),\Gamma) = \alpha \end{aligned}$$

where $\gamma_{\vartheta_N}(i, \gamma_{\vartheta_{T,N}}(t,\alpha)) = r(i,t,\Gamma)\overline{D}$. We note $\hat{r}(i,t,\Gamma) = \gamma_{\vartheta_N}(i, \gamma_{\vartheta_{T,N}}(t,\alpha))$. For fixed i and t we define the observable punctual position noted $\hat{r}_{t,i}$ as follows :

$$\begin{aligned} \hat{r}_{t,i} : W_{T,N} &\to \vartheta \\ \Gamma &\to \hat{r}_{t,i}(\Gamma) = \hat{r}(i,t,\Gamma) \end{aligned}$$

5.2.2 Observable speed

Definition 40. The observable speed noted $\hat{V}_{T,N}$ is defined as follows :

$$\begin{aligned} \hat{V}_{T,N} : \Psi \times W_{T,N} &\to \vartheta_{T,N} \\ ((i,t),\Gamma) &\to \hat{V}_{T,N}((i,t),\Gamma) = \alpha \end{aligned}$$

where $\gamma_{\vartheta_N}(i, \gamma_{\vartheta_{T,N}}(t,\alpha)) = \frac{\hat{r}(i,t,\Gamma) - \hat{r}(i,\omega)}{t\overline{T}}$. We note $\hat{v}(i,t,\Gamma) = \gamma_{\vartheta_N}(i, \gamma_{\vartheta_{T,N}}(t,\alpha))$. It is easy to demonstrate that $\hat{v}(i,t,\Gamma) = \frac{r(i,t,\Gamma) - r(i,\omega)}{t}\overline{c}$. For fixed i and t we define the observable punctual speed noted $\hat{v}_{t,i}$ as follows :

$$\begin{aligned} \hat{v}_{t,i} : W_{T,N} &\to \vartheta \\ \Gamma &\to \hat{v}_{t,i}(\Gamma) = \hat{v}(i,t,\Gamma) \end{aligned}$$

If ϑ has the Euclidean norm. We define the observable normalized speed $\bar{V}_{T,N}$ as follows :

$$\begin{aligned} \bar{V}_{T,N} : \Psi \times W_{T,N} &\to \mathbb{R} \\ ((i,t),\Gamma) &\to \bar{V}_{T,N}((i,t),\Gamma) = \alpha \end{aligned}$$

where $\gamma_{\bar{\vartheta}_N}(i,\gamma_{\bar{\vartheta}_{T,N}}(t,\alpha)) = \|\hat{v}(i,t,\Gamma)\|$. We note $\bar{v}(i,t,\Gamma) = \gamma_{\bar{\vartheta}_N}(i,\gamma_{\bar{\vartheta}_{T,N}}(t,\alpha))$. For fixed i and t we define the observable punctual normalized speed noted $\bar{v}_{t,i}$ as follows :

$$\begin{aligned} \bar{v}_{t,i} : W_{T,N} &\rightarrow R \\ \Gamma &\rightarrow \bar{v}_{t,i}(\Gamma) = \bar{v}(i,t,\Gamma) \end{aligned}$$

Proposition 8. $\bar{v}_{t,i}(\Gamma) \leq \bar{c}$.

Proof. We pose $\Gamma = (\omega, \Omega)$. According to 1, $r(i,\omega) = \rho(\psi_S(i,s))$, and according to 2, $r(i,t,\Gamma) = \rho(\psi_S(i,s)) + \sum_{j=1}^{t} u(\psi_\triangle(i,j,\Gamma))$.

Thus $\hat{v}(i,t,\Gamma) = \frac{\bar{c}}{t}\sum_{j=1}^{t} u(\psi_\triangle(i,j,\Gamma)) \Rightarrow \|\hat{v}(i,t,\Gamma)\| = \frac{\bar{c}}{t}\|\sum_{j=1}^{t} u(\psi_\triangle(i,j,\Gamma))\|$.

Yet $\|\sum_{j=1}^{t} u(\psi_\triangle(i,j,\Gamma))\| \leq \sum_{j=1}^{t}\|u(\psi_\triangle(i,j,\Gamma))\|$ and $\forall j\ \|u(\psi_\triangle(i,j,\Gamma))\| \leq$ 1

then $\|\hat{v}(i,t,\Gamma)\| \leq \frac{\bar{c}}{t}.t \Rightarrow \|\hat{v}(i,t,\Gamma)\| \leq \bar{c}$. Thus $\bar{v}_{t,i}(\Gamma) \leq \bar{c}$. □

5.3 Observable particles

Definition 41. A region Λ is a function from the set $\mathbb{R}^3$ to the set $\{0,1\}$. The set of regions is noted $\tilde{\Lambda}$.

Given two integers $T \in \mathbb{N}^*$ and $N \in \mathbb{N}^*$. We note $\tilde{T} = \{t \in \mathbb{N}^* | 1 \leq t \leq T\}$ and $\Psi = \tilde{\Lambda} \times \tilde{T}$.

Definition 42. We define the observable negative particles $\hat{P}^-_{T,N}$ as follows :

$$\begin{aligned} \hat{P}^-_{T,N} : \Psi \times W_{T,N} &\rightarrow N \\ ((\Lambda,t),((\mu,s),\Omega)) &\rightarrow \hat{P}^-_{T,N}((\Lambda,t),((\mu,s),\Omega)) = \sum_{i=1}^{N} \Lambda(\hat{r}_{t,i}(((\mu,s),\Omega))).U_M(\phi_U(i,\mu),Q_{-1}) \end{aligned}$$

Definition 43. We define the observable null particles $\hat{P}^0_{T,N}$ as follows :

$$\begin{aligned} \hat{P}^0_{T,N} : \Psi \times W_{T,N} &\rightarrow N \\ ((\Lambda,t),((\mu,s),\Omega)) &\rightarrow \hat{P}^0_{T,N}((\Lambda,t),((\mu,s),\Omega)) = \sum_{i=1}^{N} \Lambda(\hat{r}_{t,i}(((\mu,s),\Omega))).U_M(\phi_U(i,\mu),Q_0) \end{aligned}$$

Definition 44. We define the observable positive particles $\hat{P}^+_{T,N}$ as follows :

$$\begin{aligned} \hat{P}^+_{T,N} : \Psi \times W_{T,N} &\rightarrow N \\ ((\Lambda,t),((\mu,s),\Omega)) &\rightarrow \hat{P}^+_{T,N}((\Lambda,t),((\mu,s),\Omega)) = \sum_{i=1}^{N} \Lambda(\hat{r}_{t,i}(((\mu,s),\Omega))).U_M(\phi_U(i,\mu),Q_{+1}) \end{aligned}$$

6 Conclusion

The theory of the nokton is a new theory based on an algorithmic approach. We gave definitions which seem to be important for pursuing this way of unification of the theoretical physics. The results were not numerous but if the approach is good, they should not delay. It is important to determine the three constants H, H_g et H_e. In this case it is possible to compare this theory with the existing theories and the experimental facts.

Can be the quest of the physicists will come to an end.