SURROUNDING MATTER THEORY: FIRST MATHEMATICAL DEVELOPMENTS

The duality between null vectors and non null vectors is emphasized in General Relativity (GR).
This gives the idea of a mathematical new version of GR.
Using this new mathematical GR version and a physics assumption yields the following consequences in the domain of physics.

1 - Today's gravitation is replaced by the Surrounding gravitational model.

2 - The surrounding behaviour operates in the domain of gravitation. This suggests a simple solution to confinement and mass gap of the strong force

Non null vectors versus null vectors duality

- Interesting features of null vectors :
  - Energy equation calculation is a surfacic version of pythagore equation:
    - Energy equation $Em^2 = Et^2 - Emvt^2$
    - In **B** base $ds^2 = c^2dt^2 - dx^2$
    - In **D** base $2XY = \left(\frac{X+Y}{\sqrt{2}}\right)^2 - \left(\frac{X-Y}{\sqrt{2}}\right)^2$ Minkowskian metric is «detailed»
  - Boost Lorentz transform equations are simplified:

    In the **B** base : $LT = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}}\begin{bmatrix} 1 & -\frac{v}{c} \\ -\frac{v}{c} & 1 \end{bmatrix}$

    In the **D** base : $LT = \begin{bmatrix} D & 0 \\ 0 & \frac{1}{D} \end{bmatrix}$ $D = \frac{\sqrt{1-\frac{v}{c}}}{\sqrt{1+\frac{v}{c}}}$
  - Morphism between four momentums and boosts.
  - Base of barycentric formulation of boosts. Algebraic structure.
  - Coherence between energy and waves :
    - This energy travels at light speed
    - Waves also
    - They are naturally equivalent

- The today's picture contain a **sleeping actor** :

Experimental data			
Gravitation: Cosmology, Schwarzschild metric, Black holes, etc....	Particle Physics		
GR	GR	Quantum Mechanics	QFT
SR	SR	Path integral	Dirac and Lie Algebras

Sleeping actor !

2 modifications

Consequences

Experimental data			
Gravitation **with surrounding**	Particle Physics **with surrounding**		
GR modified version with null vectors	GR	Quantum Mechanics	QFT
SR	SR	Path integral	Dirac and Lie Algebras

Assumption: The 4 forces are driven by gravity

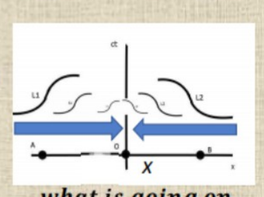
- **It gives the idea of another GR formulation**

Four momentum of an IP (Indivisible Particle): $D_0^\mu(y) = \frac{E_0}{c}(1,-1,0,0)$

It propagates a *potential* space-time deformation

$D^\mu(y) = \frac{E}{c}(1,-1,0,0)$

Space-time structure is given at each encounter of waves:



what is going on at x location

$$\frac{1}{\sqrt{1-\frac{v^2}{c^2}}}\frac{E}{c}\left(1,\frac{v_x}{c},\frac{v_y}{c},\frac{v_z}{c}\right) = D_1^\mu(x) + D_2^\mu(x)$$

Invariance break

A boost is deduced at x location $B_v^\mu(x) = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}}\begin{matrix} 1 & -v_x/c & -v_y/c & -v_z/c \\ -v_x/c & 1 & 0 & 0 \\ -v_y/c & 0 & 1 & 0 \\ -v_z/c & 0 & 0 & 1 \end{matrix}$

Privileged frame

$$g_{\alpha\beta}(x) = B_\alpha^\rho B_\beta^\kappa S_\rho^\mu S_\kappa^\nu g_{\mu\nu}(x')$$

Consequences in the domain of gravitation

Surrounding equation :

$$R_{\mu\nu} - \frac{1}{2}Rg_{\mu\nu} = \frac{8\pi G}{c^4}C_\mu^l C_\nu^m T_{lm}$$

What is this $C_\mu^l C_\nu^m$ « surrounding » factor ?

- Matter density at the location where the force is exerted.
- It depends of the scale.
- Astrophysic scale → calculated in the 15 kpc ray sphere.

When it comes to physics :

- The specification of the waves is tough
- A discrete model is mandatory
- Passing from the discrete model to the continuous macroscopic metric is
  - Complicated
  - Not completed yet
  - Similarities with the path integral

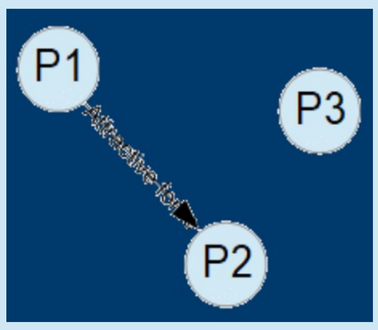
- **Consequences** in the domain of particle physics
  - Surrounding effect prevails.
  - It does **not** manifest itself in a **2 body (baryons)** interaction :
    - Electromagnetism
    - Weak interaction
  - It manifests itself **only** in a **3 body** interaction :
    - Strong force
  - The result is confinement and mass gap :
    - an increase of the strong force,
    - only this force,
    - with distance.

Nevertheless from a mathematical perspective,

- The **surrounding behaviour** of the model will remain the **fondamental behaviour** whatever the physics will tell.
- Because :

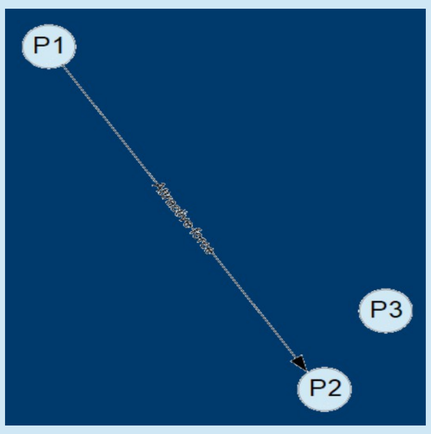
$$\frac{1}{\sqrt{1-\frac{v^2}{c^2}}}\left(1,\frac{v_x}{c},\frac{v_y}{c},\frac{v_z}{c}\right) = \frac{D^\mu(x)}{E/c} = \frac{\sum_{n=0}^{\infty}\delta\left(\|x-y_n\|_3 - x^0 + y_n{}^0\right)f\left(\|x-y_n\|_3\right)C^\mu(y_n)}{\sum_{n=0}^{\infty}\delta\left(\|x-y_n\|_3 - x^0 + y_n{}^0\right)f\left(\|x-y_n\|_3\right)E(y_n)/c}$$

P1 is attracted by P2 :



P3 particle **is in** the surrounding of P1 : the surrounding factor is weak

The strong force is **weaker**



P3 particle **is NOT in** the surrounding of P1 : the surrounding factor is strong

The strong force is **stronger**

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