The Rigid Fields

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Abstract: Those who imagine a future era in which advances in computer science will allow the study of physical phenomena involving very large quantities of particles even by means of simulation techniques, including their gravitational effects, might find interesting a theory oriented toward that, which aids to define objects and methods underlying elementary particles.

The type of object I illustrate in this short essay could be part of such a theory.

To simply understand the context of the present "nature simulation" technique, think of a three-dimensional Euclidean space in which a fixed quantity of objects called rigid-fields are placed; at any instant the position of each rigid-field is, by definition, the position in that space of its reference point.

Indeed, the geometry of a rigid-field is spherically symmetric and resembles a "very very thick" spherical shell; it is depicted as two concentric spheres, whose center is taken as the reference point of the rigid-field. The radius o_r of the smaller sphere is a parameter of the simulation context; the radius of the huger sphere is infinite. And, geometrically, the space inside the smaller sphere is not part of the volume of the rigid-field associated with it.

Thus, regardless of their positions, all rigid-fields "overlap" at every point in the space except at points inside their inner sphere (where not all of them overlap).

From a physical point of view, at every point of its volume each rigid-field provides the voltage V_k as its own contribution to the electric potential at the same point in the space. In fact, in the context space the superposition principle applies.

$$V_k = \frac{q_o}{d \cdot \varepsilon_0 \cdot \pi \cdot 4}$$

ε_0 stands for vacuum-electric-permittivity, while d is the distance of the point from the reference point of the contributing rigid-field; q_o is a property of the rigid-field object that also qualifies it as negative if

$$q_o = -o$$

or as positive if

$$q_o = o$$

o is another parameter of the simulation context; it is a positive amount of electric charge.

All this implies that, instant by instant, the difference in electric potential between one given point in the space and another at "infinite distance from all reference points of the rigid-fields" is the sum of all the contributions provided by the negative and positive rigid-fields overlapping at that point (that is, the given point in space is part of their volume).

Taking into consideration, just for a while, only one negative rigid-field and differentiating V_k

with respect to space an electric field vector "emerges" at each point of its volume... Its magnitude is

$$k=\left|\frac{V_k}{d}\right|=\frac{o}{d^2\cdot\varepsilon_0\cdot\pi\cdot 4}$$

And a known equation states that the energy density at the point is

$$u=\frac{k^2\cdot\varepsilon_0}{2}=\frac{o^2}{d^4\cdot\varepsilon_0\cdot\pi^2\cdot 32}$$

Also known is the result of integrating *u* for the electric field extending from infinity to a spherical capacitor (in static condition) of radius o_r; it's the finite amount of energy

$$U_o=\frac{o^2}{o_r\cdot\varepsilon_0\cdot\pi\cdot 8}$$

It is clearly the same for a positive rigid-field. So the total energy involved in a simulation is equivalent to U_o multiplied by the quantity of rigid-fields placed in the context space, regardless of their "polarity" (either negative or positive).

Dependant on the polarities and positions of the rigid-fields is, instead, the part of that total energy representing, for example, the electric potential energy of a macroscopic system of charged objects, if present in the simulation context.

U_o itself, as defined here, does not confer inertia to the rigid-field associated with it; however the inertia of some objects and other matter properties, like gravitational ones, are manifestations of a portion of the total energy.

Due to their electric polarities when multiple rigid-fields are present in the space they are all subject to a force (or a simulation rule that produces the same effects as a force); and, having no inertia, rigid-fields always move (change their position over time for the "out of context observer" of the simulation) at a velocity of magnitude c, the speed-of-light-in-vacuum; that is, by definition, "the speed limit" for any object in the context space.

Because of this dynamics of rigid-fields, and their electric properties, portions of the total energy involved in the simulation appear in electromagnetic forms. In fact, the sum of all the V_k contributions at each point in space gives a value that varies over time, thus determining the presence of a magnetic field vector virtually at every point... of magnitude B.

The so-called Lorentz force, as it results in the position of each rigid-field, is the kind of force that always acts on rigid-fields present in the space... As known, it is a function of q_o and three vectors: the velocity of the subjected rigid-field, the magnetic field and the electric field.

The orientation of the Lorentz force acting on a rigid-field always determines the "next orientation" of its translational velocity, because it has no inertia.

In other words... Some (very few) behaviors of rigid-fields resemble those of abstract massless charged particles occupying the volume of the spheres, of radius o_r, centered at the positions of the corresponding rigid-fields and with a Lorentz force applied at their center.

Each rigid-field contributes to the overall system with an energy U_o and with a "rigid voltage distribution". The dynamics determine the presence of an electric field k and a magnetic field B at virtually any point in space, with the resulting energy density

$$u = \frac{(k^2 + B^2 \cdot c^2) \cdot \varepsilon_0}{2}$$

So energy "flows from point to point" over time, but at any instant the integration of u over the infinite volume of the space always results in the total amount equivalent to U_o multiplied by the quantity of rigid-fields in the context.

How the dynamics of rigid-fields (for example the effects of electromagnetic interactions of a group of them) can lead to relatively stable structures of other objects is beyond the scope of this short issue. But to represent one of their usefulness we can take LER models into consideration.

LER stands for localized electromagnetic resonance and the LER models describe some behaviors of objects, so-called "vibes", which are compositions of rigid-fields in the form of electrodynamic structures. (A vibe can be said to be a structured electrodynamic object.)

Resonance consists in a periodic re-presentation of a given "structure configuration" of the 2 or more moving rigid-fields that compose a vibe.

Localization consists in the "delimited volume" within which the positions of all the rigid-fields composing a given vibe are confined at any instant, accordingly with its electrodynamic structure.

So there is a great energy density into that delimited volume, but there's also some energy in the outer space due to the infinite extension of the rigid-fields. All of this may recall a "central mass with surrounding field" scheme, although both are electromagnetic in nature.

The out of context observer (of the simulation running in the context) sees a vibe at rest when the reference point of its structure does not change position over time; but this is not the case with a realistic simulation. Normally the observer "sees" each vibe moving at great speed; the resonance is stable but the reference point of its structure has a translational velocity.

In fact, there's an energy *U* retained in a LER, which is a resonance without energy dispersion. When a vibe is (virtually) at rest the amount *U* is the minimum for its structure; but the structure can "deform" as a result of a "transient perturbation", and stably retain more energy and more speed of the vibe. The velocity magnitude is indeed related to *U* in accordance with Special Relativity, so *U* can represent the inertia of the moving vibe. (Of course *U* is always less than U_o multiplied by the quantity of rigid-fields composing the vibe.)

Note that rigid-fields always move at *c* but those composing a moving vibe exhibit (on average to the observer) a velocity vector component that corresponds to the translational velocity of the its structure as a whole.

The intertia of vibes emerges from the circumstance that a given transient perturbation accelerates them differently when the energy "retained in their delimited volume" is different; or rather when *U* is different.

The gravitational field emerges from the remote effects of concentrated large quantities of vibes. Indeed, the rigid-fields resonating in each of them extend the electromagnetic effects of their dynamics far away; the superposition of the contributions of very large quantities of rigid-fields involved in the resonances (even at different frequencies) creates the conditions for interactions with distant vibes; and it can produce remote energetic effects with net prevalence of attractive phenomena between objects composed of resonating rigid-fields.

The already discussed energy density

$$u=\frac{(k^2+B^2\cdot c^2)\cdot\varepsilon_0}{2}$$

is supposed to be equivalent to

$$\frac{M^2 \cdot G}{d^4 \cdot \pi \cdot 8}$$

which represents the energy density at points in the gravitational field (*G* stands for Newtonian-constant-of-gravitation) of the aforementioned "central mass with surrounding field" scheme.

So that the energetic effects at distance *d* from a reference point of a concentrated large quantity of vibes could produce interactions equivalent to the gravitational ones produced by the mass

$$M = d^2 \cdot \sqrt{\frac{u \cdot \pi \cdot 8}{G}}$$

A vibe composed of a quantity of negative rigid-fields equal to the quantity of positive rigid-fields exhibits a "surrounding field" that is not an electrostatic field, of course. But localized electromagnetic resonances can also maintain, in their delimited volume, the positions of rigid-fields of a certain polarity that are in excess with respect to those of the other polarity... Vibes can be electrically charged objects.

For example, if in the simulation context parameters there are

$$o_r = 8.081275\text{E-}36 \cdot m$$

$$o = 2.67029439\text{E-}20 \cdot C$$

(where *m* stands for meter and *C* for coulomb) then

$$U_o = \frac{o^2}{o_r \cdot \varepsilon_0 \cdot \pi \cdot 8}; U_o \approx 3.9651\text{E}5 \cdot J$$

(*J* stands for joule.)

In such a simulation context one vibe, or one composition of vibes, with the excess of negative rigid-fields equal to 6 is an object with a charge equivalent to that of an electron (*o* multiplied by -6). One vibe, or one composition of vibes, with the excess of positive rigid-fields equal to 4 is an object with a charge equivalent to that of an up quark (*o* multiplied by 4).

Rigid-fields could also prove useful as fundamental objects for simulating the features of entangled particles.

For example, "some information" about what's happening in the delimited volume of a LER is instantaneously present at every point in the space of the simulation context, due to the "rigidity and extension" of rigid-fields; so 2 or more vibes can remotely "influence each other" without the implications of objects moving along the paths between their positions.