ON A GENERALIZED LORENTZ FORCE

LUCIAN M. IONESCU

ABSTRACT. The generalized Lorentz force is investigated as a possible avenue to counter gravity.

Contents

1. Introduction 1
2. Two-body Systems 3
2.1. Coriolis and Centripetal Forces 4
2.2. Electric and Magnetic Forces 4
2.3. Gyromagnetic Forces 5
2.4. Gravitational Forces 5
2.5. Gravito-Magnetic Forces 5
3. Experimental Evidence and Conclusions 6
4. Annex 6
References 7

1. Introduction

Electromagnetism is a framework for dynamics

\[ \text{Differential Equations : } ma = F, \quad \text{Geometry : } F = F_{\text{Tangential}} + F_{\text{Normal}}, \]

with a cobordims flavor due to a tangential (work related) and normal (curvature related) decomposition, generalizing Newton’s framework for mechanics by including in the constitutive equation defining the forces:

\[ \text{Constitutive Equations : } F_T = eE + mG, \quad F_N = ev \times B. \]

A “dipolar charge” electric force intensity \( E \) is included besides the “monopolar charge” gravitational force intensity \( G \), together with magnetic force intensity \( B \). While \( E \) and \( G \) are responsible for local work, allowing for the definition of a potential energy, \( B \) models local curvature, a geometric force which does not produce work locally.

Now the “correct” linear momentum is the

\[ \text{Canonical momentum : } P = mv + eA \]

where \( A \) is the vector potential (in alternative EM units: \( P = mv + e/c A \)).

Date: May 25, 2011.
Key words and phrases. Quantum information dynamics, antigravity, Lorentz force.
When interpreting the formalism from the background space-time independent point of view of Quantum Information Dynamics, velocity can be interpreted as a “external gauge field”, as in general relativity, dual to the internal gauge field $A$ for the interaction under consideration (see Annex).

Since the resulting physics contains aspects attributed to the existence of an ether, similar to the reduced mass and normalized charge concepts, we will use the term ether to indicate a reference to this framework (Embedding the intrinsic dynamics into a space-time; math tools: adjunction and $\otimes$ as internal $\text{Hom}$).

We consider the Lorentz Force $F_{\text{Lorentz}}$ together with the Coulomb force $F_{\text{Coulomb}} = eE$ the prototype of a constitutive law in the context of Newton’s Law, called electromagnetic force:

$$m \frac{\partial v}{\partial t} = F, \quad F = F_{\text{Coulomb}} + F_{\text{Lorentz}},$$

$$F_{\text{Coulomb}} = eE, \quad E = e'/r^2, \quad F_{\text{Lorentz}} = v \times eB, \quad B = j'/r^2.$$

Here we preferred a discrete (quantum) formulation using a magnetic charge $j'$ (fluxon) to state a discrete version of Bio-Savart law (a related version using a moving electric charge can be found for comparison at [2]), in addition to the undisputed electric charge $e$ used to formulate Coulomb law for the electric force (The field versions are $B = \nabla \times A$ and $E = \nabla \phi$).

The term representing Coriolis acceleration $a_C$ (force $F_C$), present in the general case when we do not impose the inertial frame Galilean gauge condition, is:

$$m \frac{\partial v}{\partial t} = v \times m\omega = F_C, \quad \omega = \nabla v.$$

The centripetal acceleration (force $F_c$) is:

$$\frac{\partial v}{\partial t} = v \cdot \omega = a_C, \quad \omega = \nabla v.$$

It is a mechanical force term with no EM analog so far (“fictitious” vs. “material” is a debatable classification, since mechanical rotations are the analog of magnetic “vortices”; also electric charges, as sinks and sources, can be replaced by wormholes - see Wheeler and Misner - so, to be “real” or “fictitious” is a hamletian question, really!).

The mechanical analog of the electric force is the gravitational force:

$$F_G = mG, \quad G = k_N \cdot m'/r^2.$$

Note that we cannot normalize the equation by rescaling the charge, as in the case of the Coulomb force.

In compact form it is written as:

$$m \frac{\partial v}{\partial t} = v \times \nabla P.$$

For reasons of symmetry, $F_{\text{Normal}}$ needs additional terms:

$$F_{\text{Tangential}} = eE + mG \quad \leftrightarrow \quad F_{\text{Normal}} = ev \times B + \ldots.$$
Here *tangential* and respectively *normal* components refer to the direction of motion, which binds to the time variable in the $2 + 2 \equiv 1 + 3$ hermitian correspondence (Hodge relative decomposition for cobordism model of dynamics, i.e. “time” [6]).

It is natural to symmetrize and define the *generalized Lorentz force* to include the two terms representing the “ether” reactions, and representing a way to compensate the use of a rigid metric when embedding (material) systems in fictitious ambient space-times:

\[
e \frac{\partial A}{\partial t} = A \times \nabla P, \quad e \frac{\partial A}{\partial t} = A \times m\omega = F_{PK}, \quad e \frac{\partial A}{\partial t} = A \times eB = F_S.
\]

The term $e \partial A / \partial t$ is usually interpreted as a *motional electric force* (motional electric field; $E = \partial A / \partial t$), not due to “free” electric charges.

Altogether, the generalized Lorentz Force $F_N$, normal to the direction of “motion”, is of the type:

\[ P \times \Omega, \quad \Omega = \nabla P, \]

where $\Omega$ is a *generalized vorticity field* including centripetal/Coriolis and magnetic forces. A closer inspection:

\[ P \times \Omega = (mv + eA) \times \nabla (mv + eA) \ldots \]

reveals the presence of coefficients involving “strange” products of coupling constants: $m^2, e^2, me$.

The proper analysis requires the use of quaternions, or spinors, with its shadow, special relativity (see [6], hermitian model $2 + 2^* \equiv 1 + 3$), and the collaboration of a physicist!

The generalized Lorentz force entails the following additional terms (replacing \ldots above), which involve vorticity $\omega = \nabla v$ as the analog of magnetic force intensity $B = \nabla A$:

\[
F_N = F_L + F_C + F_{PK} + F_S, \\
\text{Lorentz Force: } F_L = v \times eB, \quad \text{Centrifugal Force: } F_C = mv \times \omega, \\
\text{de Palma – Kozirev Force: } F_{PK} = A \times m\omega, \quad \text{Searl Force: } F_S = A \times eB.
\]

Note that there may be additional “quantum” effects, i.e. due to non-simply connectedness and associated geometric/Berry/Aharonov-Bohm phase, in the case of *force-free configurations*, i.e. when $B = \nabla A = 0$ and/or $\omega = \nabla v = 0$ (see also Beltrami force-free fields). We will not consider such effects at this stage.

### 2. Two-body Systems

The main two-body system of interest in this article is the system Earth-Spinor, where by *spinor* we mean a rotating body possessing a magnetic field, e.g. Searl Effect generator (SEG / “flying disk”) or a Kerr blackhole.

The local vorticity and magnetic fields are denoted as follows:

\[
\text{Earth : } \omega_E, B_E, \quad \text{Spinor : } \omega, B.
\]
Special cases of such an object are: 1) a gyroscope, used in experiments of Bruce de Palma and Kozirev [4]; 2) homopolar generator (Faraday etc.).

The interactions between two such bodies involve both bodies masses and charges, together with the corresponding vorticity and magnetic fields.

2.1. **Coriolis and Centripetal Forces.** These are the analog of magnetic force and electric force (e.g. homopolar generator):

\[
\text{Coriolis acceleration} : a_C = v \times \omega, \\
\text{Centripetal acceleration} : a_c = v \cdot \omega. ^1
\]

As a typical example, for Earth and a point-wise object, the Coriolis (first term) and centripetal excess acceleration (second term) which acts vertically as a correction for gravitational acceleration, is [1]:

\[
a_{CC} = 2\Omega \phi + (v_\theta^2 + v_\phi^2)/R,
\]

where \( \phi \) measures the latitude and \( \phi \) measures longitude.

The importance of Coriolis force is given by the Coriolis parameter and Rossby number

\[
f = 2 \sin \phi \cdot \Omega, \quad Ro = \frac{v}{f \cdot L}, \quad f_E \approx 10^{-4}s^{-1}, \ Ro \approx \Omega/\Omega_E.
\]

For a gyroscope, the torque due to Coriolis force corresponds to Rossby number \( Ro = \omega 10^4 \); if \( \omega = 100s^{-1} \) then \( Ro = 10^6 \) and the Coriolis force can be neglected.

These forces can be thought off as corresponding to a linear momentum / angular momentum coupling between the two mechanical descriptions of the two objects.

2.2. **Electric and Magnetic Forces.** The equivalence of linear momentum implied by the canonical momentum \( P = mv + eA \) can be extended to canonical angular momentum. For simplicity we will refer to \( \nabla P = m\omega + eB \), instead of using Euler equation \( d\Omega/dt = \tau \) as a rigid body analog of Newton’s Law \( dp/dt = F \).

Then, the Homopolar Generator can be qualitatively analyzed by analogy: magnetic field \( B \) corresponds to angular momentum \( \Omega \) (vorticity):

\[
a_L = v \times B \quad \Leftrightarrow \quad a_C = 2v \times \Omega,
\]

and electric field \( E \) corresponds to centripetal acceleration:

\[
-\frac{\partial A}{\partial t} = a_E = v \times B \quad \Leftrightarrow \quad a_c = v \times \omega.
\]

Since Coriolis acceleration is perpendicular to velocity, by the mechanical-EM analogy, there should be a perpendicular component of the field intensity, interpretable therefore as a motional electric force:

\[
a_C = \partial v_L/\partial t \quad a_{Mef} = \partial A_L/\partial t.
\]

It should be compared with the claims of Hoover a.a. [4].

Can this “etherical centripetal acceleration” be so strong as to yield the purported ionization of the Searl disk?

\[ ^1 \text{A quaternionic formulation should allow the unification of the two forces.} \]
2.3. **Gyromagnetic Forces.** The new aspects of the above generalization is the coupling between mechanic and EM phenomena. The latter include gravity as a deformation in the direction of the “speed of light” Einstein’s constant (even though the constitutive equations of EM, i.e. the metric or the associated Hodge structure, form a tensor, so that there are four “speeds of light” in the continuum ambient space-time formalism of EM).

So, what is the order of magnitude of the term $\omega_E \times A$? More precisely, what is the impact of a solution of:

$$\epsilon \frac{\partial A}{\partial t} = \omega_E \times A.$$ 

as a correction to the main terms?

2.4. **Gravitational Forces.** Gravity seems to be a deformation of EM [7]. Can this be modeled as an effective force by averaging $A \times B'$?

Recall that the other well-known terms $v \times \omega, v \times B$ require by symmetry a term of the form $A \times \omega$, representing the gyro-magnetic force probably notices by de Palma and Kozirev in their experiments of falling / weighting gyroscopes, and a term of the form $A \times B$, representing the EM analog of the Coriolis force, conceivably responsible for the anti-gravitational force present in the Searl Effect.

Is Bifield-Brown effect due to the $A \times v$ term, or to the disparity between the negative and positive charge?

*Remark 2.1.* To emphasize the role of the vector potential $A$, which should be interpreted as an *ether flow* whenever comparing the “modern” theory with the historical statements about ether, we will call “fictitious” forces of the type $A \times \cdot$ as *etheral / etheric forces*.

These are geometric in nature, present whenever assuming a rigid ambient space-time as the world-stage for dynamics, special relativistic or not.

Assuming that gravity involves such “etheral” forces, the combinations between the these etheral forces of earth’s and a spinning body, will be referred to as *gravito-magnetic forces*.

2.5. **Gravito-Magnetic Forces.** Although “anti-gravity” might not be a question just about forces, since a multi-valued potential could yield effects similar to those of a genuine force defined as a gradient, we will discuss the “local” aspects: potentials which locally define forces.

The terms coupling Earth’s magnetic and vorticity fields to the angular momentum of a rotating magnetic field could provide levitation forces against gravity.

*Remark 2.2.* 1) Is the magnetic field due to a vector potential $A_{Earth}$ compensating for the Earth’s rotation?

$$\nabla P_E = 0, \quad P_E = mv_E + eA_E = 0.$$ 

2) The Hall effect lines of magnetic force show the presence of two complementary vortices (see [5]). Is this structure compatible with the aurora borealis phenomenon?

The term left to be investigate experimentally are the etheral forces $A \times B_E$ (Searl) and $A \times \omega_E$ (Faraday). They are proportional to the net electric charge.
3. EXPERIMENTAL EVIDENCE AND CONCLUSIONS

There is plenty of experimental evidence that Lorentz force, i.e. classical EM, cannot explain phenomena observed by Tesla, de Palma, Kozyrev, Biefeld-Brown, Searl, etc., not to mention more “exotic” evidence that reality is much more complex than the Newton-Maxwell local picture (non-local phenomena are not included here, since they belong to quantum theory and cybernetics).

There is a need for a careful classification of the reported evidence in rapport with the possible terms of the generalized Lorentz force presented above.

On the other hand the theory of EM has been generalized from an U(1)-gauge theory to a $SO(3)$-gauge theory (or $SU(2)$ to include spin and quantum phenomena as well: QID). The hermitean correspondence $3+1 = 2+2$ would provide an alternative formulation expressible in terms of Pauli matrices / Dirac spinors, via quaternions; but this is not desirable at this stage, since it would hide the practical meaning.

Regarding the main-stream research “picture”, the electroweak theory provides already worked-out theoretical material. It should be understood though that in “reality” symmetry is NOT broken (from $SU(2)$ to $U(1)$), but only in “theory”, in order to build a bridge with “Maxwell”-Heaviside theory, which in fact is just a Hertzian approximation of the “full” EM (QID), as countless researchers have pointed out during the last two centuries.

Our intension is not to convince the reader, but to raise a doubt, for him/her to start looking outside the academic-box.

Meanwhile we will enjoy the corresponding practical incarnations as free-energy and anti-gravity devices, not in a single instance like Tesla’s case was, but, due to the web, in most countries simultaneously.

4. ANNEX

The new physics is based on an intrinsic theory, background space-time independent. Compare with intrinsic vs. extrinsic geometry (metric, curvature etc.).

Briefly, a system is modeled intrinsically as a flow of qubits on a graph. Graphs form a dg-coalgebra; they form graph extensions, and a graph can be “factored” in many ways as an extension (compare with Hopf ring: divisibility of integers done using coalgebra structure). This framework is that of Hopf algebra approach to renormalization (see Connes-Kreimer), generalized by the author to include Kontsevich homology differential, in order to formulate the theory of Feynman Path Integrals in homological algebra terms (see Ionescu [8]).

Such a collection of graphs with divisibility and differential leads to a Quantum “Field” Theory, where the number of loops/particles, is not a constant.

Now, consider such representations of graphs $Q{-Net} \in Hom(\Gamma, G), G = SU(2)$ (Quatum Net) embedded into a space-time $Space{-Time} = M^{3,1}$:

$$\text{Embedding: } Quantum\_Net \rightarrow Space\_Time.$$ 

This is a generalized “singular homology”, with standard models graphs, rather then the simplices which are total graphs.
In a similar way, there is an adjunction (see the briefing on Grothendieck’s approach in Yu Manin’s and S. Gelfand book on homological algebra):

\[ \phi \in \text{Hom}(\text{Hom}(\Gamma, G), M) \xrightarrow{-} \text{Hom}(\Gamma, G \otimes M) \xrightarrow{-} \text{Hom}(\text{Riemann Surface, Callabi–Yau}) \ni \phi, \]

providing the correspondence with String Theory approach (viewing the IDOFs and EDOFs together in the 11D-manifold, the “landscape”), via some ribbon graphs - Riemann surfaces correspondence.

The dynamics of the Hodge structure from the intrinsic model is perceived as the ether contribution in the right side, due to the assumption of a fixed background space-time. The solution to the question “Which landscape is the right one” is “none”.

The proof that the intrinsic side can model at least what the right side does, is in the Formality Theorem of Kontsevich.

REFERENCES

[1] en.wikipedia.org/wiki/Coriolis_effect (see also Etvos effect)
[2] en.wikipedia.org/wiki/Biot-savart#Point_charge_at_constant_velocity
[4] see Rex Research: de Palma, Kozyrev, Hoover etc.

Department of Mathematics, Illinois State University, IL 61790-4520
E-mail address: lmiones@ilstu.edu