Deductions from the Quaternion Form of Maxwell's Electromagnetic Equations.

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Abstract.

The final formulations of Maxwell's electromagnetic equations were originally written in quaternions. Once returned to that form and treated with left and right hand operators as in the mathematics of P. M. Jack, a new seventh scalar electromagnetic field component emerges with possible relations to clean energy extraction and gravitation. Historical and present uses within military and humanitarian contexts are discussed. Scalar wave speeds are derived.

Introduction.

There has been much speculation over a period of time that traditional science was losing out by not considering the quaternion form of Maxwell's electromagnetic equations. However, for most, this form of the equations has either been unknown or has not been readily available for scrutiny. Relatively recently, this latter objection has been rectified by publications due to Peter Jack[1]. In this cited article he shows how to write Maxwell's electromagnetic equations in the notation of Hamilton's quaternions. This work opens up a whole new area for serious investigation and, as will be seen, leads to some unusual, possibly disquieting, results that could be related to other work concerning scalar waves[2].

History and context.

Within the evolution of J. C Maxwell's thinking there is mention in earlier work of gravitation emerging from an energetic reduction in the medium present between massive bodies[3], although the nature of the exact mechanisms involved eluded Maxwell as did the notion of negative energy. His work was based entirely on the presence of an aetherial medium mediating action at a distance. Such an all pervasive medium he concluded, had enormous intrinsic energies. Within that same little known volume by Maxwell, caution is urged from the beginning that the new mathematics and hypothetical theory presented are just that, save for two points which are actual demonstrated physical mechanisms of causality; those two mechanism being the aspects of the electromagnetic field responsible for its energy: (i) the magnetic polarizations and (ii) the electric polarizations. Movement is associated with point one, tension or strain in an elastic medium with point two. In later work[4] the idea of tension in an electromagnetic medium is further elaborated (chapter XI) as is the aetherial theory of action at a distance (chapter XXIII) and his many fundamental electromagnetic equations are fruitfully presented in the form of quaternions (sections 618-619 *quaternion expressions of the electromagnetic equations*, and throughout). Those many equations written in quaternion form by Maxwell were then reduced after Maxwell's death by Heaviside to those very few and more manageable equations we now refer to as "Maxwell's equations," which are written in modern vector notation following the works of Gibbs and Heaviside[5].

Working designs extracting energy from the limitless gravitational store have been built and used under military concealment from World War Two onward including working gravity based designs based in the science of T. Brown that have been practically utilized [6] (and references there in). These designs utilize proton and electron plasmas to create gravitational effects. Those government designs appear to use plasma associated scalar waves to move objects and collect clean energies[6]. Government papers and related books state quite plainly that electromagnetic theory inclusive of a new scalar component is indeed being used to gain these effects and, that this same science has been weaponized, and also utilized to gain clean energies as well as biological effects[2,5,6,7,8,9,10]. That new EM field component is associated with positive and negative time, gravity, positive and negative energies, temperature and charge. Positive time and energies are associated with negatively charged electron interactions and heating; negative time and energies are associated with positive charge, proton interactions and cooling. It is stated quite strenuously that the missing scalar field component is derived from Maxwell's original quaternion mathematics[5]. The working quaternion mathematics in question is omitted, presumably for purposes of weapons' design secrecy. This leaves the bulk of humanity without the knowledge needed to rightly sustain itself.

It might be noted at this point that any such gravitational expression must propagate at superluminal speeds to maintain contact with celestial mechanics[11].

It is not immediately obvious how the quaternion EM equations of Maxwell contain the missing information related to these temperature, charge, time and gravitational effects. A clever interpretation using right and left handed operators devised by a mathematician named Peter Michael Jack appears to have captured the facts correctly[1,12]. In this insightful work we find the actual mathematics in question, which do show a seventh scalar part to the electromagnetic field:- the Temporal Field T. This new field appears to be directly related to the basic scalar wave equation offered up as a solution in CIA work[2]. The Temporal Field T also offers the correct charge related thermal capacities of heat addition in positive work, and also heat subtraction in negative work said to be utilized in weaponized applications, and the negative energetic aspects said to be functioning in free energy devices[7,8].

Also it seems possible that these mathematics of Jack[1,12], or some like them, are those referred to in prioritized military applications and could well include gravitational, energetic and temporal qualities as have been ascribed to scalar waves in CIA work and the above referenced and related texts, as well as in our theories.

This mathematics may now be utilized to calculate potential wave propagation speeds emerging from Temporal Field expressions. Is such a wave or is it not superluminal? We note the needed T field *pulsed expression* is indeed characteristic of a gravity wave[11].

Jack's Analysis.

In his article, Jack takes as his starting point the assumption that the electromagnetic potential may be written

$$\boldsymbol{A} = \phi + A_1\boldsymbol{i} + A_2\boldsymbol{j} + A_3\,\boldsymbol{k},$$

where ϕ is the usual scalar potential and A_1, A_2, A_3 are the three components of the usual vector potential and *(d/dr)* is the differential operator defined by

$$\frac{d}{dr} = \frac{1}{c}\frac{\partial}{\partial t} + \frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z}.$$

Then, purely by inspection, as quaternions the electric and magnetic fields are seen to be

$$E = -\left\{\frac{d}{dr}, A\right\} = -(1/2)(d/dr \to A + \to d/dr)$$

$$= -\frac{1}{c}\frac{\partial\phi}{\partial t} + \nabla.\boldsymbol{A} - \frac{1}{c}\frac{\partial\boldsymbol{A}}{\partial t} - \nabla\phi$$

and

$$B = +[d/dr, A] = +(1/2)(\,d/dr \to A - A \to d/dr) = \nabla \times \boldsymbol{A}.$$

Here there has been alternation between the more commonly used 3-vector notion and the 3-vector of Hamilton’s quaternion notation, always taking care to match up the components of the appropriate expressions. It might be noted that the space components of these quaternion fields correspond exactly to the usual electric and magnetic fields encountered using the normal 3-vector calculus. However, the quaternion electric field has an extra – time component which is a scalar that may be denoted by T and given by

$$T = -\frac{1}{c}\frac{\partial\phi}{\partial t} + \nabla.A \tag{1}$$

This leaves the usual expressions for the electric (E) and magnetic (B) fields in terms of the usual scalar and vector potentials:-

$$E = -\nabla\phi - \frac{1}{c}\frac{\partial\boldsymbol{A}}{\partial t} \quad \text{and} \quad B = \nabla \times \boldsymbol{A} \tag{2a,b}$$

Again purely by inspection, the reformulated Maxwell Electromagnetic Field equations are seen to follow from

$$[d/dr, B] = +\{d/dr\,, E\}$$

and

$$[d/dr, E] = -\{d/dr, B\}$$

This leads to slightly modified set of Maxwell Electromagnetic Field Equations:

$$\nabla \times \boldsymbol{B} = \frac{1}{c}\frac{\partial \boldsymbol{E}}{\partial t} + \nabla T \qquad (3)$$

$$\nabla \times \boldsymbol{E} = -\frac{1}{c}\frac{\partial \boldsymbol{B}}{\partial t} \qquad (4)$$

$$\nabla . \boldsymbol{E} = +\frac{1}{c}\frac{\partial T}{\partial t} \qquad (5)$$

$$\nabla . \boldsymbol{B} = 0 \qquad (6)$$

Then following the theoretical ideas as laid out in (for example) *'Classical Electricity & Magnetism'* by Abraham & Becker pages 220-221, it is seen that

Equation (6) implies $\boldsymbol{B} = \nabla \times \boldsymbol{A}$ and it then follows that (4) implies $\boldsymbol{E} = -\nabla\phi - \frac{1}{c}\frac{\partial \boldsymbol{A}}{\partial t}$.

When these values are inserted into (3) and (5), those equations become

$$\nabla \times \nabla \times A + \frac{1}{c^2}\frac{\partial^2 A}{\partial t^2} + \frac{1}{c}\nabla\dot{\phi} = \nabla T$$

and

$$-\frac{1}{c}\nabla . \dot{A} - \nabla^2 \phi = \frac{1}{c}\frac{\partial T}{\partial t}$$

The first of these equations simplifies to

$$\nabla(\nabla . \boldsymbol{A}) - \nabla^2 A = -\frac{1}{c^2}\frac{\partial^2 \boldsymbol{A}}{\partial t^2} - \frac{1}{c}\nabla\dot{\phi} + \nabla T$$

Then, to quote Abraham & Becker, (2b) only specifies the curl of the vector $\boldsymbol{A}$. Its sources are still at our disposal and these are *defined* by laying down the condition

$$\nabla . \boldsymbol{A} = -\frac{1}{c}\dot{\phi} \qquad (7)$$

Using this in the two preceding equations leads to

$$\nabla^2 \phi - \frac{1}{c^2}\frac{\partial^2 \phi}{\partial t^2} = -\frac{1}{c}\frac{\partial T}{\partial t}$$

and

$$\nabla^2 \boldsymbol{A} - \frac{1}{c^2}\frac{\partial^2 \boldsymbol{A}}{\partial t^2} = -\nabla T \qquad (8)$$

respectively.

Deductions which follow.

Note that from equation (1) above

$$T = -\frac{1}{c}\dot{\phi} + \nabla.\boldsymbol{A}$$

and, by (7), this gives

$$T = 2\nabla.\boldsymbol{A} = -\frac{2}{c}\dot{\phi}$$

so the new scalar field, T, which Jack referred to as the 'Temporal Field', is not zero when this identification is introduced but remains to make a definite contribution to the theory.

It follows that, if $\boldsymbol{B} = 0$, then $\boldsymbol{A} = \nabla S$ and (8) becomes

$$\nabla\left(\nabla^2 S - \frac{1}{c^2}\frac{\partial^2 S}{\partial t^2}\right) = -\nabla T$$

that is

$$\nabla\left(\nabla^2 S - \frac{1}{c^2}\frac{\partial^2 S}{\partial t^2} + T\right) = 0,$$

which, if $\nabla T = 0$, results in the equation for S given in that CIA released article[2].

Note also that from the final equation above it may be deduced that

$$\nabla^2 S - \frac{1}{c^2}\frac{\partial^2 S}{\partial t^2} + T = 0,$$

if it is assumed that the constant of integration is zero. Again this assumption, because assumption it is, is in accordance with the above mentioned article[2].

However, if T is given by equation (1) and since $\boldsymbol{A} = \nabla S$, it follows that

$$T = 2\nabla^2 S$$

and substituting this into the equation above gives

$$\nabla^2 S - \frac{1}{c^2}\frac{\partial^2 S}{\partial t^2} + 2\nabla^2 S = 0$$

or

$$\nabla^2 S - \frac{1}{3c^2}\frac{\partial^2 S}{\partial t^2} = 0,$$

which indicates a wave speed of $c\sqrt{3}$; that is, a speed greater than that of light.

It is seen, therefore, that, if the quaternion form of Maxwell's Electromagnetic Field Equations is used, the normal theory follows through as usual, including the more novel notions introduced in the CIA released article mentioned[2]. However, in this case the resulting scalar field turns out to be described by an equation which indicates the wave speed to be greater than that of light; that is the scalar wave is superluminal.

Total and partial time derivatives and their role in wave speeds within an aetherial medium.

Thornhill[13] (1984) specifies the correct Total Time Derivative to be used in calculations specifying the medium's system dynamics as *bound to mass*, and so implying a return to a partial time derivative in the medium's unbound stationary state.

From Thornhill[13] (1984):

> . . . it is seen that, for general unsteady motion of a gas in three space- variables xi, (i = 1, 2, 3) when the fluid velocity components are denoted by ui, the governing equations may be written, using the summation convention,
>
> (Mass) $\frac{Dv}{Dt} - \frac{v\partial u_i}{\partial x_i} = -Av^2$

(Momentum) $\frac{Du_i}{Dt} + \frac{v\partial p}{\partial x_i} = B_i v$

(Energy) $\frac{DS}{Dt} = v(H - Apv)/T$

Here p denotes pressure, v specific volume, S specific entropy, T absolute temperature and the total time-derivative, moving with the fluid, is given by

$$\frac{D}{Dt} = \frac{\partial}{\partial t} + u_i \partial/\partial x_i \qquad (9)$$

In the assembly of Maxwell's equations, the time-derivatives which occur in Ampère's rule and in the laws of induction have invariably been interpreted as the partial derivative $\partial/\partial t$. This is not acceptable in the concept of a gas-like ethereal medium, where the ethereal velocity may vary from point to point and with time, and the Newtonian frame of reference may be chosen so that its origin moves at any constant speed, independent of the ethereal motion. To satisfy the requirements of a gas-like ether unambiguously, the time-derivative in Ampère's rule and the laws of induction can only be interpreted as the total time-derivative moving with the ethereal flow, namely D/Dt, as defined in Eq. (9) above.

Once away from mass and the bound condition the return to the partial time derivative in the medium's stationary state then permits *near instantaneous* longitudinal wave propagation speeds[11]. Wal Thornhill states: "The crucial difference between the near-infinite speed of the electric force and the relative dawdle of light on any cosmic scale is that the electric force is longitudinal."[14]

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