RECENT ADVANCES IN ECE2 THEORY

by

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ABSTRACT

A brief review is made of advances in ECE2 theory since the publication of UFT366 (the second volume of "Principles of ECE"). The review covers the analytical mechanics of gyroscopes; orbital precession; the conservation of antisymmetry in electrodynamics and gravitation; vacuum fluctuation theory and the design and construction of new circuits. Major advances have been made in each subject area.

Keywords: Advances in ECE2, gyroscope motion, orbital precession, the law of conservation of antisymmetry, vacuum fluctuation theory.

UFT400

1. INTRODUCTION

In papers of this series { 1 - 41} since UFT366 (the second volume of "Principles of ECE") major advances have been made in the application of ECE2 in four main subject areas: gyroscope dynamics; orbital precession theory; the law of conservation of antisymmetry; vacuum fluctuation theory and the design and construction of new circuits for energy from spacetime. Each subject area is briefly reviewed in Section 2 and the major advances described. Section 3 is a review of the new circuits and new circuit theory.

2. THE MAJOR ADVANCES

a) GYROSCOPE DYNAMICS

In UFT368 the analytical mechanics of the gyroscope are worked out precisely with a numerical method so that there is no need for the approximations used in the analytical methods of the textbooks. This appears to be the first time that the exact solution of gyroscope motion has been given with precision and new insight. The convective torque of ECE2 theory is also considered, so this provides insight that is missing from the standard model. The lagrangian of ECE2 theory is defined in an ECE2 covariant spacetime, in which torsion and curvature are both finite. The standard model lagrangian of the usual gyroscope theory is defined in a Galilean covariant space. The graphical results of the paper show various kinds of motion that have never been identified in the ususal analytical theory of the gyroscope. The major conclusion is that the motion of the gyroscope is much richer than previously known.

In UFT369 it is emphasized that the underlying geometry of gyroscope motion in ECE2 theory is Cartan geometry. For example the acceleration in spherical polar coordinates is an example of the Cartan covariant derivative with well defined spin connection. This is a major advance in understanding, because a generally covariant theory is needed to fully understand the concept of acceleration. A Galilean covariant theory is not sufficient. Some sample problems are solved numerically: 1) the gyroscope in a gravitational field; 2) the gyroscope with point attached to a stand; 3) the theory of spherical orbits; 4) the general theory of a gyroscope in an external force field; 5) the general theory of Milankowitch cycles. So the various gyroscope motions are variations on the theme of Cartan geometry and general covariance in relativity theory. The major advance is that gyroscope motion is recognized for the first time to be generally covariant. The graphics of the free falling gyroscope show new features that are unknown in previous analytical theories. The Laithwaite experiment is explained by suitable choice of initial conditions and a condition of weightlessness defined and graphed. An external torque is introduced and its effect on the gyroscope motion graphed in detail, giving several new insights.

In UFT370 a major advance in understanding is made in that rotational dynamics in general is shown to be generally covariant and defined by a Cartan spin connection. Rotational dynamics in general is therefore a sub structure of Cartan geometry so that the concept of rotational dynamics can be extended in many different ways. Examples are given in terms of various gyroscope motions. Graphics are given for a solution which considers two mass points, and provide results that were not known in classical analytical theories.

In UFT396 the above papers are completed using a Lagrangian theory of gyroscopes to which an external torque is applied. The calculational effort is reduced considerably using an approximation for quickly rotating gyroscopes and the lifting effects observed by Laithwaite and Kidd are explained qualitatively. The solutions of the Lagrange equations prove the existence of a local linear momentum that can be used for propulsion. The major advances made in this paper include the first complete evaluation of gyroscope motion, without using the approximations of the ususal textbook methods. The major discovery is made that the gyroscope system is able to generate propulsion without any interaction with the environment. Such a system can be used for new types of transport. Additionally, the entire theory is a sub structure of ECE2 generally covariant unified field theory because the basic dynamics are an example of the Cartan covariant derivative as shown in the papers reviewed already. Another important insight of this paper is that an external torque leads to lifting effects. Again, this as not known in the standard literature. A constant torque around the Z axis is used and its effects worked out numerically and graphed. Many new insights emerge. The emergence of this knowledge has been hampered by dogmatism for nearly two hundred years.

b) ORBITAL PRECESSION

The major discovery was made in UFT372 that orbital precession can be explained by the ECE2 Lagrangian, which is the Lagrangian of special relativity in a space with finite torsion and curvature. This explanation is true both for two and three dimensional orbits. Einsteinian general relativity (EGR) has been refuted in almost a hundred different ways in the UFT series of papers, so the ECE2 theory is preferred because it is correctly based on geometry with torsion. The relevant Euler Lagrange equations are solved numerically using the same basic method as in the solution of the gyroscope motion given in the preceding Section and the same basic method is applied in UFT372 to quantization in the H atom. It is shown that the orbit is a precessing ellipse. The orbital velocity at the perihelion is much higher than that at the aphelion. In this paper two examples were given of the applicability of the method: the orbital precession of Mercury and the radial Schroedinger equation and it was shown that the numerical method produces known analytical results almost exactly.

In UFT375 the ECE2 covariant Lagrangian was used to describe the orbit of an S2 star around a massive object near Sagittarius B, and to the Hulse Taylor binary pulsar.

Einsteinian general relativity (EGR) fails qualitatively to give retrograde precession, which is reported to exist in S2 star systems, but the ECE2 covariant theory gives both forward and retrograde precessions, another major discovery. It is shown that the EGR theory used in the solar system fails by eight orders of magnitude in the S2 system, and by two orders of magnitude in the Hulse Taylor system (HP) system. This failure is explained away in standard physics by claiming that the Einstein theory used in the solar system applies only in the weak field limit, so an elaborate correction is used for data from the HP system. However, the geometry of EGR is fundamentally incorrect in that torsion is removed by a contrivance - that of using the symmetric connection. The classic UFT99 shows that if torsion is removed, curvature vanishes. The classic UFT88 shows that the second Bianchi identity is changed completely by torsion, and so is the Einstein field equation. In the S2 system the weak field approximation of EGR is shown in UFT375 to be valid, yet the Einstein theory fails by two orders of magnitude, and cannot give retrograde precession at all.

The numerical computation based on ECE2 theory on the other hand gave reasonably accurate results, using Cartesian coordinates. The trajectories of the S2 star system were graphed and the numerical method correctly gives a constant relativistic angular momentum. In the S2 star system the orbit is nearly Newtonian despite the large masses involved. The numerical method needs only an initial velocity and initial coordinates, and from this the precession angle can be computed as shown in Section 3 of UFT375. In the non relativistic limit it was found that the precession angle is satisfactorily zero within the numerical uncertainty. UFT375 made another major discovery by showing that retrograde precession can be produced with ECE2 fluid dynamics, described in UFT374.

In order to describe the Hulse Taylor binary pulsar with ECE2 covariant theory. Using this method the orbits of both stars of the Hulse Taylor pulsar are shown to be ellipses. The Lorentz factor of the Hulse Taylor pulsar deviates from unity only by one part in a million, so relativistic effects are very small, despite the fact that two stars each with a mass comparable with the sun orbit each other. The two masses of the binary pulsar orbit each other very quickly, and there is an observed decrease in radius per orbit period of 76.5 microseconds per year. This means that the semi major axis shrinks by 3.5 metres a year, leading to a loss in mass which is far too small to account for the orbital decrease. The standard model of physics claims that the orbital shrinking is due to gravitational radiation, but this is wholly incorrect because the geometry of EGR is wholly incorrect. ECE2 can give a reasonable explanation in terms of fluid dynamics, and probably also with other mechanisms of the ECE2 theory.

In UFT376, it was shown that the ECE2 covariant Minkowski force equation gives orbital precession, another major discovery. This force equation modifies the Newtonian force equation by the fourth power of the Lorentz factor as described in Eq. (6) of the paper. This covariant force equation must be solved with the ECE2 field equations of gravitation. The ECE2 covariant Minkowski force equation gives the same result as fluid dynamics under a condition given in Eq. (16) of UFT 376, so the overall methodology of the UFT papers is self consistent.

In UFT377 it was shown that the ECE2 covariant lagrangian gives both forward and retrograde precession, depending on the way in which the Euler Lagrange equations are set up and solved numerically. The same paper defines the spin connections by using the field equations with the Euler Lagrange equations. This is another major discovery that goes far beyond the standard model (EGR). The spin connections are determined completely by the orbit. The ECE2 Lagrangian is used in Cartesian coordinates, and can be developed to give forward precession or retrograde precession. Forward precession is observed in the solar system and is produced by solving simultaneously two Euler Lagrange equations in X and Y. Retrograde precession is produced by the Euler Lagrange equation written in vector format as in Eq. (13) of UFT377. The vector Euler Lagrange equation is equivalent to the Newton equation multiplied by the cube of the Lorentz factor as in Eq. (18) of UFT377. This vector equation is written in terms of its Cartesian components and solved numerically, giving a retrograde precession in the opposite direction to the precession observed in the solar system. Such retrograde precessions have been observed in S2 star systems. As an aside it is interesting that EGR has been abandoned completely in S star systems by astronomers working in standard physics laboratories.

In Section 3 of UFT377 four methods of numerical solution are developed, based on theories summarized in this Section (b). The Euler Lagrange theory with observer time t was found to be the consistent theory. It was found that forward precession is accompanied by a constant relativistic angular momentum. The proper Lagrange variables in this case are X and Y. When the proper lagrange variable is the position vector r, The Euler Lagrange equation is equivalent to the well known relativistic Newton force equation, and retrograde precession is obtained. Retrograde precession is also obtained from the well known Minkowski force equation. However, the relativistic angular momentum is no longer a constant of motion when the Minkowski and relativistic Newton equations are used. The constant of motion in this case is the non relativistic angular momentum. This fact indicates that further analysis is needed, probably by setting up the vector Lagrangian in plane polar coordinates.

c) CONSERVATION OF ANTISYMMETRY.

The law of conservation of antisymmetry emerges from the antisymmetry of the torsion tensor in Cartan geometry, a basic property of a vector valued two form of differential geometry. The field tensor in ECE2 theory is based directly on the torsion tensor, so its antisymmetry is also a fundamental property of the field equations of ECE2; for electromagnetism, gravitation and fluid dynamics. There are scalar, vector and trace laws of antisymmetry, and all must be considered simultaneously for any problem in physics. This makes physics more rigorous than the standard model, which still develops electrodynamics as a nineteenth century un unified theory. Antisymmetry conservation is another major development of ECE2 theory.

In UFT381 the antisymmetry laws are applied to electromagnetic and gravitational plane waves, a static magnetic flux density, a static gravitomagnetic field, a static electric field strength and the acceleration due to gravity. The field equations are written out in full detail and S. I. units summarized. Some particular solutions of the antisymmetry laws are given and spin connections deduced. This is the first paper in which antisymmetry is developed systematically.

In UFT384 it is shown that orbital theory rigorously obeys antisymmetry for planar orbits and precessing orbits. The relevant spin connections are calculated. In ECE2 the relation between field and potential is defined in terms of the spin connection, so theories that appear to be Galilean covariant become part of a generally covariant unified field theory in a rigorously defined manner based on Cartan geometry (see for example UFT369). The four hundred papers and books of the unified field theory (UFT) series are four hundred variations on the theme of Cartan geometry. The latter is well defined and irrefutable given its fundamental definitions, the structure equations and identities. So ECE and ECE2 are also irrefutable mathematically, and if refuted experimentally can be modified without violating the laws of geometry. This is the overwhelming advantage of basing a theory of natural philosophy on geometry. In UFT384 spin connections for forward and retrograde precessions are calculated and graphed using arrows to indicate their direction.

In UFT385 spin connections are calculated for electric and magnetic dipole fields. It is shown that this theory conserves antisymmetry. The vector antisymmetry equations are solved simultaneously for the three components of the vector spin connection and the scalar spin connection calculated. The same overall procedure can be used for the magnetic and electric dipole fields. The existence of the spin connection is proven in numerous ways in the UFT series, both theoretically and experimentally in papers such as UFT313, UFT321, UFT363, UFT382 and UFT383 in which circuits that take energy from spacetime are described and explained with ECE and ECE2. The numerical analysis and graphics of section 3 of the paper clarify and augment the development in Sections 1 and 2, and this is true in general of the sections 3 of all the UFT papers. In the section 3 of UFT385 the fields and potentials are graphed using flow diagrams. These are a key help to understanding.

In UFT386 it is shown that conservation of antisymmetry leads to the inference of a vacuum current density. The word "vacuum" is synonymous with "aether" or "spacetime". The components of the spin connection vector are calculated using the vector antisymmetry law, so in three dimensions they can be deduced uniquely from the three components of the vector potential. The procedure is illustrated with magnetostatics and the field of a magnetic current loop is illustrated graphically in Section 3. It is important to note the graphical results of this and other papers because the graphics greatly clarify the mathematics, which are sometimes intricate. In UFT386 the graphics show the vector potential A of a far field dipole; its spin connection connection; a three dimensional view of the direction vectors of a far field dipole; a cut in the XZ plane of the magnetic flux density B of a far field dipole; the A potential generated by a magnetic current loop; the spin connection vector of a magnetic current loop; a cut in the XZ plane of the B field of a magnetic current loop; the current density J of a magnetic current loop and models or examples of the a field. All the UFT papers and books contain incisive and important graphics by co author Horst Eckardt, without which the mathematics would sometimes become too intricate to appreciate. Without the mathematics, understanding is empirical or qualitative, and the mathematical principles of natural philosophy (philosophiae naturalis principia mathematica) are developed in order to be able to forge a deeper understanding from which inductive inferences can be made. With computer algebra and graphics, complexity of mathematics is not an obstacle, although simplicity of concepts is a law of philosophy (Ockham's Razor). Simple concepts can lead to intricate mathematics, which are again reduced to simplicity using incisive graphics. Each UFT paper and book uses this overall methodology. The latter has produced major advances and has refuted larg sections of the standard model.

In UFT387 it is shown that antisymmetry is rigorously conserved and leads to a new type of electrostatics and magnetostatics in which there is a contribution from the vacuum. The vacuum four current is defined, together with the secondary magnetic field of electrostatics and secondary electric field of magnetostatics. Conservation of antisymmetry is a foundational law of unified physics and therefore must be considered for every problem. The obsolete physics is not rigorous, and is very incomplete, because it does not conserve antisymmetry and for many other reasons given in the UFT series. For the first time, it is realized in this paper that the interaction with the vacuum is determined by the spin connection, both for the electric field strength E and the magnetic flux density B. The graphics in section 3 illustrate the secondary E field of a magnetic dipole for two theories given in Table 1 of Section 3; three dimensional views of the scalar spin connection of a magnetic dipole at plane Z= 0 and Z = 1; and the vector potential A of a point charge.

In UFT388 the law of conservation of antisymmetry reaches its most complete form with the inclusion of trace antisymmetry inferred by co author Douglas Lindstrom. The paper makes the point that every circuit is influenced by the vacuum, and so is every material. In the simplest instance the Lamb shift is produced in the H atom, a radiative correction; and the Dirac g factor of two for one electron is changed by the vacuum. ECE2 theory produces simple and powerful explanations for these phenomena in the UFT series on www.aias.us and www.upitec.org. The trace antisymmetry equation is given in Eq. (12) of UFT388. So the complete set of antisymmetry equations is made up of trace, scalar and vector antisymmetry laws. The complete set must be considered for every problem in physics. A computational and graphical procedure is recommended in this paper in order to achieve comprehensive self consistency for every problem considered. Section 3 of this paper is on the mapping of the vacuum with the spin connection, using two examples. The graphics include three dimensional illustrations of fields and current densities of a plane wave, including the vector spin connection; and notably a three dimensional map of the spin connection.

In UFT389, ECE2 gravitational physics is described, using the complete set of wave and field equations and the complete set of five equations of conservation of antisymmetry. The triple unification achieved in the ECE2 theory ensures that the structure of these equations is also the structure of electrodynamics and fluid dynamics. The new trace antisymmetry law of gravitation is given in Eq. (11) of this paper; the scalar antisymmetry law of gravitation in Eq. (12) and the vector antisymmetry laws in Eqs. (13) to (15). In addition to the field equations and antisymmetry laws, the ECE2 covariant lagrangian and hamiltonian must also be considered. Section three is a comprehensive solution using computer algebra, both for forward and retrograde precession. The graphics reduce the mathematical complexity to simple images: the path and vector spin connection of a relativistic two dimensional orbit; the path and difference of vector spin connections for forward and retrograde precessions; and the gravitomagnetic field for retrograde precession.

In UFT390 a rigorous methodology is developed for ECE2 gravitation, described by the complete set of equations of UFT389. The methodology is illustrated for orbital precession, but also applies to other types of precession such as Lense Thirring and de Sitter precession, light deflection due to gravitation and all the phenomena observed in gravitational physics such as the velocity curve of a whirlpool galaxy. This is another major advance of ECE2 physics.

In UFT391 it is shown that antisymmetry is rigorously conserved in light deflection due to gravitation, orbital precession, and the velocity curve of a whirlpool galaxy. Catastrophic failure of Einsteinian general relativity (EGR) is proven by numerical integration of the gravitational Binet equation, and a simple proof is given that ECE2 theory gives an exact description of any orbital precession. EGR also fails catastrophically when compared with the velocity curve of a whirlpool galaxy and also fails by an order of magnitude in S2 star systems, in paper such as UFT377, reviewed already in this overview paper (UFT400). Astronomers working on S star systems have abandoned EGR in favour of empiricism, but ECE2 provides a self consistent explanation in terms of a generally covariant unified field theory. These are all major advances of ECE2 theory. The catastrophic or qualitative failure of EGR has been shown in many ways in the four hundred UFT papers and books, one example is graphed in Figures 1 to 4 of Section 3, dealing with EGR precession. These show that EGR produces an unstable orbit under well defined conditions. The orbiting mass falls in to the attracting mass according to EGR. The latter's geometry is completely incorrect as shown by classic UFT papers such as UFT88, so sooner or later it must fail. It has now been abandoned by leading astronomers and by the large ECE2 School of Physics.

d) VACUUM FLUCTUATIONS

In recent UFT papers, interaction with the vacuum has been developed with the well known theory of vacuum fluctuations used for example to describe the Lamb shift, one of the radiative corrections. The first paper on this subject was UFT392 in which the vacuum fluctuations were termed jitterbugging, shivering, or zitterbewegung. In UFT392 the vacuum fluctuation was incorporated in the scalar potential of the Coulomb law and in the vector potential of magnetostatics. Simple expressions were obtained for the vector spin connection of this version of vacuum fluctuation theory. It was shown that the origin of the vacuum electric field strength is the shivering spin connection.

In UFT393 the method of UFT392 was extended to the electric dipole potential and field, giving several original results. The basic idea of UFT392 and UFT393 is to replace the position vector in the absence of the vacuum by a shivering position vector, the shivering being induced by the vacuum. The concept of isotropic averaging is introduced for the first time in UFT393 and computer algebra used to compute the shivering dipole electric field strength. The graphics of section 3 of this paper show firstly the undistorted dipole field, and thereafter illustrate the effect of the vacuum, the latter distorts the electric dipole field in the absence of the vacuum. The central region of the dipole field contains interesting new patterns. Second and fourth order isotropic averages are considered. Three dimensional graphics are given of the divergence and curl of the vacuum distorted dipole field, showing that the vacuum can have significant effects.

In UFT394 the effect of vacuum fluctuations on the magnetic dipole potential and flux density is computed. The same basic method is used as that developed in UFT392 and UFT393, and isotropic averaging again utilized. It is found that the classical contact term becomes non zero in the presence of the vacuum. In the absence of the vacuum it is zero. This is one of several important illustrations in these papers of the effect of the vacuum. The complexity of the algebra is not a problem for the computer and the graphics reduce the complexity to easily understandable results. It is shown in section 3 of UFT394 that the vacuum produces a vacuum electric current and fluctuating magnetic charges or monopoles which average to zero. Therefore the shivering of magnetic dipole potentials and flux densities gives important new insight to the nature of the vacuum. Clearly, these methods can be extended to the whole of physics, notably electromagnetism and gravitation. The graphics of section 3 of UFT394 use a variable shivering radius to induce extra detail in the magnetic dipole field. The contact term is illustrated with second and fourth order isotropic averaging. The total field with contact term displays interesting structure, both for second and fourth order isotropic averaging. The divergence and curl of B is illustrated in three dimensional plots. These are all important and wholly unexpected results.

In UFT395 a tensorial Taylor series expansion is used to compute the effect of the vacuum on material matter and circuits and the method exemplified by deriving the well known Lamb shift and by computing the effect of the vacuum on the dipole vector potential responsible for effects in NMR. The details of the tensor Taylor series are given in full, and computer algebra used to develop isotropic averaging methods for higher order terms of the expansion. The well known Lamb shift calculation curtails the series at the first non zero term, but higher terms are also important.

In UFT397 the method of UFT395 is extended to physics in general, giving important new insights. Physics as is understood currently is a subject that is developed in the hypothetical absence of the vacuum. However, what is actually observed in any experiment must always include the influence of the vacuum. Two well known examples are the Lamb shift and the anomalous g factors of elementary particles: the radiative corrections. Similarly, Newtonian gravitation is developed in the absence of any consideration of the vacuum. It is argued that the vacuum must produce precession, because that is what is observed experimentally. The method based on isotropic averaging of terms in a tensor Taylor series is illustrated with the Lamb shift calculation, and thereafter extended to precessional effects in gravitation by incorporating the methods of Section (b) of this review paper, UFT400. The method is also applied to the magnetic dipole field. In Section 3 of UFT397, second, fourth and sixth order isotropic averages are summarized, having been obtained by computer algebra. The fact that the vacuum can produce precession is illustrated by a simple comparison of the vacuum fluctuation theory of this section and the precession theory of section (b). The fact that the vacuum can produce precession is another major advance. The graphics of section 3 reduce the complexity of the computation to an easily understandable illustration of the effect of the vacuum. Effects at fourth and sixth order are illustrated and summed to give the total effect. The effect of the vacuum on the Coulombic and inverse square laws of gravitational attraction are illustrated.

In UFT398 higher order corrections and spin connections of the Lamb shift are computed using a method that reduces correctly to the usual Lamb shift theory. It is shown that higher order corrections are inversely proportional to powers of the radiation volume V. The latter factors out from the usual Lamb shift theory but appears in higher order terms. For small radiation volume the higher order corrections can become considerable, another major discovery uncovered with the use of computer algebra. Spin connection components are computed and graphed, so the Lamb shift becomes part of ECE2 generally covariant unified field theory.

In UFT399 it is shown that infinite amount of energy can be obtained from the vacuum because the vacuum can infinitely amplify the electric field strength of a material or circuit. This fact is shown using Euler Bernoulli resonance theory and the tensorial Taylor method. If implemented, this is a discovery of the utmost importance for the unlimited acquisition of energy. The discovery is doubly important because it is based on the same theory as that used for the explanation of the Lamb shift. This is an accurate and well known theory. Euler Bernoulli resonance is also a well known method of amplifying small driving forces. In this case the driving force is the vacuum fluctuation responsible for the Lamb shift. The second method of producing peaks of infinite amplitude rests directly on the fundamental definitions of the electric field strength and scalar potential.

e). ADVANCES IN CIRCUIT DESIGN

(Section by Dr. Horst Eckardt)

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