A Simple Unified Field Theory of General Relativity and Electromagnetism without Extra Dimensions

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Abstract

This paper presents a brief analysis of the basic concepts of electromagnetic phenomena and then tries to reorganize and situate them in the context of the theory of general relativity. Existence of electric charges in two opposite types and the apparent absence of equivalence principle are two major obstacles in this task which we will show how to take a leap over them both.
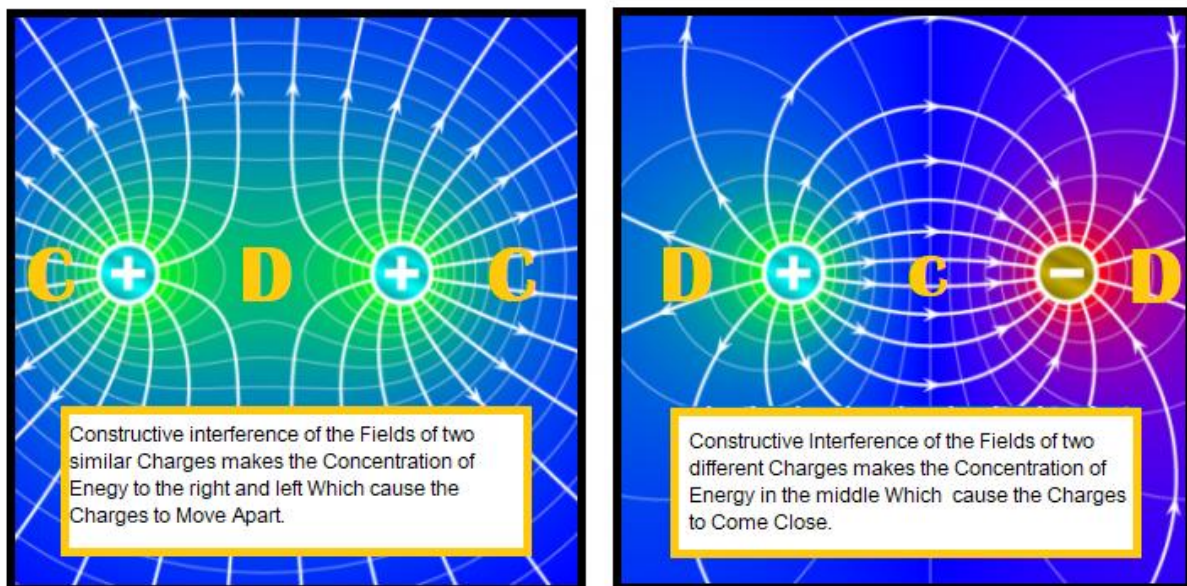
History of science tells us that the unification of apparently different phenomena of nature in one theoretical framework often attained by changing the way we look to these phenomena rather than by changing or improving our perception of the phenomena themselves. Among many examples is the unification of astronomy and physics made by Isaac Newton in the 17th century by showing that the movement of the planets in orbits could be thought of as free falling motion governed by the same laws as that of an apple falling from the tree.

The fact that Newton's law of gravitation and coulomb's law have the same mathematical form naturally leads our thinking to try to replace coulomb's law by a field theory based on Riemannian geometry. However, this idea will be faced by two difficulties. Firstly, the existence of the electric charge in two opposite types makes it difficult to represent all the feature of the electric field by geometrical quantities. Fortunately, this obstacle can be removed if we try to base our program of geometrization on the energy stored in the electric field instead of the field itself because this energy depends only on the absolute magnitude of the field as given by the relation:

Density of energy is proportional to the squire of Electric Field

One should not think that we are making oversimplification when we look for a geometrical quantity and try to relate it to a characteristic like the density which describe the electric field in less details, because all other features of the electric field will be represented in the results of the interference of the electric fields of different or similar types of charges.

Now when we look again to the interaction of charges everything turns out surprisingly simple and natural: the interaction can be understood on the basis of gravitational theory. Two different electric charges seem to attract each other because the results of constructive and destructive interference of their fields cause the density of energy to increase in the region between them and to decrease in regions in the left and right to the line between them, then it is easy to explain the reaction of the charges either by General Relativity or Newton's law of gravitation. The case of interaction of two similar charges can be dealt with in the same way.

Constructive interference of the Fields of two similar Charges makes the Concentration of Enegy to the right and left Which cause the Charges to Move Apart.

Constructive Interference of the Fields of two different Charges makes the Concentration of Energy in the middle Which cause the Charges to Come Close.

Now, let us turn to the second difficulty of this program of geometrization of the electric field; that is the absence of the equivalence principle which is a necessary requirement for any theory that try to explain the reaction of the objects when affected by a field on a geometrical basis. We can see that our explanation of the reaction of electric charges implies that the mass density and volume of the body

may also take part on the interference process inside the body and around its center. This interference will not decrease the difference of the density of energy resulted from the interference of electric fields of the charges but will surely decrease the effect of this difference on the gravitational field because as a general rule: adding the same quantity to two different quantities will decrease the ratio between them and so decrease any physical result of the difference between them. This may lead us to think of the possibility that different reaction of electric charges of different masses dos not necessary means absence of equivalence principle but may be understood as a result of the interference of the mass of the body around its center and the energy density of the electric field.