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Gravitational Field in the Scatter Effect

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Abstract— *Gravitational scattering, in the context of astrophysics, denotes the phenomenon wherein two or more celestial bodies interact via their gravitational fields [1][2], thereby inducing modifications in their respective trajectories. This process is of fundamental significance in the study of dynamic systems within the realm of astrophysics. In physics, action is a scalar quantity that describes changes in energy balance in a system as it follows a trajectory. It's crucial in classical mechanics, quantum mechanics, and general relativity, especially in systems with small action values similar to the Planck constant. This research paper aim to establish a connection between the field & gravitational theory by assuming energy conservation over time. This assumption will facilitate establishing a relationship that provides a pathway for the space tensor to be incorporated into our innovative gravitational field model, thereby rendering it comprehensible. Hope this research paper can benefit the citizens and the humanities.*

Keywords— *Gravitational field, gauge invariance, gauge symmetry, short run energy conservative, long run energy conservative.*

I. INTRODUCTION

Classical electromagnetism achieved realization but could not account for the discrete lines in atomic spectra or the distribution of blackbody radiation at different wavelengths. Max Planck's investigation of blackbody radiation marked the inception of quantum mechanics. He conceptualized atoms as tiny oscillators capable of possessing only discrete energies when they absorb and emit electromagnetic radiation, known as quantum harmonic oscillators. This limitation of energies to discrete values is referred to as quantization. Expanding on this notion, in 1905, Albert Einstein proposed an explanation for the photoelectric effect, asserting that light consists of individual packets of energy called photons. This implies that electromagnetic radiation, traditionally perceived as waves in the classical electromagnetic field, also exhibits particle-like behavior.

Gravitational scattering is typically studied through simulations and mathematical models to analyze the interactions between celestial bodies. One crucial aspect of this phenomenon is energy exchange, where a fast-moving object can transfer some of its kinetic energy to a slower-moving object, resulting in a slingshot effect. This principle is utilized in space exploration to provide spacecraft with a momentum boost by maneuvering close to a planet. Research on gravitational scattering has yielded valuable insights into various astrophysical phenomena, especially in dense regions such as star clusters or galactic cores, where it affects star formation and the distribution of stellar populations. For example, hypervelocity stars, which are ejected from galaxies, often result from gravitational scattering involving massive objects like black holes. Moreover, intense interactions between compact objects such as black holes can lead to the emission of gravitational waves, detectable by instruments like the Laser Interferometer Gravitational-Wave Observatory (LIGO). The analysis of gravitational scattering encompasses both Newtonian mechanics and general relativity, with the latter being indispensable for systems involving high mass or velocity.

Gravitational scattering is the process by which two or more celestial objects interact through their gravitational fields, causing their trajectories to alter. This phenomenon is essential in astrophysics and the study of dynamic systems. When objects such as stars, planets, or black holes pass close enough to influence each other's motions, their paths can shift dramatically. These interactions typically result in either bound systems, like binary star systems, or unbound systems, where the objects continue moving apart after the interaction. An example of a body ejected from a planetary system by this process would be Kuiper belt bodies pushed from the Solar System, especially by Jupiter.

II. DISCUSSION

Gravitational scattering is typically studied through simulations and mathematical models to analyze the interactions between celestial bodies. One crucial aspect of this phenomenon is energy exchange, where a fast-moving object can transfer some of its kinetic energy to a slower-moving object, resulting in a slingshot effect. This principle is utilized in space exploration to provide spacecraft with a momentum boost by maneuvering close to a planet. Research on gravitational scattering has yielded valuable insights into various astrophysical phenomena, especially in dense regions such as star clusters or galactic cores, where it affects star formation and the distribution of stellar populations. For example, hypervelocity stars, which are ejected from galaxies, often result from gravitational scattering involving massive objects like black holes. Moreover, intense interactions between compact objects such as black holes can lead to the emission of gravitational waves, detectable by instruments like the Laser Interferometer Gravitational-Wave Observatory (LIGO). The analysis of gravitational scattering encompasses both Newtonian mechanics and general relativity, with the latter being indispensable for systems involving high mass or velocity.

These gravitational scattering can lead to changes in orbits or make celestial bodies leave their original planetary systems. In a protoplanetary disk, this could be caused by gravitational scattering due to over-densities in the fluid of the disk, or by larger planets. For example, in our Solar System, it's possible that Uranus and Neptune were gravitationally scattered onto larger orbits through close encounters with Jupiter and/or Saturn. Systems of exoplanets can also undergo similar dynamical instabilities after the dissipation of the gas disk, which can alter their orbits and sometimes lead to planets being ejected or colliding with the star. Planets scattered gravitationally may end up with highly eccentric orbits, with perihelia close to the star, which can then be further affected by the gravitational tides they raise on the star. The resulting systems often operate close to the limits of stability.

Innovative Idea and Insight:

In the concept of action, which is used to describe the motion of a single particle with constant velocity. It is calculated as the momentum of the particle multiplied by the distance it travels. Alternatively, it can be expressed as the difference between the particle's kinetic and potential energy multiplied by the time it has that amount of energy. More formally, action is a mathematical function that takes the trajectory of the system as its input and yields a real number as its output. The value of action varies for different paths. In terms of dimensions, action is expressed in energy multiplied by time or momentum multiplied by length, and its SI unit is joule-second, analogous to the Planck constant (h). Lorentz transformation (l).

Our New Suggestion:
Field of Action~=Ed*P*l*hw
Field of A～＝Ed*t*l*hw
P momentum oscillation perturbation
Field of Energy~=hpwv
Field of E~=hpwv

In field theories, different configurations of unobservable fields can lead to identical observable quantities. A transformation from one field configuration to another is termed a gauge transformation. The lack of change in measurable quantities, despite the field being transformed, is a property known as gauge invariance. For instance, if you could measure the color of lead balls and find that changing the color does not affect the number of balls that fit in a pound, the property of "color" would exhibit gauge invariance. As any invariance under a field transformation is well-thought-out a symmetry, gauge invariance is sometimes called gauge symmetry. Generally, any theory that shows gauge invariance is considered a gauge theory.

In electromagnetism, when the electric field (E) and magnetic field (B) are observable, then the potentials V ("voltage") and A (the vector potential) sustain not. So, transformations of Gauge play a crucial role in quantum field theory, constraining the laws of physics. Physicists realized that all fundamental interactions arise from local gauge symmetries. Perturbative quantum field theory describes forces in terms of force-mediating particles called gauge bosons. The culmination of these efforts is apply in Standard Model, a quantum-field function that accurately predicts all fundamental interactions except gravity.

So, this research paper hopes to bridge the gap between the field and gravitational theory, as in the assumption of energy conservative, in the long run. This will allow us to have a kind of relation that will provide a way of path that the tensor of the space can fit into our innovative model assumption of the tensor gravitational field of potential scatter that we can understand.

The concept of gauge symmetry was first discovered in the context of classical electromagnetism. A static electric field can be described using an electric potential (voltage) defined at every point in space. In practical terms, we often use the Earth as a reference for the zero level of potential, or ground. However, only differences in potential are physically measurable, which is why a voltmeter needs two probes to measure the voltage difference between them. This means that one could choose to define all voltage differences relative to some other standard instead of the Earth, resulting in the addition of a constant offset.

If the potential φ is a solution to Maxwell's equations, then after this gauge transformation, the new potential φ' is also a solution to Maxwell's equations, and no experiment can distinguish between these two solutions. In other words, the laws of physics governing electricity and magnetism (Maxwell's equations) are invariant under gauge transformation. This leads to the conclusion that Maxwell's equations exhibit a gauge symmetry.

In this research paper, we hypothesized that a change in the charge of a variable particle could be indicative of a superconductor within the surrounding field, potentially providing a field potential. This energy scatter could also produce a magnetic scattering effect, influencing the magnetic properties of the gravitational field tensor. The generator, serving as the key to the transformation, may act as a source capable of lifting both planets and stars. With this modification, hopefully we may link up the gravativity in utilizing the transformant.

Gauge symmetry is closely related to charge conservation. Imagine a process where one could briefly violate conservation of charge by creating a charge q at point 1, moving it to point 2, and then destroying it. It might seem that this process is consistent with conservation of energy. We could say that creating the charge required an input of energy E1=qV1 and destroying it released E2=qV2. This seems natural because qV measures the extra energy stored in the electric field owing to existence of a charge at a certain point. Conservation of energy would be satisfied outside of the interval during which the particle exists, because the net energy released by creation and destruction of the particle, qV2-qV1, would be equal to the work done in moving the particle from 1 to 2, qV2-qV1. However, although this scenario salvages conservation of energy, it violates gauge symmetry. Gauge symmetry requires that the laws of physics be invariant under the transformation, which implies that no experiment should be able to measure the absolute potential without reference to some external standard such as an electrical ground. But the proposed rules E1=qV1 and E2=qV2 for the energies of creation and destruction would allow an experimenter to determine the absolute potential simply by comparing the energy input required to create the charge q at a particular point in space in the case where the potential is V1 and V2 respectively. The conclusion is that if gauge symmetry holds and energy is conserved, then charge must be conserved.

So, in this research paper, we suggested that a relaxation in the short run approach, when utilizing the charge which can change the behavior of the particle as well as the field when the charge is larger the field of scatter will be stronger, which may hold to the assumption of the change in field size as an affine parameter, that could have a change in a shift as the field size enlarge. As a result, that makes B size=change in A of the magnet potential scatter (charge), and as A size=change in B of the magnet potential scatter (charge). As our research paper suggested.

The concept of a static electric field can be explained using an electric potential (voltage) that is defined at every point in space. In practical terms, it is common to use the Earth as a reference point that defines the zero level of the potential, also known as ground. However, only differences in potential can be physically measured, which is why a voltmeter requires two probes and can only measure the voltage difference between them. Therefore, it is possible to define all voltage differences relative to a different standard, resulting in the addition of a constant offset.

If the potential (V) is a solution to Maxwell's equations, then a new potential (V') resulting from a gauge transformation is also a solution to Maxwell's equations, and no experiment can distinguish between these two solutions. This means that the laws of physics governing electricity and magnetism (Maxwell's equations) are invariant under gauge transformation, demonstrating gauge symmetry.

Moving from static electricity to electromagnetism, we encounter a second potential, the magnetic vector potential A, which can also undergo gauge transformations. These transformations can be local, meaning that instead of adding a constant to V, a function that takes on different values at different points in space and time can be added. If A is also changed in certain corresponding ways, the same electric (E) and magnetic (B) fields result. The detailed mathematical relationship between the fields E and B and the potentials V and A is provided in the article on gauge fixing, along with a precise statement of the nature of the gauge transformation. The important point to note is that the fields remain the same under gauge transformation, & therefore Maxwell's equations are still satisfied.

As discuss above, in classical general relativity, gauge transformations refer to arbitrary coordinate transformations. These transformations must be invertible, and both the transformation and its inverse must be smooth, meaning they can be differentiated an arbitrary number of times. A coordinate transformation can distort Cartesian coordinate grid, creating a nonlinear co-relation between the old (x, y) coordinates and the new ones. Despite these changes, Einstein's equations of general relativity remain valid in the new coordinate system. These changes in the coordinate system are still known as gauge transformations in general relativity.In our innovative concept assumption, the field of transformant can serve as a wave scatter potential, to function as a link of gravitational field as well as the change in shift as the magnet size potential as affine parameter connection does.

In conclusion, this research paper endeavors to establish a connection between the field & gravitational theory by assuming energy conservation over time. This assumption will facilitate establishing a relationship that provides a pathway for the space tensor to be incorporated into our innovative gravitational field model, thereby rendering it comprehensible. Hope this research paper can benefit the citizens and the humanities.

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