How gravitation works

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Abstract

Spherical shock fronts deform and expand their carrier. These excitations form the footprints of the particles.

The interaction

Gravitation is an interaction between a discrete object and a field that gets deformed by the interaction. First, we focus on the tiniest interaction. It is a pulse response. These pulse responses are solutions of one of two quaternionic second order partial wave equations.

$$\varphi = (\partial^2/\partial\tau^2 - \langle\nabla, \nabla\rangle)\ \psi$$

$$\rho = (\partial^2/\partial\tau^2 + \langle\nabla, \nabla\rangle)\ \psi$$

τ plays the role of proper time. ∇ is the nabla operator. The first equation is the quaternionic equivalent of the wave equation. The second splits into two first order partial differential equations.

$$\boldsymbol{\nabla} \equiv \{\partial/\partial x, \partial/\partial y, \partial/\partial z\}$$

$$\nabla_r \equiv \partial/\partial\tau$$

$$\phi = \phi_r + \boldsymbol{\Phi} = \nabla\psi$$

$$\equiv (\nabla_r + \boldsymbol{\nabla})(\psi_r + \boldsymbol{\psi}) = \nabla_r\psi_r - \langle\boldsymbol{\nabla}, \boldsymbol{\psi}\rangle + \boldsymbol{\nabla}\psi_r + \nabla_r\boldsymbol{\psi} \pm \boldsymbol{\nabla}\times\boldsymbol{\psi}$$

Thus ∇ works as a quaternionic multiplying operator.

$$\rho = \nabla^*\phi = (\nabla_r - \boldsymbol{\nabla})(\nabla_r + \boldsymbol{\nabla})(\psi_r + \boldsymbol{\psi}) = (\nabla_r\nabla_r + \langle\boldsymbol{\nabla}, \boldsymbol{\nabla}\rangle)(\psi_r + \boldsymbol{\psi})$$

In an otherwise free three-dimensional spatial setting, three pulse responses can occur. A one-dimensional actuator causes a one-dimensional shock front.

$$\psi = g(x\ \boldsymbol{i} \pm \tau)$$

During travel this shock front keeps its shape and its amplitude. The imaginary vector $\boldsymbol{i}$ only occurs in the solutions of the second equation. In the solutions of the first equation it equals unity.

In two dimensions a rather complex vibration occurs that is quite like the pattern when a stone is thrown into the center of a pond.

A three-dimensional actuator causes a spherical shock front.

$$\psi = g(r\ \boldsymbol{i} \pm \tau)/r$$

The spherical shock front integrates over time τ into the Green's function of the field. The Green's function results as a pulse response in the Poisson equation.

$$\rho = \langle \nabla, \nabla \rangle \psi$$

The Green's function has some volume. This volume is locally added to the volume of the field. Subsequently it spreads over the full extent of the field. Thus, the dynamic impulse response first locally deforms the field. This deformation quickly fades away. However, the volume persistently expands the volume of the field.

This interaction is so tiny and is so quickly vanished that the deformation cannot be perceived by any observer. This does not mean that a coherent swarm of overlapping spherical shock fronts cannot produce a significant and noticeable effect. But therefore, the overlap must occur in time and in space.

Interesting is to note that the one-dimensional shock front does not integrate into a volume. Consequently, it does not cause a deformation of its carrier.

Ensembles of spherical shock fronts

Recurrently regenerated dense and coherent swarms of hop landing locations create the overlap conditions that cause a persistent and significant deformation of the field that embeds the hop landings. A stochastic process that generates the subsequent hop landing locations in a hopping path of a point-like object can generate such condition. The swarm must be coherent. This is ensured if the stochastic process owns a characteristic function. The characteristic function is the Fourier transform of the location density distribution that describes the swarm. If the characteristic function contains a gauge factor, then this factor can act as a displacement generator. It means that the hopping path is not closed. Thus, in first approximation the swarm moves coherently and smoothly as a single unit. With other words, the stochastic process with its characteristic function, the hopping path, the hop landing location swarm, and the location density distribution represent the point-like object that both hops around and moves smoothly as a single object. The object is an elementary particle. The squared modulus of its wavefunction equals the location density distribution of the swarm. The characteristic function acts as a wave package that is continuously regenerated. Usually moving wave packages disperse, but this one keeps being regenerated. Consequently, the object combines particle behavior with wave behavior. The hop landing location swarm can simulate interference patterns. The hop landing locations cause spherical shock fronts that integrate into a Green's function. The Green's function blurs the location density distribution. The result is the convolution of the Green's function with the location density distribution. This result is the contribution of the elementary particle to the local gravitation potential.

Back-reasoning explains that the spherical shock fronts possess a mass capacity. They contribute part of that capacity to the mass of the elementary particle. In other words, the mass of the elementary particle is proportional to the number of elements of the hop landing location swarm.

Modules

Elementary particles are elementary modules. Together the elementary modules configure all other modules and some of the modules constitute the modular systems that occur in the universe.

Like with elementary modules, a stochastic process generates the footprint of modules. The characteristic function of this process equals a dynamic superposition of the characteristic functions of the components of the module. The superposition coefficients act as internal displacement generators and determine the internal positions of the components. The characteristic function of the module also contains a gauge factor that acts as a displacement generator, such that the module moves as a single unit. Therefore, the stochastic process of the module binds the components of the module. The footprint generates a swarm of spherical shock fronts that together deform the embedding field. This deformation determines the contribution of the module to the local gravitation potential.

References

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