Unified Force Equation

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Abstract

In modern physics, each force has its own equation that shows the dependence of the force on the distance between the sources of force: Coulomb's law, Newton's law of gravity, Gilbert's law. The study shows that they can all be expressed with a single formula that includes the number of spatial dimensions. The new formula is valid for any space.

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Introduction

Newton's law of gravity, Coulomb's law, and Gilbert's law depend on the inverse square of the distance [4]. This makes it possible to unify them and describe these completely different phenomena with one universal formula.

Unification

Let's look at Coulomb's law [1]:

$$F = q_1 q_2 / 4\pi \varepsilon r^2, \quad (1)$$

where: F – force acting between charges;
q – charge;
r – distance between charges;
ε – permittivity.

The strength of the force exerted by charge q_1 is:

$$E = F/q_2 = q_1/4\pi \varepsilon r^2, \quad (2)$$

$4\pi r^2 = S$ is actually the surface area of a sphere with radius r.

The distribution of the force strength over the surface S for any charge is:

$$D = ES = q/\varepsilon, \quad (3)$$

Equation (3) describes any force field, only instead of ε, an appropriate propagation coefficient must be used, i.e., for a magnetic field μ, for a gravity field the modified gravity constant etc.

Therefore, general equation that describes all potential force fields is:

$$D = ES = \alpha/\Pi, \quad (4)$$

Where: D – force distribution;
E – strength;
S – surface on which force is measured;
α – source of force;
Π – propagation coefficient.

The formula for the surface S depends on the number of dimensions of the space. Therefore, for a two-dimensional space $S_2 = 2\pi r$,
for a three-dimensional space: $S_3 = 4\pi r^2$,
for a four-dimensional space: $S_4 = 4\pi^2 r^3$.

Unified gravity law.

For uniformity Newton gravity [2] law: $F = G\,mM/r^2$,

where: G – gravity constant,
must be written as: $F = mM/4\pi\gamma r^2$ (5)
where: $\gamma = 1/4\pi G$ – modified gravity constant, or more precisely, propagation coefficient of gravity.
The source of gravity is mass.

Unified magnetic field.

Source of magnetic field is Gilbert magnetic charge or magnetic monopoly [5].

Propagation coefficient is permeability.

Conclusions

Equation (4) is valid for any potential force field in space with any number of spatial dimensions.

References

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