Discrete Dipole Force

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In this paper I describe a fundamental physical force, whether this is real or fictional, which is based on discrete dipole charges. It couples with Coulomb's law, which is Spin-1, to produce Spin-2 like effects, which might be interpreted as some form of gravity under stochastic entangled motion.

Assume that for each point in space, there is a neutrally charged center which location in space is fixed at some point in time. We place N charges randomly around this center at the surface of a unit sphere. Now, imagine that these charges belong to freely moving distant particles that evolve according to Coulomb's law for a long period of time, in such a way that positive charges gather in one direction and negative charges gather in the opposite direction.

For example, in an atom, positive charges (protons) are in the nucleus while negative charges are orbiting the nucleus (electrons). At some point in the space between the electrons and protons, there is a tendency that negative charges are overall in one direction and the positive charges are overall in another direction. However, this polarity does not need to be exact.

On the unit sphere around this point in space, one can think of it as having two poles, one positive and one negative, as an approximation to the distribution of charges, but these two poles do not have to be lining up along an axis. With other words, you get a more accurate model than a pure North-South polarity, but also, this is less accurate than describing each individual charge.

A particle that moves through this point in space, might interact with the polarity of positive and negative charges. For example, a positively charged particle at rest will be attracted toward the negative pole, but detracted from the positive pole. This force could be equal independent of reference frame, e.g. whether the particle is at rest or in motion. However, it might also depend on the reference frame. For now, we will only make approximations and focus on the force on a particle at rest.

This model is basically what happens when you take Coulomb's law and approximate it, such that there is a general direction where positive charges are and a general direction where negative charges are. Instead of calculating the force of attraction or detraction for every particle, we remove all those forces that cancel in opposite directions, but instead of letting this become our new aligned axis of a North-South polarity, we keep the freedom where positive and negative charges can have two independent directions: One pole of positive charges in one direction and one pole of negative charges in another direction, where the two directions do not have to be opposite.

With other words, in this model there is not a pure cancellation of forces, because this would result in an aligned axis. Yet, we also want to keep the intuition that the positive direction is like moving along an axis in positive direction. The negative direction is like moving along an axis in negative direction. Using this semantics, we think of this as a point in space that can curve. It tells us how a one-dimensional world line, crossing this point, curves from negative toward positive charge.

Since the only interaction we are interested in is the curve from negative toward positive charge, this means that there is no interaction when we have two charges of the same sign, a dipole force:

$$F_{ijk} = k \cdot \varepsilon_{ijk} \cdot q_j \cdot q_k \,/\, (|\mathbf{r}_i - \mathbf{r}_j| \cdot |\mathbf{r}_i - \mathbf{r}_k|) \qquad \text{`q` is charge, `k` is interaction constant}$$

Where `$\mathbf{r}$` is position and `$\varepsilon_{ijk}$` returns `1` when `$q_j \cdot q_k < 0$, i != j, i != k, j != k` and `0` otherwise.

This force `$F_{ijk}$` is the magnitude of a vector force with direction along the normal of the plane constructed from `$\mathbf{r}_i - \mathbf{r}_j$` and `$\mathbf{r}_i - \mathbf{r}_k$`. The choice of up vs down depends on whether the universe is left- or right-handed. The corresponding recoil force is divided half at particle `j` and `k`.

Now, this vector force becomes zero if the the polarity aligns with a pure North-South pole axis. This is because the cross product becomes zero. Correspondingly, if the positive charge is in the same direction as the negative charge, then the cross product also becomes zero.

The maximum dipole force is felt when the positive and negative directions are orthogonal.

One can imagine a system of two oppositely charged particles that are very close to each other. For a distant test particle, the dipole force is very weak, because the directions to the positive and negative charges almost point in the exact same direction. In addition, the force felt by particle `i` from `j, k` is the canceled by `k, j`, since the cross product is antisymmetric.

This means that under ideal conditions and using an idealized classical model, this dipole force vanishes entirely. Under less ideal conditions and less idealized models, using average randomly chosen interaction constants, this dipole force would be very weak, compared to other forces of nature.

With other words, if a dipole force is observable, then it is likely very weak, but also requires breaking the symmetry of `i` between the the opposite contributions of `j, k` vs `k, j`. A such symmetry breaking can happen by using some particle that carries the force in discrete quanta.

On average, with a force carrying particle, the dipole force keeps an object located approximately in the same place over time, but oscillating in the spherical surface centered on the source with two oppositely charged particles. For systems of particles under this influence, which absorb the force carrying particle at irregular places in the system, this can cause internal angular momentum along the spherical surface.

The movement internal in systems will be eratic, like a random walk, but the effect will be greater toward the dipole source. Since there is greater sporadic angular momentum closer to the source, this can cause an inertia gradient within the system. The parts of the system further away have easier for moving toward the parts closer to the source, since the parts closer to the source have greater inertia on average and more resistance against change in physical constraints with parts that are further away. This might make the overall system accelerate toward the dipole source. The effect is roughly proportional to the inverse square law.

The recoil effect might be thought of as an entangled motion that preserves the total energy of both a test particle and the dipole source. The test particle does not need to have mass or charge, because the dipole force only depends on the charges and distances to the dipole particles.

In conclusion, this dipole force can be thought of as some form of gravity under stochastic entangled motion. The force is very weak, if observable at all. Particles without mass, such as light, might bend their paths through space due to this force. At the current moment of research, it is not possible to say whether this force of real or fictional. The particle functioning as a force carrier is not known.