A note on anisotropic quantum gravity

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Abstract

Anisotropic gravitation is considered, leading to a unique view of dark matter.

1 On the interruption of processes by time dilation

A *process* is a system of mass-energy, along with its internal interactions.

Time dilation is the *interruption* of said process, whether it be kinematic and/or gravitational – both are the result of external interactions. In the case of the gravitational interaction, the process is interrupted by spacetime itself (e.g. gravitons). In the case of the non-gravitational interaction, the process is interrupted by the other force-carrying particles (e.g. photons, etc).

It is the gradient of the gravitational time dilation [1], based on the distance from the gravitating process, that causes acceleration toward the gravitating process. This is encoded in the first term on the right-hand side of the Schwarzschild line element

$$ds^2 = -\left(1 - \frac{R_s}{r}\right) c^2 dt^2 + \frac{dr^2}{\left(1 - \frac{R_s}{r}\right)} + r^2(d\theta^2 + \sin^2\theta d\phi^2). \tag{1}$$

where R_s is the Schwarzschild radius

$$R_s = \frac{2GM}{c^2}, \tag{2}$$

M is the mass-energy of the gravitating process, G is the universal gravitation constant, and c is the speed of light in vacuum.

If all of physics is about processes, then it is therefore all about *computation* [2,3] – here we have even adopted the concept of process interruption, which is surely familiar to all assembly programmers [4].

The densest process for any given amount of mass-energy M is a black hole – contemporary digital or quantum processors are nowhere close to this limit.

In Newton and Einstein's theory, all mass-energy gravitates in an *isotropic* (spherical) manner. In this paper, we will consider aspherical – *anisotropic* – gravitating processes.

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2 On the holographic principle

It takes n Boolean degrees of freedom to describe the gravitational field [5, 6] generated by a process of mass-energy M. This is regardless of the radius of the gravitating process, and regardless of how many non-gravitational degrees of freedom exist. Where k_b is the Boltzmann constant, and ℓ_p is the Planck length, the number of gravitational degrees of freedom is

$$n = \frac{k_b A_s}{4\ell_p^2 \log 2}, \tag{3}$$

where in the case of the Schwarzschild line element

$$A_s = 4\pi R_s^2. \tag{4}$$

In the case where the process is a black hole, this effectively quantizes the event horizon – the event horizon is made up of an ensemble of Planckian oscillators. All of the non-gravitational degrees of freedom have been stripped away as gravitational waves, leaving only the gravitational degrees of freedom. In other words: a black hole is raw spacetime.

Note that as a process falls toward a black hole's event horizon, the process is interrupted to the point where it becomes fully *assimilated* – it becomes one process with the black hole.

3 On connectionless versus connected interaction

Unlike long-range electromagnetism, which is a *connectionless* interaction, gravitation is a *connected* interaction.

For electromagnetism, the photons are 'fired and forgotten' – there is only one oscillator per non-gravitational degree of freedom: the sender.

On the other hand, for gravitation, which is a connected interaction, there are two oscillators per gravitational degree of freedom: there is the sender and the receiver (sometimes parsecs apart). This is a kind of gravitational entanglement between the sender and receiver, a relic from the beginning of the Big Bang that persists to this day. For gravitation, there are n concurrent connections per process – no more, no less. Thus, Mach's principle [1] is yet again validated.

To use another analogy from computer science [7], the connectionless interaction is like a User Datagram Protocol network socket, and the connected interaction is like a Transmission Control Protocol network socket.

4 On dark matter

With regard to the flat rotation curve found in galactic dynamics [8]: if this number n is at least conserved as a gravitationally bound process (e.g. a galaxy) goes from sphere to disk as distance from the process centre increases, then the gravitation becomes anisotropic, strengthening along the orbit plane, weakening elsewhere. In fact, gravitation is anisotropic for all gravitationally bound processes, for there is no such thing as a perfect spherically symmetric, isotropic, homogeneous process (not even a black hole is spherically symmetric, because the event horizon is quantized). This includes galaxies, clusters, walls, and filaments. For instance, for a perfect disk, the interaction strength increases by a factor of c with a long-range falloff proportional to $1/r$, and for a perfect filament it increases by a factor of c^2 with a long-range falloff proportional to 1 (e.g. no falloff). For more details, see [9], where we show that for these perfect shapes that the gravitational field goes from being $(3+1)$-dimensional down to $(2+1)$ or $(1+1)$-dimensional. For example, at a distance of 10 kiloparsecs from the Galactic centre, it is found that the dimension of the gravitational field is roughly $(2.96+1)$.

We have no reason to expect that we will find a WIMP, axion, or similar solution [10–15] to the dark matter problem – if gravitation is quantized, then dark matter is made up of a graviton *condensate*.

5 Conclusion

In this paper we have defined a unique view of dark matter, which forms due to anisotropic gravitation in gravitationally bound processes. Of greatest importance is the fact that there is a finite number of gravitational degrees of freedom for a process of mass-energy M, and that when aligned, they form gravitational bonds that are stronger than that predicted by Newton and Einstein's isotropic theory of gravitation.

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