the general science journal

How a Standing Wave (Particle) Behaves in a Gravitational Field

An explanation for gravitational acceleration

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Abstract:

This paper outlines a detailed explanation for the acceleration due to gravity. The wave nature of condensed matter and the time dilation effect due to gravitational potential are used to explain the effect.

Introduction:

A particle can be modeled as a standing wave comprised of inward and outward traveling spherical waves that each reflect at the combined standing wave's nodes – thus an inward wave becomes an outward wave and vice versa at each reflection.

A balance is achieved in the distribution of the inward and outward waves' amplitude (and hence momentum) such that the natural shape for a particle in free space is spherical. As the outward waves travel away from the center of the particle and into space, they decrease in amplitude and energy density; but they are perfectly balanced by the inward waves that increase in amplitude and energy density as they converge towards the center of the particle.

In this configuration a perfect balance exists in the momentum exchanges of all the waves comprising the particle, such that the same spherical shape persists from one moment to the next. If, however, the particle interacts with another solid object, this perfect balance is disrupted and a new balance is attained – but in the new configuration the perfect spherical shape is distorted due to the pressure between the particle and the other solid object it is interacting with.

To see how such a wave structure behaves in a gravitational field, we must consider how each of the component waves are affected by the gravitational field

The gravitational field itself is a field of varying time dilation. The closer one gets to a mass where the gravitational potential is greater, the more time is dilated (running slowly). The effect is very small, but when it has an effect on waves that are traveling very fast, and which remain in the field for a considerable period of time, the result is gravity, as we know it.

Normally light waves do not stay within the gravitational field for very long, as their speed is so high – so only a slight bending of the wave occurs towards the mass. The waves that make up matter are affected in the same way, but they remain localized in the field for much longer, so the effects are much more noticeable.

The Analysis:

To see what the effect on the waves of a particle would be, we need to do the following maths:

From my earlier analysis of moving standing waves (*An Introduction To Energy Field Theory* – see reference at the end of this paper) we saw that:

For a standing wave (particle) that is traveling along at speed v:

$$\frac{f_{high}}{f_0} = \frac{c}{c-v} \qquad (1) \qquad\qquad \frac{f_{low}}{f_0} = \frac{c}{c+v} \qquad (2)$$

('high' and 'low' refer to the frequencies of the waves compared to the original frequency f_0)

And from General Relativity we know that when a wave travels from one gravitational potential to another, its frequency (which equates to energy) changes.

Thus for a standing wave (particle) that is placed in a gravitational field with acceleration a:

$$\frac{f_{high}}{f_0} = 1 + \frac{ah}{c^2} \qquad (3) \qquad\qquad \frac{f_{low}}{f_0} = 1 - \frac{ah}{c^2} \qquad (4)$$

The time taken for light to travel the vertical distance h is given by:

$$t = \frac{h}{c} \qquad (5)$$

Initial analysis suggests that this time equation would be an approximation because it is assumed here that light travels at the same speed at each point over the vertical distance h, but it actually travels slightly slower in a higher gravitational potential (slightly slower at the bottom than at the top). However, as the gravitational potential level is slightly less at the top than at the bottom, the waves traverse an equal amount of gravitational potential despite the different distances traveled. The waves from the top and from the bottom meet at a point equidistant in time rather than space. As the differences in h and in c are equal and cancel out, I have shown the simplified equation where this complication is ignored. This equation can be applied to the waves moving upwards or downwards.

Imagine a particle held stationary in a gravitational field by an upward force from a table top. The particle is a standing wave that can be thought of as comprising waves, of which the vertical components propagate upwards and downwards over time to form the standing wave.

The waves at the bottom of the particle travel very slightly slower than the waves on the top (due to the greater gravitational potential at the bottom), so in order for the standing wave to remain a continuous waveform, the waves at the bottom must bunch up (get closer together) so that the same number of wave crests travel from top to bottom as from bottom to top.

As the downward waves slow down and bunch up as they move into a region of higher gravitational potential, their frequency increases, and thus so does the momentum they carry, thus the force they impart on the table on which they are resting increases.

The strength of the force that holds the particle stationary (between the table and the particle) depends on the energy of the waves, so if they have higher frequency there will be a stronger force. Thus an equilibrium position is attained where the forces balance between the particle and the table. Also the continuity of the waves of the standing wave is maintained across the differing gravitational potential, such that the particle is stationary; but a pressure exists between the table and the particle – where the waves have higher frequency and are compressed closer together.

If the table is suddenly removed, the first thing that happens is that the opposing force from the waves comprising the table is removed, so the bunched up waves at the bottom of the particle spread out to restore the particle's normal spherical geometry. Once this occurs, however, the number of wave-crests propagating from the bottom of the particle to the top decreases. This is because at the midway point between the table and the particle exists a node in the standing wave. When the table is removed, the node moves downward as there is now a mismatch in the momentum of the waves reflecting at each side of the node, so the waves from the particle push the node downward. As the downward component of the particle’s standing wave is reflected at the node to form the upward wave, the resulting upward wave will be Doppler shifted to become a slightly lower frequency wave. Similarly, the upward wave reflecting at the node to form the downward wave will arrive at the bottom as a slightly higher frequency wave as it is reflected and Doppler shifted at a node that is moving downwards. By this method the change is transmitted from one node to the next and affects the whole particle’s wave structure.

Thus a moment after the table is removed, the particle becomes a standing wave comprised of a higher frequency down wave and lower frequency up wave. As a result, the particle will gain more momentum in the downward direction, and the standing wave’s nodes (and therefore the whole particle) will attain a downward speed (v). This is the configuration for a particle in motion.

The waves continue to travel slower at the bottom of the particle than at the top, and the nodes are continued to be pushed downward due to the greater momentum of the downward wave compared with the upward wave on the other side of the node. This process will continue to occur from one moment to the next, causing the particle to accelerate downwards.

The speed that a particle is moving at is the same as the speed at which the standing wave's nodes are moving (assuming the particle is neutral, not charged – with charged particles the nodes may be moving faster or slower than the overall group velocity of the particle).

So to calculate this speed (v) for a particle accelerating in a gravitational field for the period of time (t), we can perform the following operations on the above equations:

Substitute (1) and (5) into (3):

$$\frac{c}{c-v}=1+\frac{at}{c}$$

$$c=(c-v)\left(1+\frac{at}{c}\right)$$

$$c=c+at-v-\frac{vat}{c}$$

$$\frac{vat}{c}=at-v \qquad (6)$$

Substitute (2) and (5) into (4):

$$\frac{c}{c+v}=1-\frac{at}{c}$$

$$c=(c+v)\left(1-\frac{at}{c}\right)$$

$$c=c-at+v-\frac{vat}{c}$$

$$\frac{vat}{c}=-at+v \qquad (7)$$

Substitute (6) into (7) :

$$at-v=-at+v$$

$$2at=2v$$

$$v=at$$

QED

Conclusion

I have derived the classical velocity that a particle achieves when it is accelerated by gravity for a period of time (t) by considering only the effects on the frequencies of the upward and downward waves.

It appears that the acceleration due to gravity is explained by the following four-step process:

The Primary Cause:

(1) An increase in frequency (and hence momentum) of the downward component of the particle's standing wave due to the slowing of waves in higher gravitational potential. Similarly a decrease in frequency of the upward component wave due to a speeding up of waves in a lower gravitational potential.

Secondary Considerations:

(2) The higher momentum downward wave then pushes the standing wave's nodes downward.

(3) The reflected upward wave is then Doppler shifted to a slightly lower frequency.

(4) The upward/downward waves then continue to reflect backwards and forwards between the nodes, constantly undergoing small Doppler shifts, causing momentum to build in the downward direction.

This clearly demonstrates that the standing wave model for a particle works, and that the time dilation effect in the gravitational field can account for gravitational acceleration of particles.

REFERENCES

Declan Traill (2001) "Relatively Simple? An Introduction to Energy Field Theory"
http://www.wbabin.net/traill4/traill.htm