Relationship between mass and speed of light

10th Nov,2012

Tetsuya Nagai

It has been observed officially that the light is bent under gravity.

From general relativity

$$\varphi = \frac{4Gm}{bc^2} \tag{1}$$

Where c is the speed of light in vacuum.

Where φ is the curvature of light when light passes through distance b away from mass m.

G is the gravitational constant.

In general relativity the bending of light has been explained by the distortion of space. However instead of the distortion of space, can't we explain the bending of light as a phenomenon that derived from the changing of the speed of light depend on location in a vacuum?

I try to explain the bending of light with using non- distorted axis of space-time as following.

I assume that the total amount of the Laplacian of c^2 is proportional to the mass, and have the following relationship.

$$\int_{v} \nabla^2 c^2 dv = km \tag{2}$$

where k is a constant

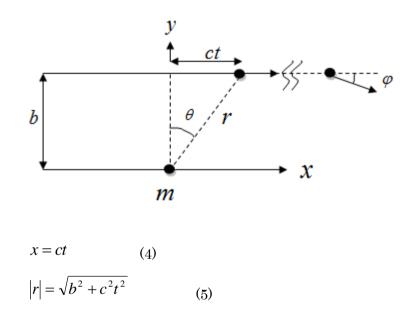
from(2)

$$grad(c^{2}) = \nabla c^{2} = \frac{\int_{v} \nabla^{2} c^{2} dv}{4\pi |r|^{2}} \frac{r}{|r|} = \frac{kmr}{4\pi |r|^{3}}$$
(3)

In following figure x is the traveling direction of the light.

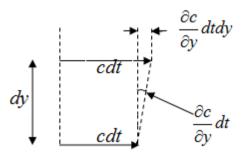
The light will pass through the distance b away from the mass on the axis y.

$$r = [x, y]$$
 is a vector.



$$\cos(\theta) = \frac{b}{\left|r\right|} = \frac{b}{\sqrt{b^2 + c^2 t^2}} \tag{6}$$

Where θ is the angle between r and axis y



$$\frac{\partial c^2}{\partial y} = 2c \frac{\partial c}{\partial y} = 2c_0 \frac{\partial c}{\partial y}$$
(7)

Where c_0 is standard speed of light in vacuum. $|c_0 - c| << c_0$

$$\frac{\partial c}{\partial y} = \frac{1}{2c_0} \frac{\partial c^2}{\partial y} \quad (8)$$

$$\frac{\partial c}{\partial y} = \frac{1}{2c_0} \frac{\partial c}{\partial y} = \frac{1}{2c_0} \operatorname{grad}(c^2) \bullet \frac{y}{|y|} = \frac{1}{2c_0} \frac{km}{4\pi |r|^2} \cos(\theta)$$
(9)

Therefore

$$\varphi = \int_{-\infty}^{\infty} \frac{\partial c}{\partial y} dt = \int_{-\infty}^{\infty} \frac{1}{2c_0} \frac{km}{4\pi (b^2 + c^2 t^2)} \frac{b}{\sqrt{b^2 + c^2 t^2}} dt$$
$$= \frac{1}{2c_0} \frac{km}{4\pi} \int_{-\infty}^{\infty} \frac{b}{(b^2 + c^2 t^2)^{\frac{3}{2}}} dt = \frac{km}{4\pi b c_0^{-2}}$$
(10)

From (1)(10)

$$k = 16\pi G \tag{11}$$

From (2)(11)

$$\int_{v} \nabla^2 c^2 dv = 16\pi Gm \tag{12}$$

Therefore total amount of the Laplacian of c^2 is proportional to mass. As a result I found a relationship between the mass and the speed of light.

Also I try to seek the relationship between the gravity and light speed.

From(3)and (11)

$$grad(c^{2}) = \frac{kmr}{4\pi |r|^{3}} = \frac{16\pi Gmr}{4\pi |r|^{3}} = \frac{4Gmr}{|r|^{3}}$$
 (13)

From the law of universal gravitation.

$$g = -\frac{Gmr}{\left|r\right|^3} \tag{14}$$

Where g is the gravitational acceleration.

From(13)(14)

$$grad(c^2) = -4g$$
 (15)

Therefore the gradient of c^2 is four times the acceleration of gravity and the opposite direction.